CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01

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NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

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Title: Barefoot Power Lighting Programme
Version: 07
Date: 24/07/2012

A.2. Description of the small-scale programme of activities (PoA):

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1. General operating and implementing framework of PoA

The purpose of this small-scale Programme of Activities (PoA) is to disseminate LED based lighting systems to households and Small and Medium Enterprises (SMEs) in developing countries and to expedite the process of phasing out the use of portable fossil fuel based lamps. All project lamps distributed will be charged by renewable energy systems (e.g. photovoltaic systems).

Barefoot Power Pty Limited (BFP) will act as the Coordinating/Managing Entity (CME) for the PoA. BFP is a global, social for profit enterprise that manufactures and distributes solar lighting products to people at the base of the pyramid. The company operates through two functional units:

1. The BFP Executive Unit is based in Australia and is responsible for overall company management as well as product development and R&D.
2. The BFP Supply Unit is based in China and is responsible for production, distribution and overall logistics.

Project lamps will be distributed through In-Country Distribution Companies (ICDC), which are fully or partly owned by BFP, or through other, independent Distribution Partners (DP). The ICDC and DPs will be responsible for the implementation of one or more CPAs. The ICDCs and DPs, together referred to as CPA entities, will distribute project lamps directly to end-users or via one or more intermediaries. The proposed method of distribution of project lamps is depicted schematically in Figure 1.

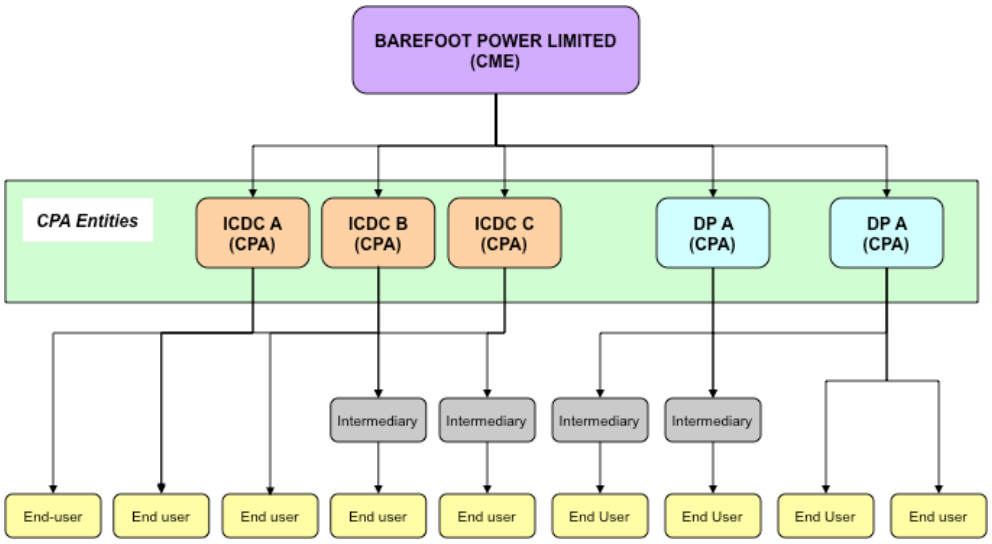

Figure 1: Schematic overview of method for distribution of project lamps

BFP, as the CME, will be responsible for:

- Development of a PoA Design Document (CDM-POA-DD) and CDM CPA Design Documents (CDM-CPA-DD) for CPAs that are developed under the Programme of Activities;
- Obtaining letters of approval for implementation of the PoA from each Host Party involved in the PoA;
- Obtaining letter of authorization of its coordination of the PoA from each Host Party involved in the PoA;
- Liaise with the Designated National Authority (DNA) on matters related to the implementation of the PoA and inclusion of CPAs;
- Providing capacity-building and training to the CPA entities regarding the monitoring and record keeping requirements as outlined in the PoA-DD and CPA-DD documents;
- Providing technical and administrative support to the CPA entities to guarantee compliance with the monitoring requirements and other PoA stipulations;
- Providing technical advice and support to the implementation of an appropriate battery disposal system under the CPAs;
- Collect and compile monitoring records from all the CPA entities;
- Establish and maintain a database compiling sales records from different CPA entities;
- Coordinate monitoring activities and data management during the lifetime of the PoA;
- Prepare and submit periodic monitoring reports and facilitate verification of the same;
- Act as the focal point with the CDM Executive Board for matters related to the PoA;
- Be responsible for CER transactions with CER buyers;
- Liaise with the Designated National Authorities;
- Carry out a quality check on CPAs to be included in the Programme of Activities;
- During the life of the PoA, maintenance of all monitoring reports of all CPAs in accordance with record keeping systems outlined in the CDM-POA-DD;

ICDCs and DPs, as CPA Entities, will be responsible for:

- Disseminate and distribute project lamps that meet the technical requirements of the PoA;
- Keep records of sales and users as per the monitoring plan and provide hard and electronic records to the CME on a regular basis;
- Comply with any other PoA requirement as per the guidance received by the CME;
- Make available staff for validation and verification, where applicable;
- Collection of warranty cards and/or receipts or other type of documentation from end-users, if applicable.
- Comply with prevailing regulations pertaining to use and disposal of batteries.
- Ensure owners of project lamps have access to replacement batteries of comparable quality.

Barefoot Power will enter into contractual arrangements with all CPA entities. The contractual arrangements will summarize roles and responsibilities regarding the implementation of the individual project activities as a CDM Programmes of Activities. At a minimum, the contractual arrangement shall ensure that the CME will have control of all relevant records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with the specific requirements of the programme.

When purchasing the project lamp, the end-user will fill in and sign a warranty card/receipt/other documentation (either physically or using a dedicated SMS system) containing the serial number of the

project lamp as well as the name, location/address and phone number of the end-user. This documentation will also assign the legal rights of the CERs to Barefoot Power.

2. Policy/measure or stated goal of the PoA

The stated goal of the PoA is to make modern LED based lighting technologies available to households and SMEs in developing countries and to expedite the phasing out of fossil fuel based lamps.

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

There are no laws, policies or mandatory requirements in the Host Country stipulating the adoption of project lamps by households or SMEs, nor their dissemination. This proposed PoA is a voluntary action by the CME, Barefoot Power Pty Limited.

A.3. Coordinating/managing entity and participants of SSC-POA:

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1. Coordinating or managing entity of the PoA as the entity which communicates with the Board

Barefoot Power Pty Limited will act as the coordinating/managing entity for the PoA

2. Project participants being registered in relation to the PoA.

The following entities will be registered as Project Participants in relation to the PoA:

- Barefoot Power Pty Limited

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Kenya (host)	Barefoot Power Pty Limited (Managing Entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

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The PoA will be implemented in Kenya. The geographic coordinates of Kenya are shown below.

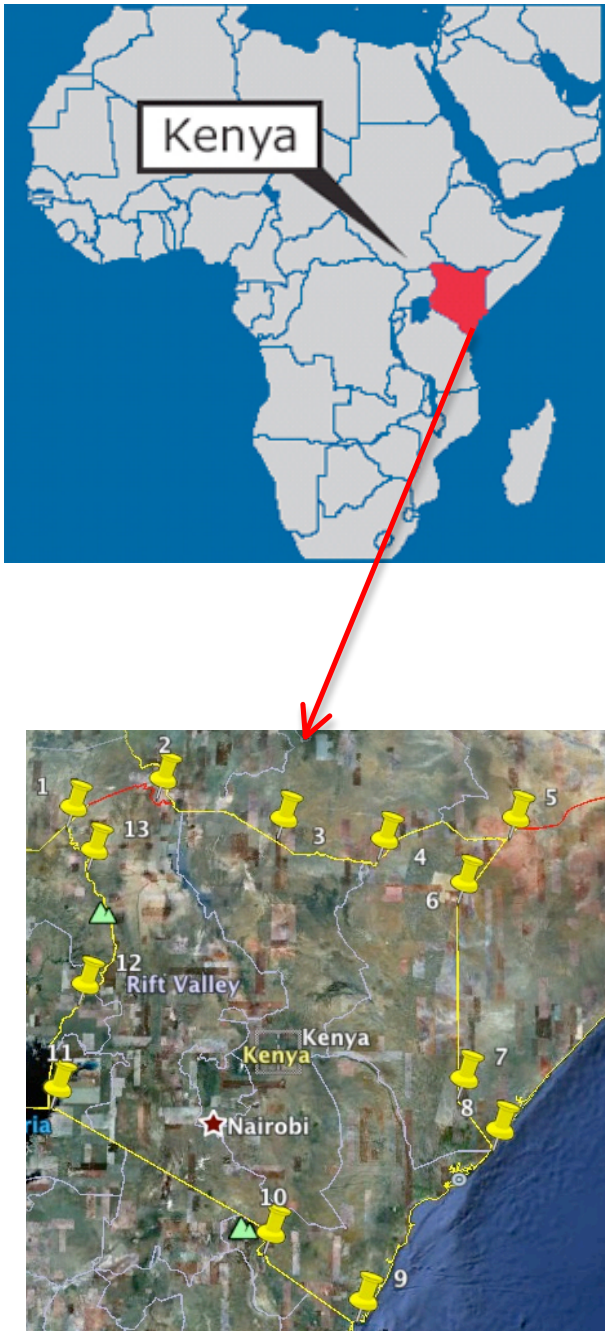

Figure 2: Map of Africa with location of Kenya

Kenya border coordinates

	Latitude	Longitude

Kenya border point 1	4°10'28.34"N	34° 0'38.74"E
Kenya border point 2	4°41'36.79"N	35°37'38.14"E
Kenya border point 3	3°53'41.61"N	37°49'23.71"E
Kenya border point 4	3°30'28.79"N	39°36'33.51"E
Kenya border point 5	3°58'42.09"N	41°57'34.90"E
Kenya border point 6	2°42'42.36"N	41° 0'38.58"E
Kenya border point 7	0°49'31.95"S	40°58'30.66"E
Kenya border point 8	1°42'50.36"S	41°35'17.19"E
Kenya border point 9	4°41'23.11"S	39°16'40.83"E
Kenya border point 10	3°32'6.15"S	37°42'12.84"E
Kenya border point 11	1° 2'10.33"S	33°58'20.05"E
Kenya border point 12	0°49'16.24"N	34°24'19.64"E
Kenya border point 13	3°19'39.60"N	34°26'38.17"E

A.4.1.1. Host Party(ies):

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Kenya

A.4.1.2. Physical/ Geographical boundary:

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The geographical area within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented is defined by the national boundary of the Host Country, Kenya. In line with the *Clarifications regarding the "Procedures for the registration of a Programme of Activities as a single CDM project activity and issuance of Certified Emission Reductions for a Programme of Activities"* (EB 60, Annex 26) and the *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for Programme of Activities* (version 01.0, EB 65, Annex 3), the project proponent might decide to amend the boundary of the programme post-registration to include additional Host Parties.

A.4.2. Description of a typical small-scale CDM programme activity (CPA):

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

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The project activity will distribute LED based lighting systems to households and SMEs using fossil fuel based lamps.

Light Emitting Diodes (LED) are electronic devices that emit visible light when electric current flows through them. LEDs are manufactured using semiconductors, like silicon and germanium. The semiconductors are alloyed or doped with small quantities of a chosen impurity. According to the impurities chosen, a distinction is made between p-type or n-type, where the letters p and n stand for positive and negative respectively. The semiconductor alloy therefore contains half of p-type and half of

n-type semiconductors and together they make a junction called a pn junction. When the LED is switched on, electric current passes through the pn junction and charge carriers, both negative (electrons) and positive (holes), are created. When electrons recombine with holes within the device, they release energy in the form of photons. This effect produces the colour of light that corresponds to the energy of a photon. The light produced depends on the semi-conductor material used in the LED. Semi-conductor material such as gallium arsenide produces mainly red light. Synthetic materials such as p-phenylenyinyl can produce light of any color.

LED-based lighting systems are an environmentally safe and sound technology and have a number of advantages over traditional lighting systems:

- LED-based lighting systems are much more efficient in terms of light output per electric power input, e.g. a LED with a power input of 10-watt units produces light output of 60 lumens per watt, this is as much light as a common 50-watt incandescent bulb.

- LEDs don't waste as much energy in the form of heat. In comparison, most of the energy in an incandescent lamp is in the infrared (or non-visible) portion of the spectrum, which in turn is accompanied by heat.

- Unlike fluorescent lamps, LEDs don't contain mercury and are, therefore, more environmentally friendly.

Through the distribution of LED based lighting system, an environmentally safe and sound technology will be transferred to the Host Parties.

In line with approved baseline and monitoring methodology AMS III.AR, the PoA will introduce LED based lighting systems that meet the following technical and operational requirements:

- The project lamps will have a useful lifetime of at least 5,000 hours that will be certified by manufacturer or the responsible vendor as the time at which the lamp's initial light output declines by no more than 30%;
- The project lamps' battery charging efficiency, at the time of purchase will at least be 50%, as certified by manufacturer;
- The project lamps will have a configuration of diodes with a minimum illumination of 20 lux (for task, portable lights and ambient lights) as certified by manufacturer;
- Project lamps will have a minimum of one year warranty which will cover free replacement or repair of any failed lamps, batteries and where applicable solar panels.

The batteries of the project lamps will be charged by renewable energy systems.

The following additional technical specifications requested by the methodology (AMS-III.AR, version 01, para.6) will be described by each CPA in the CPA-DD:

- Lamp wattage (in Watts) and illuminance (in lux);
- Lamp rated lifetime (in hours);
- Where applicable type and rated capacity of renewable energy equipment for charging the battery (in Watts);
- Type (e.g NiMH, Lead-Acid, Li-ion) and rated capacity of the battery (in Ampere Hours);
- Type of charge controller (e.g active or passive);
- Autonomous Time and Daily Burn Time;

- Where applicable (with solar energy charging systems) maximum, minimum and average monthly Solar Fraction values during the year;
- Where applicable, grid charging time;
- Physical protection against weather impacts (e.g rain, heat, insect ingress).

In case the programme introduces new project lamps that have not yet been described in a CPA-DD, the programme will introduce a new CPA and provide a description of the technical specifications of the new project lamp in a new CPA-DD.

A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

The eligibility criteria for the inclusion of a SSC-CPA in the PoA have been formulated as follows in accordance with the *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (version 01.1, EB 65, Annex 3)

#	Eligibility criteria	Means of verification
1	The geographical boundary of the CPA including any time-induced boundary shall be consistent with the geographical boundary set in the PoA	Distribution plan of the SSC-CPA. Any amendments on the project boundary will be done in accordance with the *Clarifications regarding the "Procedures for the registration of a Programme of Activities as a single CDM project activity and issuance of Certified Emission Reductions for a Programme of Activities"* (EB 60, Annex 26).
2.	The CPA has measures in place to avoid double counting	
2a.	Project lamps distributed by the CPA will be marked for clear and unique identification with the project activity	Mark on the project lamps distributed by the CPA. The mark should at least uniquely identify the project lamp with the PoA and with the CPA.
2b.	The CPA has not yet been included in another Programme of Activities or has not yet been registered as a single CDM project activity	Signed confirmation from the entity implementing the CPA, confirming that the project has not yet been included in another Programme of Activities or has not yet been registered as a single CDM project activity
3	The project lamps and charging systems will at least meet the minimum technical and operational requirements as specified in version 01 of AMS III.AR *Substituting fossil fuel based lighting with LED lighting systems*. The CPA shall also comprise of activities that replace portable fossil fuel based lamps with LED-based lighting systems in residential and non-residential applications	
3a	The project lamps shall have a useful lifetime of at least 5,000 hours that will be certified by manufacturer or responsible vendor as the time at which the lamp's initial output declines by no more than 30%;	Certificate from the manufacturer
3b	The project lamps' batteries shall have a	Certificate from the manufacturer

#	Eligibility criteria	Means of verification
	charging efficiency of at least 50% (certified by the manufacturer);	
3c	The project lamps shall have a minimum of one year warranty which will cover free replacement or repair of any failed lamps, batteries and where applicable solar panels.	Warranty card.
3d	The CPA shall comprises activities that replace portable fossil fuel based lamps with LED-based lighting systems in residential and non-residential applications	Distribution plan
4	The start date of the CPA shall not be prior to the commencement of the validation of the PoA.	The start date of the CPA will be defined as the date on which the CPA starts distribution of project lamps under the PoA and shall not occur prior to the commencement of the validation of the PoA. Sales documentation such as invoices, receipts or warranty cards shall be provided as documentary evidence.
5	The CPA meets all the applicability criteria of AMS III.AR (version 01)	Detailed assessment that the CPA meets all the applicability criteria of AMS III.AR (version 01).
6	The CPA meets the requirement pertaining to the demonstration of additionality.	
6a	For microscale CPAs, the CPA requirements stipulated in the *Guidelines for demonstrating additionality of microscale project activities* (version 04, EB 68, Annex 26) are as given below: "Type III project activities that aim to achieve emissions reductions at a scale of no more than 20 ktCO2e per year, are additional if any one of the following conditions is satisfied: (a) The geographic location of the project activity is a LDC/SID or special underdeveloped zone (SUZ) of the host country: SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following	a) Emission reduction estimations (i) Confirmation that the geographic location of the project activity is a LDC/SID or special underdeveloped zone (SUZ) of the host country: SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following conditions using most recent available data: • The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; • The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures or

#	Eligibility criteria	Means of verification
	conditions using most recent available data: • The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; • The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures (b) The project activity is an emission reduction activity with both conditions (i) and (ii) satisfied (see below); (i) Each of the independent subsystems/measures in the project activity achieves an estimated annual emission reduction equal to or less than 600 tCO2e per year; and (ii) End users of the subsystems or measures are households/communities/SMEs."	(ii) Emission reduction calculations showing estimated annual emission reduction of each independent subsystem and business plan indicating end users of the subsystems.
6b	For CPAs that do not meet the requirements of the *Guidelines for the demonstration of microscale projects*, additionality of a typical CPA shall be demonstrated using the simplified procedures for small-scale project activities as given in *Guidelines on the demonstration of additionality of small-scale project activities* (version 09, EB 68, Annex 27). In line with the *General guidelines for SSC CDM methodologies* (version 17, EB 61, Annex 21), the project activity shall further use the *Non-binding best practice examples to demonstrate additionality for SSC project activities* (EB 35, Annex 34) and the *Guidelines for objective demonstration and assessment of barriers* (version 01, EB 50, Annex 13). More specifically, a typical CPA would not have occurred anyway due to the following barriers:	a) Documentation of the common practice of fuel usage for lighting in the project region (e.g. based on representative sample surveys, official data or peer reviewed literature). b) Documentation of the common practice of the lighting technology used in the project region (e.g. based on representative sample surveys, official data or peer reviewed literature) c) Agreement between Barefoot Power Pty Limited and In Country Distribution Company that is distributing Barefoot Power products. If the In Country Distribution Company is not distributing Barefoot Power's products, proof that it is not a subsidiary of a multinational group and/or evidence to show that the project could not access appropriate capital without consideration of CDM revenues such as loan agreements/bank statements to show that CDM revenues were critical in approval of the loan and/or Emission Reduction Purchase Agreements.

#	Eligibility criteria	Means of verification
	The CPA is implemented in a country (or other geographical area) where fossil fuel usage for lighting purposes is prevailing practice. The CPA is implemented in a country (or other geographical area) where a less technologically advanced alternative to the LED based lighting systems is available, which is based on fossil fuel. It will further be demonstrated that the less technologically advanced alternative involves lower risks due to the performance uncertainty or low market share of the LED based lighting systems adopted. Finally, the CPA would not have occurred anyway due to one or more access-to-capital barriers. Existing barriers for access-to-capital can be demonstrated at various levels: • It can be demonstrated that the implementation of the CPA is consequential to the removal of the access-to-capital at the level of Barefoot Power (i.e. the CPA would not have been implemented if Barefoot Power would not have been able to raise the necessary capital for the development of its next generation of high-quality solar-based LED systems). • It can be demonstrated that CPA would not have been implemented due to lack of access to working capital at the distributor level. • It can be demonstrated that the CPA would not have been implemented due to lack of finance at the end-user level.	
7	The CPA shall conduct a local stakeholder consultation meeting and perform an environmental impact analysis.	a) Local stakeholder consultation meeting report as well as the meeting overview detailed in section D of the CPA DD. b) Environmental analysis carried out in line with local environmental laws and detailed in section C of the CPA DD.
8	The CPA has not received funding from	Confirmation letter from CPA entity that the CPA has

#	Eligibility criteria	Means of verification
	Annex I parties that results in a diversion of official development assistance	not received funding from Annex I parties or confirmation letter from Annex I party that funding to the CPA does not result in a diversion of official development assistance.
9	The CPA targets households and SMEs that use fossil fuel lamps for lighting purposes	Business plan and distribution model. Documentation of the common practice of fuel usage for lighting in the project region (e.g. based on representative sample surveys, official data or peer reviewed literature)
10	For CPAs with project lamps that will claim emission reductions for up to seven years, the project activity will carry out a survey in the third year of the CPA's crediting period to determine the percentage of project lamps distributed to end users that are operating and in service. The CPA entity shall put in place a system to record data and information about the end users to allow for sampling in year three of the crediting period of the CPA. At a minimum the information should include: • Contact details of end user • Location of end user • Serial number of the project lamp	Monitoring manual of CPA that includes the description of the sampling plan more specifically the sampling design, data to be collected and implementation plan in line with version 02.0 of the *Standard for sampling and surveys for CDM project activities and programme of activities* (EB 65, Annex 2). A sampling plan detailed in section B.6.1 of the CPA DD in line with version 02.0 of the *Standard for sampling and surveys for CDM project activities and programme of activities* (EB 65, Annex 2).
11	The annual emission reductions achieved by the CPA will not exceed 60 ktCO2e	Emission reduction estimations
12	The CPA is not a debundled component of a large-scale project activity in accordance with the latest approved version of the *Guidelines on assessment of debundling for SSC project activities.*	Debundling check carried out in line with the latest approved version of the *Guidelines on assessment of debundling for SSC project activities.*
13	The LED based lighting systems distributed by the CPA will be charged solely by a renewable energy system.	Technical review of the CPA by the CME. Technical specifications of the project lamps that are distributed by the CPA.
14	The CPA entity has signed contractual agreements with the CME to participate in the PoA. Those agreements will include all rights and responsibilities of both parties, e.g. approval procedures by the CME, monitoring requirements, emission reduction transfer and benefit sharing. At a minimum	Agreement between CME and entity implementing the CPA.

#	Eligibility criteria	Means of verification
	the agreement shall ensure that the coordinating/managing entity will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with the specific requirements of the programme.	

The following management system will be implemented by the CME for the inclusion of CPAs:

1. Personnel involved in the process of inclusion of CPAs in the PoA

BFP will appoint a technical reviewer who has been trained and has working experience in CDM. The technical reviewer will have excellent knowledge of CDM modalities and procedures and will have the following responsibilities:

a) Carry out a technical review of a proposed CPA to ensure that the CPA meets all the eligibility criteria as formulated in the PoA-DD
b) Collect and compile supporting evidence that are required for the inclusion of the CPA in the PoA
c) Verify that the CPA has not yet been developed as a single CDM project or been included in another PoA
d) Collect, compile and store data and information regarding each CPA

2. Training and capacity building for personnel involved in the inclusion of the CPAs

BFP shall further conduct training and capacity building exercises for the technical reviewer and any other personnel it appoints based on any identified needs to ensure that continuous improvements of the PoA management system is taking place. The training would include information on the latest EB guidelines on PoA development, CPA inclusion, monitoring, verification and issuance.

3. Procedure for technical review of inclusion of CPAs

All new CPAs proposed for inclusion in the PoA shall be reviewed by BFP using a technically competent, independent reviewer or team of reviewers to ensure that the new CPA fully complies with the registered CDM design requirements.

The following gives an overview of the process to be followed:

a) Identify required competency

Barefoot Power will consider the review requirements and identify the competency areas required by the reviewer. The competence analysis completed for previous technical review tasks can be used for later tasks provided that the technical requirements have not changed.

b) Selection of the technical review team or individual

The reviewer may be composed of one or more persons, as necessary, to ensure that the reviewer has the competency necessary to properly complete the review. If there is more than one person in the team, one member shall be appointed as the team leader. The reviewer shall be independent of direct involvement in

the development or preparation of the CPA, the CPA eligibility criteria or the monitoring report being reviewed.

c) Performance of the technical review

The technical review shall in general, follow the below process:

1. Obtain an up to date approved technical review form containing the eligibility criteria and means of verification for inclusion of CPAs into a PoA as outlined in the registered PoA DD
2. If the technical review is to be performed by a team, allocate review tasks to suit team member competency
3. Confirm the completeness of documents received for the CPA, based on the checklist in the technical review form
4. Assess all elements in the eligibility criteria checklist in the technical review form, collect required additional evidence and reach conclusions
5. Where necessary the technical reviewer might raise system improvement requests and provide them to the operating unit responsible for the CPA or monitoring report. The manager of the operating unit is required to review the issues, act on system improvement requests and rectify any discrepancies and return the updated documentation to the technical review team.
6. Document the findings, decision and comments in a technical review report.
7. The reviewer shall finalise the technical review after all non compliances have been rectified or the agreed deadline for completion of action has passed.
8. Any remaining non compliances shall be clearly identified in a technical review report, and in particular if any of the non compliances will result in a potential rejection of the proposed CPA or potential CERs.
9. The completed technical review report is provided to the decision maker (at the CPA or CME, depending on what level of Technical Review it is).

d) Technical review report

The reviewer shall document their preliminary and final findings in the technical review report, including the opinion of the team leader as to whether the CPA and monitoring report comply with all technical requirements, and any qualifications or residual issues. The report will contain sufficient information to enable a competent person to review the evidence and reach the same opinion as the team leader. In particular a CME technical review should allow the DOE to reach the same conclusion.
The technical review report, CPA eligibility statement or monitoring report and all supporting information shall be provided to the decision maker.

4. Procedure to avoid double counting

In order to avoid double counting *along the supply chain*, the following measures will be taken:

- Each project lamp will be marked in such a way that it will be unambiguously linked to the proposed Programme of Activities
- The CME will enter into a contractual arrangement with all CPA entities. Among other things, the contractual arrangement will stipulate that the CPA entity agrees that the emission reductions achieved by the use of the project lamps distributed by the CPA entity will be subscribed to the proposed Programme of Activities
- In a similar way, the warranty card, receipt or other purchase documentation which will be signed by the end user will include a stipulation that the emission reductions achieved by the use of the project lamp will be subscribed to the Programme of Activities.

In order to avoid double counting of *replacement lamps*, the following measures will be taken:

- When a project lamp fails or breaks down, the end user will take it to one of the BFP service centre (directly or through a retailer).
- At the service centre, a job card is created which contains the serial number of the project lamp, a description of the problem, action taken, replacement parts used, etc.
- In case the project is still under warranty, the project lamp can be replaced if the failure or breakdown cannot be repaired. A note will be made on the job card that the project lamp is replaced, including the serial number of the old lamp, the serial number of the new lamp and the contact details of the recipient.
- The service centre will send monthly overviews to the CPA entity, including copies of the job cards.
- The CPA entity will process the information and summarize data and information regarding the replacement lamps. The information regarding the replacement lamps will be send to the CME on a quarterly basis as part of the quarterly report.
- Using the serial numbers, the CME will remove the replaced lamps from the project database and enter the serial number of the replacement lamp.

5. Records and documentation control process for each CPA under the PoA

Documents are controlled by making sure they are clearly identified, complete and up to date, properly approved and that they are available when they need to be used. Controlled documents include the CME management system manual, Standard Operating Procedures (SOPs), forms, and templates.

- *Responsibility*

BFP is responsible for preparing and approving the controlled documents they consider are needed to make sure the activities are completed properly each time they are done. BFP will also ensure that the personnel performing those activities are aware of and have access to the latest version of the relevant SOP. The Carbon Project Manager is responsible for document control policies and for all documents held centrally. Individual managers are responsible for the controlled documents describing the critical activities under their control. This responsibility includes preparing, updating, approving and controlling the document.

- *Process*

a) Controlled documents have the words “Controlled Document” in the header of each page of the document.
b) Controlled Documents include:
   - The CME Quality Manual
   - Standard Operating Procedures describing how critical activities are to be performed. They include the responsibility for performance of the work.
   - Work Instructions describing how a simple task is to be performed. They do not include responsibility for the work.
   - Forms are preformatted documents for the collection of information. After they have been completed they become records.
   - Templates for new documents such as SOPs and Work Instructions.

c) Each controlled document has on the footer or header of each page:

a. A unique identifier – this can be a name or a number
b. Version number – to identify the latest document
c. Page numbers – the page number and the number of pages in the document
d. Name and function of document owner – this person is responsible for approving and keeping the document up to date

d) Each manager responsible for a critical activity is responsible for keeping a master list of their documents and making sure that an up to date copy of their master list is also sent to the CME document controller. The master list can be electronic or hard copy; it lists the unique identifier and version number of the current document and has the date the list was updated.

The manager responsible for a controlled document is also responsible for providing the management representative with a master copy of each controlled document.

Each person who needs to use a controlled document is responsible for making sure that they have the latest version.

- *Storage of records*

i. Barefoot Power Records

Barefoot Power, as the coordinating entity will be responsible for filing all records electronically on a server. The data on the server is operated by a third party and is regularly backed up by the service provider. Barefoot Power will keep copies of all records for 2 years past the termination of the carbon credit program.

ii. CPA Records

The CPA entities will keep hard and soft copies of all its CDM-related records. This includes:

- Copies of quarterly reports
- Invoices from Barefoot Power
- Delivery confirmations

All records will be kept at the relevant head office of the CPA entity.

6. Measures for continuous improvements of the PoA management system

Barefoot Power will carry out a management review which is a structured review of the operation of the management system undertaken by the management team and formulates clear objectives for improvement of the management system. The Barefoot Power management team will review the operations of the PoA management system at least once per year. The quorum for decision at the meeting is 50%. The review can be in person or using any method that supports the free exchange of ideas in real time. The review shall consider:

a) Internal audits of the management system
b) Corrective and preventative actions identified by the audit
c) Nonconforming CPAs
d) Supplier performance – contractors and consultants
e) Results of external audits
f) Results of EB reviews
g) Changes to the UNFCCC CDM and PoA requirements

The conclusions of the review will include:

a) Suitability of policy
b) New performance objectives
c) Changes to the CME management system
d) Resource requirements
e) Resource plans
f) Plans for new CPAs

The Carbon Project Manager shall review the outcomes of the review and develop a timetable for the implementation of all outcomes from the review. The affected operations managers and CPA Coordinators will prepare specific implementation plans to meet the timetable developed. The Carbon Project Manager will monitor the implementation of the review outcomes and report back to the Barefoot Power Management team on progress.

Internal audits of the management system

Internal audits will be used to measure and improve the performance of management and personnel. The extent of the audit programme will cover all elements of the management system, all CME operations, all CPAs and all operations of CPA implementers. Its objectives will be:

a) To verify conformance with the requirements of the registered PoA and the CDM
b) To provide the DOE with confidence that the CME and CPA are well managed and meeting the requirements of the registered design and the CDM
c) To contribute to improvement of the management system

Responsibilities:

a) Internal auditor and review manager will set a schedule of audits and appoint auditors, review internal reports, planned corrective actions and follow ups.
b) Lead auditor will be responsible for the proper performance of assigned internal audits
c) CPA coordinators and operations managers will fully assist the audit team and implement corrective actions as necessary
d) BFP carbon project manager will ensure all corrective actions are effectively and timely implemented.

Internal audit process:

1. Initiate the audit
    a. Appoint lead auditor
    b. Define and record objectives, scope and criteria of the audit
    c. Select the team if technical experts
    d. Contact the auditee and request required documents
2. Conduct document review (desk review)
3. Prepare for onsite activities
    a. Prepare audit plan
    b. Assign work to the audit team
    c. Prepare audit documents
4. Conducting on site audit activities (if any)
    a. Conduct the opening meeting

b. Manage team communication
c. Work with guides and observers
d. Collect and verify information
e. Generate and record audit findings
f. Raise system improvement requests where applicable
g. Prepare audit conclusions
h. Conduct the closing meeting

5. Prepare, approve and distribute the audit report
   a. The lead auditor completes the internal audit report (It might be that the final conclusion can only be reached after system improvement reports are completed or their deadline passed)
   b. The report is signed by the lead auditor and the auditee
   c. The report and supporting documents are distributed as needed

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

>>

The proposed PoA is a voluntary coordinated action

The proposed PoA is a voluntary coordinated action by Barefoot Power Pty Limited. There are no laws, policies or mandatory regulations in Kenya that require households or SMEs to use LED based lighting systems.

If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA.

In line with the *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (version 01.0, EB 65, Annex 3), it can be demonstrated that in the absence of the CDM, none of the implemented CPAs would occur.

For demonstration of additionality, the project activity has used the simplified procedures for small-scale project activities as given in *Guidelines on the demonstration of additionality of small-scale project activities* (version 09, EB 68, Annex 27). In line with the General Guidelines for SSC CDM Methodologies, the project activity has further used the *Non-binding best practice examples to demonstrate additionality for SSC project activities* (EB 35, Annex 34) and the *Guidelines for objective demonstration and assessment of barriers* (version 01, EB 50, Annex 13). The project will also rely on version 04 of the *Guidelines for demonstrating additionality of microscale project activities* (EB 68, Annex 26).

In line with the above provisions, it can be demonstrated that the project activity would not have occurred anyway due to the following barriers:

Fossil fuel based lamps are **prevailing practice** in many countries in sub-Sahara Africa. This is partly due to low levels of electrification (currently 85% of the population in Africa does not have access to electricity) and partly to a lack of reliable and affordable alternatives. Research carried out by Lighting Africa suggests that, of the approximately 110 million off-grid households across Africa (encompassing 580 million individuals), more than half employ kerosene lamps as their primary light source, together spending a total of more than $ 5 billion on kerosene per year.[1] Other non-renewable off-grid alternatives for kerosene lamps include candles, wood, animal dung, battery powered light devices, and diesel generators for rich households and SMEs. Some of these conventional lighting alternatives (e.g. diesel generators and battery powered light devices) are typically expensive and most of them are often both dangerous and harmful to the environment. The table below shows how the use of kerosene is the prevailing practice in selected countries in Africa.

Table 1: Use of Energy Sources to Provide Lighting in Selected Countries in Africa (%)

Question: Do you ever use any of the following sources of energy to power appliances or to create

[1] Lighting Africa (2010) *Solar Lighting for the Base of the Pyramid – Overview of an Emerging Market*

light?				
	Ethiopia[2]	Tanzania[3]	Kenya[4]	Ghana[5]
	n=1006	n=1000	n=1000	n=995
Kerosene	91	95	96	84
Firewood/charcoal	46	38	49	17
Candles	23	58	34	54
Diesel/gasoline	6	4	2	2
Biogas	1	0	0	0
None of these	1	8	4	
Diesel or petrol powered generator	0	0	0	1

As opposed to fossil fuel based lamps, solar-based LED systems have only entered the market recently. In 2010 market penetration was estimated at 1.1% of the off-grid and under-electrified population in Africa.[6] Given the relatively short experience with solar-based LED systems, many consumers are unaware of how solar lanterns work and the use of kerosene lamps remains deeply embedded in the practices of many households and SMEs in Africa. Lighting Africa even talks about a "cultural change" which will be required to move from kerosene lamps to solar-based LED systems.[7]

Changing prevailing practices among households and SMEs will also require the project to overcome existing **technological barriers**. For many households and SMEs, kerosene lamps constitute a lower risk even though it is a less technologically advanced alternative to the solar-based LED lighting systems. This risk perception towards solar-based LED lighting systems has been corroborated by the fact that in recent years a range of cheap and low-quality LED lighting products entered the market, which soon started to show failures and performance issues. Hence, consumers have increasingly become cautious about LED lighting systems and at times have chosen to continue using kerosene lamps, despite the economic, health and social disadvantages. This form of market spoilage was also found by a study carried out by the Lumina Project, which concluded that, because of initial exposure to low quality LED lighting systems, many people started to have serious reservations about the reliability of the technology.[8]

In order to ensure the long-term success of LED lighting systems and avoid further market spoilage, there is a need for producers and distributors to start developing and distributing higher quality products that last longer and that provide proper lighting services to the target customers. The introduction of high-quality products should however be done at an affordable price because for many end-users in developing countries the relatively high up-front cost of LED lighting systems as compared to kerosene lamps can pose a significant barrier. In fact, the **access-to-capital barrier** does not only play at the end-user level. It has been argued that access-to-capital is creating bottlenecks along the entire off-grid lighting market

[2] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Ethiopia*

[3] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment – Tanzania*

[4] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Kenya*

[5] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Ghana*

[6] Lighting Africa (2010) *Solar Lighting for the Base of the Pyramid – Overview of an Emerging Market*

[7] Lighting Africa (2010) *Solar Lighting for the Base of the Pyramid – Overview of an Emerging Market*

[8] Tracey, J., P. Alstone, A. Jacobson, E. Mills (2010), *Market Trial: Selling Off-Grid Lighting Products in Rural Kenya*. The Lumina Project. Technical Report 6.

value chain. Lighting Africa, for instance, has highlighted some of the primary financing challenges at each level of the supply chain as follows:[9]

Manufacturers: Manufacturers face two financing challenges. The first lies in initial capital for both R&D and the fixed assets for a production facility. The second challenge lies in working capital - having sufficient liquidity to purchase inputs and produce finished goods before receiving payment.
Wholesalers and large distributors: The wholesalers and large distributors typically face disproportionately high inventory levels due to a long global supply chain or poor demand predictions in early years of operations and they are often required to extend credit to dealers in order to stimulate sales.
Small retailers: The last-mile dealers are similarly squeezed on working capital liquidity, as they are usually small rural/peri-urban operations and face the consumer's limited ability to pay.
Customers: Lower-income households typically cannot afford to pay a lump sum of USD 20 or more and credit schemes for small-scale products are not always available.

Barefoot Power has already taken steps to deal with financing barriers at the wholesale, retail and customer level by providing trade financing and by working with micro-finance institutions. However, for the development of its next generation of high-quality, solar-based LED systems further capital investments are needed. In this context, the additional revenue from carbon credits is critical in creating the necessary investor confidence and in allowing for a business model that can both offer high-quality products for an affordable price and provide proper after-sales services.

Because of the above-mentioned barriers, the project activity would not have occurred anyway and, therefore, the project activity is additional.

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

>> **Record keeping system for each CPA under the PoA**

Records to be kept

The following documents and records will be kept during the implementation of the project:

- Delivery confirmation: A delivery confirmation will be signed by the CPA entity upon delivery of project lamps by the manufacturer.[10] The delivery confirmation will contain the following information:
  - Types of project lamps delivered by the manufacturer.
  - Number of project lamps (per type) delivered by the manufacturer
  - Manufacturing date of project lamps
  - Date on which the project lamps are delivered by the manufacturer.

- Invoice: The manufacturer will send an invoice to the CPA entity based on the order received from the CPA. The invoice will contain the following information.
  - Types of project lamps ordered by the CPA entity

[9] Lighting Africa (2010) *Solar Lighting for the Base of the Pyramid – Overview of an Emerging Market*

[10] In most cases, the manufacturer will be Barefoot Power Pty Limited (BFP)

- Number of project lamps (per type) ordered by CPA entity
- Date of invoice

- Warranty cards[11]: Each project lamp recipient will fill in a warranty card in threefold. In order to incentivize recipients to fill-in the warranty card, the warranty will only be activated once the card has been filled in and data has been entered into the project database. The warranty card will contain the following information:
  - Serial number of the project lamp
  - Date of purchase
  - Name of recipient
  - Location (including district or other geographical unit used for multi-stage sampling)
  - Contact details
  - Acknowledgment that BFP is the owner of the carbon credits

- Quarterly reports: Each CPA entity will submit quarterly reports to the CME containing the following information:
  - Types of project lamps distributed by the CPA entity
  - Number of project lamps distributed (per type)
  - Date on which the project lamps where distributed
  - Information about replacement lamps

- Survey data: During the implementation of the project activity, a number of surveys will be carried out. Data and records, including interviews, training records of surveyors, random sampling results, visiting records, etc. will be kept by the CME.

- Job cards: BFP will have a number of service centres in each country where its products are distributed. The service centres will be responsible for making repairs and for providing replacement lamps (see later). For each repair/replacement, the service centres will create a job card which contains the following information:
  - Serial number of project lamp
  - Date
  - Customer name and contact details
  - Description of the problem
  - Action taken
  - Whether the lamp needed to be replaced or not
  - Serial number of the replacement lamp.

  Every month, the service centres will send an overview of the job cards to the CPA entity.

Record keeping system

The coordinating/managing entity (CME) will file all records electronically on a server. A dedicated, electronic database will be developed and maintained to store and analyse data and information about the CPAs, the individual project lamps and the recipients of the project lamps.

[11] Alternatively, the recipient can fill in a receipt, other purchase documentation or an SMS-based system can be used

The CPA entities will keep hard and/or soft copies of all its CDM-related records, including the quarterly reports, invoices, delivery confirmation and sales records. All records (or copies thereof) will be kept at the relevant country office of the CPA entity. If applicable and where possible, the CPA will maintain a dedicated, electronic database for keeping CDM related records.

All records will be kept until at least two years after the end of the last crediting period.

Record keeping procedures

The CPA entities will follow the procedures below to process and store relevant information:

- The CPA entities will compile quarterly reports regarding the number of project lamps that were distributed during the quarter. An electronic copy of the quarterly report will be sent to the CME. The CPA entity will keep its own copy of the report and file it at its headquarter or country office.
- The CPA entities will keep a copy, both in hard copy and/or in soft copy, of all the delivery confirmations that will be signed by it. The copies of the delivery confirmations will be kept at the CPA entities' headquarters or country office. The CPA entity will also send the data and information from the delivery confirmations electronically to the CME.
- The CPA entities will keep a copy, both in hard copy and/or in soft copy, of all the invoices received from the manufacturer for the delivery of project lamps. The copies of the invoices will be kept at the CPA entities' headquarters or country office.
- The CPA entities will keep a copy, both in hard and/or in soft copy, of all job cards received from service centres for repair and replacement of faulty lamps. The copies of the job cards will be kept at the CPA entities' headquarters or country office. The CPA entity will also send data and information from the job cards electronically to the CME.
- The CPA entities will collect and keep copies of warranty cards, receipts or other purchase documentation duly filled in and signed by end-users. The CPA entity will also send data and information from the purchase documentation electronically to the CME.

The CME will follow the procedures below to process and store relevant data and information:

- Electronic quarterly reports from the CPA entity including information regarding the number of project lamps that were distributed under the CPA will be collected from the CPA entities on a quarterly basis. Upon receipt of the quarterly reports, the data and information will be processed by CME staff and entered into the dedicated, electronic database.
- Delivery confirmation: upon receipt of the project lamps, the CPA entity will sign a delivery confirmation. Data and information on the delivery confirmation will be electronically sent to the CME. CME staff will process the information from the delivery confirmation and enter it into the electronic database. The CPA will remain with a copy of the delivery confirmation for its own records.
- Invoice: the CPA entity will send data and information from invoices electronically to the CME. Relevant data and information from the invoice will be entered into the dedicated database and will be used as a quality control for the data and information on the delivery confirmation. The CPA will remain with a copy of an invoice for its own records.
- Job cards: the CPA entity will send data and information from job cards collected from service centres to the CME. CME staff will process the information from the job cards and enter it into the dedicated, electronic database. The CPA will remain with a copy of the job card for its own records.
- Data and information from warranty cards (or receipts or other purchase documentation) will be sent electronically by the CPA entities on a quarterly basis. The data and information will include serial number of the project lamp, data to unambiguously identify each recipient of a

project lamp under the CPA, whether the project lamp is a replacement lamp and acknowledgement by the recipient that Barefoot Power holds legal title over the carbon credits that are generated by the use of the lamp. The CPA will remain with a copy of the warranty card (or receipt or other purchase document) for its own records.

- Records of the surveys that are carried out to estimate the percentage of project lamps that are operational and in service will be collected and stored by the CME.

An overview of the record keeping procedures is given in the picture below.

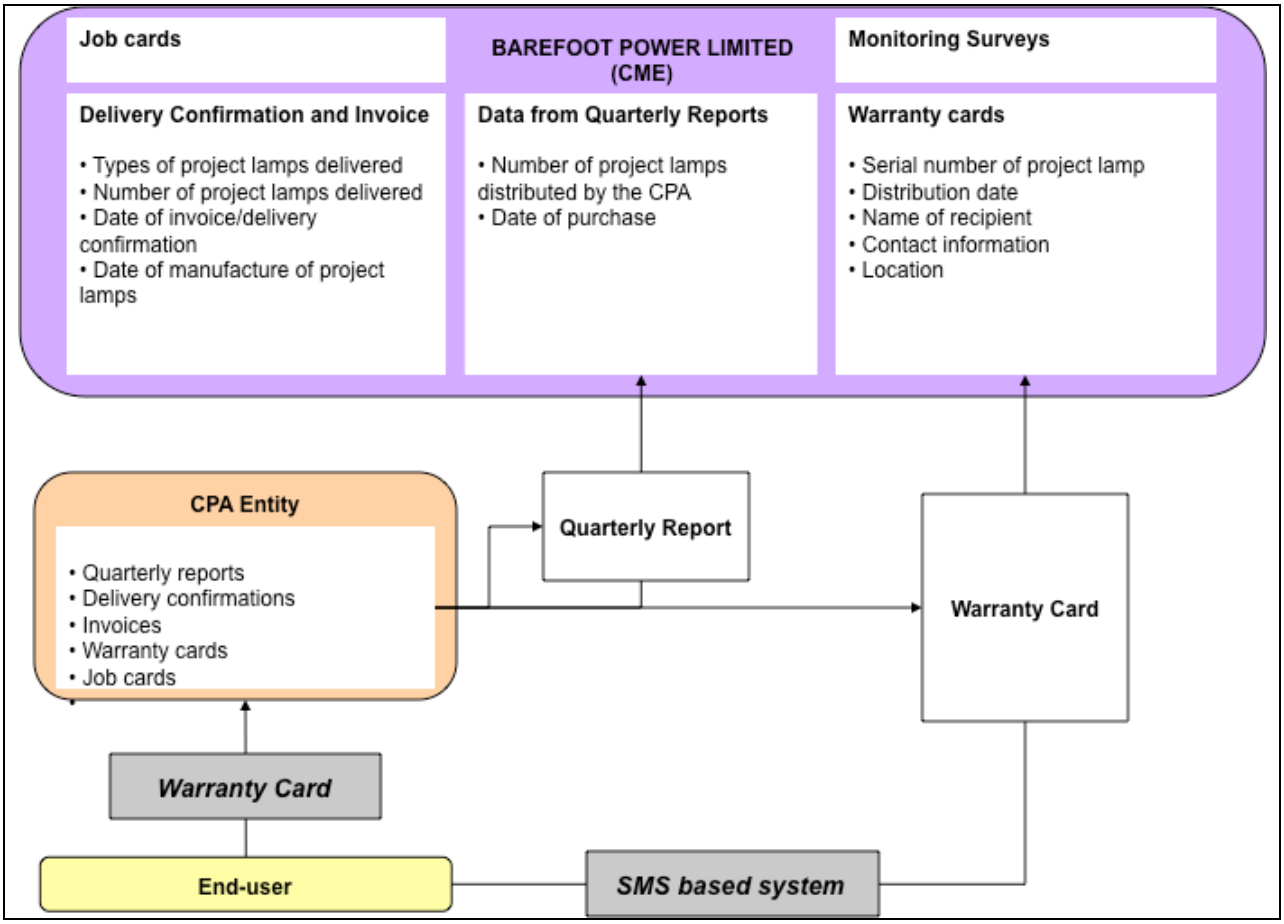

Figure 3: Record keeping system of the Programme of Activities

In order to restrict the number of project lamps distributed through the project activity to no more than five per household (for residential applications) or per business location (e.g. for commercial applications such as shops), a check box replying to whether the 'Number of Project Lamps in use in end-user's household is more than 5' will be on the warranty card. If the end-user is utilising 5 or more project lamps, the box must be checked, and emission reductions would not be claimed for these lamps.

System to avoid double counting

In order to avoid double counting *along the supply chain*, the following measures will be taken:

- Each project lamp will be marked in such a way that it will be unambiguously linked to the proposed Programme of Activities
- The CME will enter into a contractual arrangement with all CPA entities. Among other things, the contractual arrangement will stipulate that the CPA entity agrees that the emission reductions achieved by the use of the project lamps distributed by the CPA entity will be subscribed to the proposed Programme of Activities
- In a similar way, the warranty card, receipt or other purchase documentation which will be signed by the end user will include a stipulation that the emission reductions achieved by the use of the project lamp will be subscribed to the Programme of Activities.

In order to avoid double counting of *replacement lamps*, the following measures will be taken:

- When a project lamp fails or breaks down, the end user will take it to one of the BFP service centre (directly or through a retailer).
- At the service centre, a job card is created which contains the serial number of the project lamp, a description of the problem, action taken, replacement parts used, etc.
- In case the project is still under warranty, the project lamp can be replaced if the failure or breakdown cannot be repaired. A not will be made on the job card that the project lamp is replaced, including the serial number of the old lamp, the serial number of the new lamp and the contact details of the recipient.
- The service centre will send monthly overviews to the CPA entity, including copies of the job cards.
- The CPA entity will process the information and summarize data and information regarding the replacement lamps. The information regarding the replacement lamps will be send to the CME on a quarterly basis as part of the quarterly report.
- Using the serial numbers, the CME will remove the replaced lamps from the project database and enter the serial number of the replacement lamp.

Debundling

In line with paragraph 10 of the Guidelines on Assessment of Debundling for SSC Project Activities (EB 54, Annex 13, version 03), the CPAs in the PoA are exempted from performing a de-bundling check because the emission reductions achieved by each independent subsystem (i.e. each LED based lighting system) is not larger than 1% of the threshold defined by the methodology used: the threshold for AMS III.AR is 60,000 tCO2/year and 1% of 60,000 tCO2/year equals 600 tCO2/year. As per AMS III.AR version 01, the default emission factor per project lamp equals 0.08 tCO2/year which is far below the threshold of 600 tCO2/year.

Provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA

Barefoot Power, as the CME, will have contractual arrangements with every CPA entity. The contractual arrangement will include a provision where the CPA entity agrees that their activity is being subscribed to the PoA.

A.4.4.2. Monitoring plan:

>>

The coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA.

Emission reductions achieved by each individual CPA will be verified by checking the following three parameters.

1. The number of project lamps distributed will be verified by randomly selecting quarterly reports that have been prepared by the CPA entities and contain information about the number of project lamps that have been distributed by the CPA entity. The numbers in the quarterly reports will be compared with the numbers that are recorded in the project database and based on which the emission reductions are calculated.
2. The dates on which the project lamps are distributed to the end user will be verified by randomly selecting a number of warranty cards/receipts/other purchase documentation that have been filled out by the end user and collected by the CPA entities. This document will have the serial number of the project lamp which makes it possible to look up the record of the project lamp in the project database and compare the purchase dates.
3. The percentage of project lamps that are operational in year three of a CPA will be verified by randomly selecting a sample of the sample records that have been collected by the CPA entity when doing the survey. Using own professional judgment, the DOE will check the acceptability of the data for each record in the CPA's sample records.

The latest version of the *Standard for sampling and surveys for CDM project activities and programme of activities (Version 2.0)* will be used for determining the sampling approach and sample size during verification.

In order to avoid double accounting occurs, the coordinating/managing entity will design the project database in such a way that project lamps can only be assigned to one CPA. This will help avoiding that a project lamp is counted twice under two CPAs. The project database will be updated on a regular basis allowing the status of the CPA to be verified at any time.

A.4.5. Public funding of the programme of activities (PoA):

>> Barefoot Power received one million Euro from the European Commission's Global Energy Efficiency and Renewable Energy Fund (GEEREF).

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

>>
01/07/2012

B.2. Length of the programme of activities (PoA):

>>
28 years (336 months)

SECTION C. Environmental Analysis

>>

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at SSC-CPA level x

Due to the multiple host country locations of the PoA, each CPA will need to comply with the respective host country environmental documentation requirements. Therefore, environmental analysis will be done at the SSC-CPA level.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
Not applicable. Environmental analysis will be done at the SSC-CPA level.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

>>
According to the host party laws and regulations in Kenya, no environmental impact assessment is required for a typical CPA included in the programme of activities.

SECTION D. Stakeholders' comments

>>

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at SSC-CPA level x

Stakeholder comments will be invited at the SSC-CPA level. This will ensure that comments and inputs are duly considered and account is taken of the different stakeholders in different host countries.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

>>
Not applicable. Stakeholder comments will be invited at the SSC-CPA level.

D.3. Summary of the comments received:

>>
Not applicable. Stakeholder comments will be invited at the SSC-CPA level.

D.4. Report on how due account was taken of any comments received:

>>
Not applicable. Stakeholder comments will be invited at the SSC-CPA level.

SECTION E. Application of a baseline and monitoring methodology

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

>>

SSC-CPAs included in the PoA will apply approved SSC baseline and monitoring methodology AMS III.AR *Substituting fossil fuel based lighting with LED lighting system* (version 01).

The approved SSC baseline and monitoring methodology AMS III.AR is approved for use in a PoA by the Board.

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

>>

The project activity qualifies as small-scale project activity because annual emission reductions achieved by individual CPAs will not exceed 60,000 tCO2e over the crediting period. The project activity falls under category AMS III.AR *Substituting Fossil Fuel Based Lighting with LED Lighting Systems*, because the project activity meets the applicability criteria as follows:

#	Applicability criteria	Justification
1.	This category comprises activities that replace portable fossil fuel based lamps (e.g. wick-based kerosene lanterns) with LED based lighting systems in residential and non-residential applications (e.g. ambient lights, task lights, portable lights).	The project activity involves the distribution of LED based lighting systems that replace the use of portable fossil fuel based lamps
2.	This methodology is applicable only to project lamps whose batteries are charged using one of the following options: (a) Charged by renewable energy system (e.g. photovoltaic systems or mechanical systems such as wind battery chargers); (b) Charged by a standalone distributed generation system (e.g. a diesel generator set) or a mini-grid; (c) Charged by a grid that is connected to regional/national grid.	All project lamps distributed under the project activity are solely charged by renewable energy systems, e.g. photovoltaic systems.
3.	At a minimum project lamps shall be certified by their manufacturer to have a rated average life of at least 5,000 hours. Rated average life is the life certified by the manufacturer or responsible vendor as being the time at which the lamp.s initial light output will decline by no more than 30%. In addition, the manufacturer shall certify that the project lamps. battery charging efficiency, at the time of purchase, is at least 50%.	Project lamps have a minimum average life of at least 5,000 hours as certified by the manufacturer. The battery charging efficiency of the project lamps at the time of purchase is at least 50%, as certified by the manufacturer.
4.	Project Lamps shall have a minimum of one-year warranty.	All project lamps distributed under the project activity have a minimum one-year warranty, which covers free replacement or repair of any failed lamps, batteries and solar panels.
5.	The project design document shall explain the proposed method of distribution of project lamps. It shall also explain how the proposed project activity will: a) Ensure that the replaced baseline lamps are only those directly consuming fossil fuel. This can be done through documentation of the common practice of fuel. b) Eliminate double counting of Emission Reductions, for	The method of distribution of project lamps shall be explained in CPA DDs. a) The replaced baseline lamps are only those directly consuming fossil fuel.

	example due to LED manufacturers, suppliers of solar and/or battery equipment, or others claiming credit for Emission Reductions for the project lamps. At a minimum project lamps shall be marked as CDM project lamps; c) Ensure compliance with prevailing regulations pertaining to use and disposal of batteries.	b) To eliminate double counting, all Project Lamps distributed by the CPAs under the PoA shall have a mark on the project lamps that at least uniquely identifies the project lamp with the PoA. Additionally, the CPA implementing entity shall sign an agreement with the CME confirming that the CPA has not yet been included in another Programme of Activities or has not yet been registered as a single CDM project activity. c) Each CPA shall ensure compliance with prevailing regulations pertaining to use and disposal of batteries.
6.	The project design document shall include design specification of project lamps such as: (a) Lamp wattage (in Watts) and illuminance (in lux); (b) Lamp rated lifetime (in hours); (c) Where applicable type and the rated capacity of renewable energy equipment for charging the battery (in Watts); (d) Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the battery (in Ampere Hours); (e) Type of charge controller (e.g. active or passive); (f) Autonomous Time and Daily Burn Time; (g) Where applicable (with solar energy charging systems) maximum, minimum and average monthly Solar Fraction values during the year; (h) Where applicable grid charging time; (i) Physical protection against weather impacts (e.g. rain, heat, insect ingress).	The following design specifications of the individual project lamps under the CPAs shall be described in the specific CPA-DDs. a) Lamp wattage (in Watts) and illuminance (in lux); (b) Lamp rated lifetime (in hours); (c) Type and the rated capacity of renewable energy equipment for charging the battery (in Watts); (d) Type and rated capacity of the battery (in Ampere Hours); (e) Type of charge controller (e.g. active or passive); (f) Autonomous Time and Daily Burn Time; (g) Maximum, minimum and average monthly Solar Fraction values during the year; (h) Physical protection against weather impacts (e.g. rain, heat, and insect ingress).
7	The project activity shall restrict the number of project lamps distributed through the project activity to no more than five per household (for residential applications) or per	In order to restrict the number of project lamps distributed through the project activity to no more than

	business location (e.g. for commercial applications such as shops)	five per household (for residential applications) or per business location (e.g. for commercial applications such as shops), a check box replying to whether the 'Number of Project Lamps in use in end-user's household is more than 5' will be on the warranty card. If the end-user is utilising 5 or more project lamps, the box must be checked, and emission reductions would not be claimed for these lamps.
8.	Measures are limited to those that result in emissions reductions of less than or equal to 60 k ton CO2 equivalent annually.	The average annual emissions reductions for each CPA under the PoA shall be less than or equal to 60 k ton CO2 equivalent annually.
9.	LED Lamp Effective Useful Life i) Option 1: Project Lamps are assumed to operate for two years after project lamp distribution to end-users. Therefore, emission reductions can only be claimed for two years; ii) Option 2: Project Lamps are assumed to operate for seven years after project lamp distribution to end-users, and thus emission reductions can be claimed for up to seven years per project lamp, if and if all the following conditions for the project lamps are met: (a) At a minimum, LED lamps must be certified by their manufacturer to have a useful life of 10,000 hours. Within this time span, the relative luminous flux shall not reduce by more than 30% as per equation 1. Such claims shall be confirmed by a third-party testing organization using an applicable standard and testing protocol. As an alternative to long-term measurement of light output over the full lifetime of the lamp, a shortened measurement period of 2,000 hours may be chosen. If a 2,000-hour test period is used, the relative luminous flux shall not decrease by more than 10% during the 2,000 hours of continuous operation. As per the principles indicated in paragraph 4 of AMS-II.J Demand-side activities for efficient lighting technologies, if the average life value is not available ex ante, it shall be made available for verification;	Project Lamps distributed will either operate for two years after they have been distributed to end users or seven years after they have been distributed to end users with the following conditions met: (a) The LED lamps will be certified by their manufacturer to have a useful life of 10,000 hours. Within this time span, the relative luminous flux shall not reduce by more than 30% as per equation 1. Such claims shall be confirmed by a third-party testing organization using an applicable standard and testing protocol. As an alternative to long-term measurement of light output over the full lifetime of the lamp, a shortened measurement period of 2,000 hours may be chosen. If a 2,000-hour test period is used, the relative luminous flux shall not decrease by more than 10% during the 2,000 hours of continuous operation. As per the principles indicated in paragraph 4 of AMS-II.J Demand-side activities for efficient lighting technologies, if the average life value is not available ex ante, it

	b) The project lamps use a replaceable, chargeable battery. In addition, there must be documented measures in place to ensure that lamp owners have access to replacement batteries of comparable quality; c) Following criteria are satisfied with regard to the design specifications of the project lamps: (i) An illumination level of 20 lx for task and portable lights and 4 lx@1m for ambient lights; (ii) For charging option per 2 (b) or 2 (c), the Daily Burn Time (DBT) shall be equal to autonomous time after eight hours of charging; (iii) For charging option 2 (a) with solar PV panel as the charging source, the minimum Solar Fraction achieved on a monthly basis during the year shall be 100%; (iv) The battery capacity will be such that Autonomous Time of the Project Lamps shall be a minimum of 150% of DBT; (v) With regard to dust and water tightness a minimum protection of IP41 is achieved in accordance to IEC 60529 or an equivalent national standard. (d) Conditions 11 (a), 11 c (i) to 11 c(v) are confirmed by a third-party testing organization based on sample test of project lamps using applicable national standards where such are available or alternatively the standards or test protocols indicated in annex 1 of version 01 the methodology AMS III AR. The laboratory conducting and certifying the tests shall comply with the requirements of a relevant national or international standard, e.g. ISO/IEC 17025. If the testing results are not available ex ante, they shall be made available for verification; (e) Project lamps shall be, in addition to the standard lamp specifications, be marked for clear, unique identification with the project activity.	shall be made available for verification; b) The project lamps use a replaceable, chargeable battery. In addition, CPAs have documented measures in place to ensure that lamp owners have access to replacement batteries of comparable quality; c) Following criteria are satisfied with regard to the design specifications of the project lamps: (i) An illumination level of 20 lx for task and portable lights and 4 lx@1m for ambient lights; (ii) The minimum Solar Fraction achieved on a monthly basis during the year shall be 100%; (iii) The battery capacity will be such that Autonomous Time of the Project Lamps shall be a minimum of 150% of DBT; (iv) With regard to dust and water tightness a minimum protection of IP41 is achieved in accordance to IEC 60529 or an equivalent national standard. (d) Conditions (a) to (c) are confirmed by a third-party testing organization based on sample test of project lamps using applicable national standards where such are available or alternatively the standards or test protocols indicated in annex 1 of version 01 the methodology AMS III AR. The laboratory conducting and certifying the tests shall comply with the requirements of a relevant national or international standard, e.g. ISO/IEC 17025. If the testing results are not available ex ante, they shall be made available for verification; (e) Project lamps shall be, in addition to the standard lamp specifications, be marked for clear, unique identification with the

		project activity.

E.3. Description of the sources and gases included in the SSC-CPA boundary

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The project boundary is the physical, geographical site where each project lamp is utilized and includes the physical, geographical site of the renewable energy systems (e.g. photovoltaic systems).

The source and gas included in the SSC-CPA boundary is carbon dioxide from fossil-fuel based lamps.

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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In line with baseline and monitoring methodology AMS III.AR *Substituting Fossil Fuel Based Lighting with LED Lighting System,* the baseline scenario is the use of lamps that directly consume fossil fuel (e.g. wick-based kerosene lanterns).

According to research carried out by Lighting Africa more than half of the households in Africa employ kerosene lamps as their primary light source, together spending a total of more than $ 5 billion on kerosene per year.[12] Other non-renewable off-grid alternatives for kerosene lamps include candles, non-renewable biomass, battery powered light devices, and diesel generators. More detailed in-country research based on representative sample surveys has also clearly indicated that fuel usage for lighting is common practice in many African countries. As can be seen from table 2 below, over 90% of households in Ethiopia, Tanzania and Kenya sometimes use kerosene for lighting purposes. Table 3 further shows that 80% or more of households in Ethiopia, Tanzania, Kenya and Ghana use kerosene lamps as the main lighting device.

Table 2: Use of Energy Sources to Provide Lighting in Selected Countries in Africa (%)

Do you ever use any of the following sources of energy to power appliances or to create light?				
	Ethiopia[13]	Tanzania[14]	Kenya[15]	Ghana[16]
	n=1006	n=1000	n=1000	n=995
Kerosene	91	95	96	84
Firewood/charcoal	46	38	49	17
Candles	23	58	34	54
Diesel/gasoline	6	4	2	2
Biogas	1	0	0	0
None of these	1	8	4	

[12] Lighting Africa (2010) *Solar Lighting for the Base of the Pyramid – Overview of an Emerging Market*

[13] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Ethiopia*

[14] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment – Tanzania*

[15] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Kenya*

[16] Lighting Africa (2008) *Market Assessment Results. Quantitative Assessment - Ghana*

Diesel or petrol powered generator	0	0	0	1

Table 3: Types Lighting Devices Used in Selected Countries in Africa (%)

What if anything was used to light the main room last night?				
	Ethiopia	Tanzania	Kenya	Ghana
	n=1006	n=1000	n=1000	n=995
Kerosene lamp with simple wick - no cover	69	60	67	~74
Kerosene lamp with glass cover	14	30	30	~5
Candles		19	5	~20
Firelight	11	7		
Flashlight or torch	10	8	10	~15
Lightbulb in socket or lamp	8	10		~6

Based on the above survey results, it is concluded that the use of fossil fuel based lighting systems is common practice in countries in Africa and, therefore, constitutes the baseline scenario for the project activity.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA):

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

In line with the *Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities* (version 01.0, EB 65, Annex 3), additionality of a typical CPA shall be demonstrated by referring to the *Guidelines for demonstrating additionality of microscale project activities* (version 04, EB 68, Annex 26). Paragraph 4 of the guidelines state that:

"Type III project activities that aim to achieve emissions reductions at a scale of no more than 20 ktCO2e per year, are additional if any one of the following conditions is satisfied:

(a) The geographic location of the project activity is a LDC/SID or special underdeveloped zone (SUZ) of the host country. SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following conditions using most recent available data:

- The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%;
- The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures

(b) The project activity is an emission reduction activity with both conditions (i) and (ii) satisfied (see below);

(i) Each of the independent subsystems/measures in the project activity achieves an estimated annual emission reduction equal to or less than 600 tCO2e per year; and

(ii) End users of the subsystems or measures are households/communities/SMEs."

Alternatively, for CPAs that do not meet the requirements of the *Guidelines for the demonstration of microscale projects*, additionality of a typical CPA shall be demonstrated using the simplified procedures for small-scale project activities as given in *Guidelines on the demonstration of additionality of small-scale project activities* (version 09, EB 68, Annex 27). In line with the *General guidelines for SSC CDM methodologies* (version 17, EB 61, Annex 21), the project activity shall further use the *Non-binding best practice examples to demonstrate additionality for SSC project activities* (EB 35, Annex 34) and the *Guidelines for objective demonstration and assessment of barriers* (version 01, EB 50, Annex 13).

More specifically, a typical CPA would not have occurred anyway due to the following barriers:

The CPA is implemented in a country (or other geographical area) where fossil fuel usage for lighting purposes is prevailing practice.

The CPA is implemented in a country (or other geographical area) where a less technologically advanced alternative to the LED based lighting systems is available, which is based on fossil fuel. It will further be demonstrated that the less technologically advanced alternative involves lower risks due to the performance uncertainty or low market share of the LED based lighting systems adopted.

Finally, the CPA would not have occurred anyway due to one or more access-to-capital barriers. Existing barriers for access-to-capital can be demonstrated at various levels:

- It can be demonstrated that the implementation of the CPA is consequential to the removal of the access-to-capital at the level of Barefoot Power (i.e. the CPA would not have been implemented if Barefoot Power would not have been able to raise the necessary capital for the development of its next generation of high-quality solar-based LED systems).
- It can be demonstrated that CPA would not have been implemented due to lack of access to working capital at the distributor level.
- It can be demonstrated that the CPA would not have been implemented due to lack of finance at the end-user level.

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

If the CPA applies the *Guidelines for demonstrating additionality of microscale project activities* (version 04, EB 68, Annex 26), the following key criteria for assessing additionality will be used:

- CPA will achieve emission reductions at a scale of no more than 20ktCO2e per year
- One of the following conditions is satisfied:
  - The geographic location of the project activity is a LDC/SID or special underdeveloped zone (SUZ) of the host country. SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following conditions using most recent available data:
    - The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%;
    - The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures.

- The project activity is an emission reduction activity with both conditions (i) and (ii) satisfied (see below);
  i. Each of the independent subsystems/measures in the project activity achieves an estimated annual emission reduction equal to or less than 600 tCO2e per year; and
  ii. End users of the subsystems or measures are households/communities/SMEs.

If the CPA does not apply the *Guidelines for demonstrating additionality of microscale project activities* (version 04, EB 68, Annex 26), the following key criteria for assessing additionality will be used:

- The CPA is implemented in a country where fossil fuel usage for lighting is common practice. This will be demonstrated based on representative sample surveys, official data or peer reviewed literature.
- The CPA is implemented in a country where a less technologically advanced alternative is available, which results in higher emissions. This will be demonstrated based on representative sample surveys, official data or peer reviewed literature.
- The CPA would not have been implemented anyway due to barriers related to access to capital. Demonstration of the lack-of-access barrier shall be based on the Guidelines for objective demonstration of barriers (version 01, EB 50, Annex 13) and shall include information on the nature of the companies and entities involved in the financing and implementation of the CPA. If the CPA only distributes Barefoot Power products, it shall be proven that the implementation of the CPA is consequential to the removal of the access-to-finance barrier at the Barefoot Power level.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

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Depending on the technical specifications of the project lamp, a two-year or seven-year lifetime will be assumed for the lamps as per option 1 and option 2 in paragraphs 10 and 11 of AMS III.AR.

Baseline emission calculation for a typical SSC-CPA will be based on default annual baseline emissions factor for the project lamps distributed to end-users as given in baseline and monitoring methodology AMS III.AR (version 01). For specific SSC-CPAs, and in cases where adequate data are available, the project activity will opt for the use of alternative values as per paragraph 12 of approved baseline and monitoring methodology AMS III.AR.

All project lamps under the Programme of Activities will be charged by renewable energy systems (i.e. option (a) under paragraph 2 of AMS III.AR). Therefore, the grid factor (GF_y) in year y will equal 1.0.

For a typical SSC-CPA, and in the absence of relevant information, the project activity will apply a value of 1.0 for the Dynamic Baseline Factor (option 1). For specific SSC-CPAs, and in cases where adequate data and information are available regarding the national growth rate for fuel use in lighting, the project activity might opt for option 2 and use a Dynamic Baseline Factor of more than 1.0.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

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Baseline emissions are calculated using equation (2)

$BE_y = DV * GF_y * DB_y$

BE_y	Baseline Emissions per project lamp in year *y* (tCO2e)
DV	Default Emissions Factor
GF_y	Grid Factor in year *y*
DB_y	Dynamic Baseline Factor (change in baseline fuel, fuel use rate, and/or utilization during crediting period) in year y

DV will be calculated using the fixed parametric values provided in paragraph 12 of AMS III.AR:

- Fuel Use Rate: 0.025 liters/hour
- Utilization Rate: 3.5 hours per day
- Utilization: 365 days per year
- Fuel Emission Factor: 2.4 kgCO2/liter
- Leakage factor: 1.0
- Number of fuel-based lamps replaced by the project lamp: 1.0
- Net-to-Gross factor: 1.0

Using the above fixed parametric values, the Default Emission Factor (DV) equals 0.08 tCO2e per project lamp.

In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the CME or a CPA entity), alternative parametric values could be used.

Grid Factor (GF_y) in year y will be equal to 1.0 because the project activity uses renewable energy systems to charge the project lamps.

In the absence of relevant information, the Dynamic Baseline Factor (DB_y) in year y will be 1.0. In case recent data is available regarding the national growth rate of kerosene fuel use in lighting (FF_g), individual CPAs might opt to use a value of 1.0 + FF_g.

Project emissions

Project emissions are zero because the project activity uses renewable energy systems to charge the project lamps.

Emission reductions are calculated using equation (4):

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

ER_y	Emission reductions in year *y* (tCO_2e)
$N_{i,j}$	Number of project lamps distributed to end users of type *i* with charging method *j*

$OF_{y,i,j}$	Percentage of project lamps distributed to end users that are operating and in service in year *y*, for each lamp type *i* and charging method *j*. Assumed to equal to 100% for years 1, 2 and 3. Equal to value determined per paragraph 21, for years 4, 5, 6 and 7

Number of project lamps ($N_{i,j}$) distributed to end users will be conservatively estimated based on the sales records of the CPA entities.

$OF_{y,i,j}$ is estimated statistically during the third year of the crediting period.
Approved baseline and monitoring methodology AMS III.AR further requires emission reductions to be considered from the date of completion of distribution of the project lamps to end-users. For those cases where project lamps are distributed during multiple years, the methodology further requires that "the elapsed lifetime of lamps can be unambiguously tracked to ensure that emission reductions are not credited beyond two years (for Option 1) or seven years (for Option 2) for any given project lamp". Therefore, an adjustment has to be made for the Utilization (days/year) of project lamps for the year (or verification period) in which they are distributed and the year (of verification period) in which the lifetime of the project lamp ends. The adjustment is made by introducing a correction factor for effective operational days for each verification period *y* ($CF_{OD,y}$) where $CF_{OD,y}$ is calculated using the following equation:

$$CF_{OD,n,y} = OD_{n,y} / k$$

Where:

$CF_{OD,n,y}$	Correction factor to adjust for the number of days project lamp *n* is operational in year (or verification period) *y*
$OD_{n,y}$	Number of days project lamp *n* is operational in year or verification period *y*
k	Number of days in year or verification period *y*
y	Year or verification period

$OD_{n,y}$ is further calculated using the following equation:

If $DATE_{n,start} < DATE_{y,start}$ and $DATE_{n,end} >= DATE_{y,end}$, then $OD_{n,y} = DATE_{y,end} - DATE_{y,start}$
If $DATE_{y,start} < DATE_{n,end} <= DATE_{y,end}$, then $OD_{n,y} = DATE_{n,end} - DATE_{y,start}$
If $DATE_{y,start} <= DATE_{n,start} < DATE_{y,end}$, then $OD_{n,y} = DATE_{y,end} - DATE_{n,start}$

$DATE_{n,start}$	Date on which project lamp *n* is distributed to the end user
$DATE_{n,end}$	Date on which the effective useful life of project lamp *n* ends
$DATE_{y,start}$	Start date of verification period or year *y*
$DATE_{y,end}$	End date of verification or year *y*

The date on which project lamp *n* is distributed to the end user ($DATE_{n,start}$) will be monitored and based on the date of purchase by the end user as is indicated on the warranty card/ receipt or other purchase documentation. In case the actual date of purchase is not available, the date on which the project lamp is distributed will be estimated based on available data regarding the average number of days between date of manufacture of a project lamp and the date on which the project lamp is actually distributed to the end user.

$DATE_{j,start} = DATE_{man,j} + Lag_Time$

Where

$DATE_{j,start}$	Date on which project lamp *j* is distributed to the end user
$DATE_{man,j}$	Date on which project lamp *j* is manufactured
Lag_Time	Average number of days between the date of delivery of a project lamp to the CPA entity and the date of purchase by the end-user
j	project lamps for which the actual purchase date is not available

The date on which project lamp *j* is manufactured will be recorded at the point when the project lamps are delivered to the CPA entity.

The Lag_Time will be determined under the conditions specified by SSC WG 36 in response to a request for clarification (SSC_609) dated 23 March 2012. In the cases that a CPA does not involve direct distribution of project lamps to end-users, but instead involve distribution of project lamps through intermediaries, the average number of days between the date on which project lamps are delivered to intermediaries and the date on which the project lamps are distributed from the intermediaries to end-users, will be determined using either survey methods or by using a default value of 120 days.

For cases where estimation of the Lag_Time does not involve intermediaries, the Lag_Time will be calculated using data from project lamps *m* for which the actual purchase date is available using the following formula:

$Lag_Time = \sum (DATE_{m,-tart} - DATE_{man,m})/m$
Where:

Lag_Time	Average number of days between the date of delivery of the project lamps to the CPA entity and the date of purchase by the end-users (days)
$DATE_{m,start}$	Date on which project lamp *m* is distributed to the end user
$DATE_{man,m}$	Date on which project lamp *m* is manufactured
m	Number of project lamps m for which the purchase date is available

The date on which project lamp *m* is manufacture will be derived from the first six digits in the serial number, which is recorded on the warranty card, receipt or other purchase documentation.

The date on which the effective life of project lamp *n* ends ($DATE_{n,end}$) will be calculated based on $DATE_{n,start}$ and the Lamp Effective Useful Life as determined by the provisions in paragraph 10 and 11 of AMS III.AR (i.e. two-year or seven-year lifetime).

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

Data / Parameter:	**Fuel use rate**
Data unit:	Liters/hour
Description:	Amount of fuel used per hour by fossil fuel based lamps
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR or alternative value if adequate data and information is available.

Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR.
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entity), alternative parametric values could be used.

Data / Parameter:	**Utilization rate**
Data unit:	hours/day
Description:	Average number of hours per day households use fossil fuel based lamps in the baseline
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR or alternative value if adequate data and information is available.
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR.
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entity), alternative parametric values could be used.

Data / Parameter:	**Utilization**
Data unit:	days/year
Description:	Number of days per year households use fossil fuel based lamps in the baseline.
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR.
Value applied:	365
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	n/a

Data / Parameter:	**Fuel Emission Factor**
Data unit:	kgCO2/liter
Description:	Amount of carbon dioxide emissions resulting from the combustion of fossil

	fuel used for lighting purposes in the baseline
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR.
Value applied:	2.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entity), alternative parametric values could be used.

Data / Parameter:	**Leakage factor**
Data unit:	-
Description:	-
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR.
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entity), alternative parametric values could be used.

Data / Parameter:	**Number of fuel-based lamps replaced per project lamp**
Data unit:	-
Description:	-
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR or alternative value if adequate data and information is available.
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and

	comprehensive data collected by the Barefoot Power or a CPA entitiy), alternative parametric values could be used.

Data / Parameter:	**Net-to-Gross factor**
Data unit:	-
Description:	-
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR.
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entitiy), alternative parametric values could be used.

Data / Parameter:	**DV**
Data unit:	tCO2e
Description:	Default Emission Factor
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR or alternative value if adequate data and information is available.
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	n/a

Data / Parameter:	**GF_y**
Data unit:	-
Description:	Grid Factor
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR, the Grid Factor equals 1.0 when the project lamps are charged by renewable energy systems (e.g. photovoltaic systems).
Any comment:	n/a

Data / Parameter:	**DB_y**
Data unit:	-
Description:	Dynamic Baseline Factor (change in baseline fuel, fuel use rate, and/or utilization during crediting period) in year y.
Source of data used:	Default value from approved baseline and monitoring methodology AMS III.AR or alternative value if relevant information is available.
Value applied:	Variable
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the stipulations of the approved baseline and monitoring methodology AMS III.AR
Any comment:	In cases where adequate research and documentation is available (e.g. strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non governmental organizations or reliable and comprehensive data collected by the Barefoot Power or a CPA entity), alternative parametric values could be used.

Data / Parameter:	**z**
Data unit:	n/a
Description:	Standard normal for a confidence level of 90%
Source of data used:	H. Russell Bernard (1995) *Research Methods in Anthropology. Qualitative and Quantitative Approaches.* Altamira Press, London.
Value applied:	1.645
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the standard value for standard normal for a confidence level of 90% for a two-tailed test
Any comment:	N/A

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	**$N_{i,j}$**
Data unit:	-
Description:	Number of project lamps distributed to end users of type *i* with charging method *j*
Source of data to be used:	Quarterly reports from CPA entity
Value of data applied for the purpose of calculating expected emission reductions in section E.6	Variable

Description of measurement methods and procedures to be applied:	The number of project lamps distributed will be calculated based on the sales records of the CPA entity. Project lamps that are replacement lamps will not be counted towards the calculation of number of lamps distributed to end-users. The sales records will be summarized on a quarterly basis and sent to the CME.
QA/QC procedures to be applied:	Annual sales records from the CPA entity will be combined with end of year inventory of the CPA entity and compared to the number of project lamps that were delivered to the CPA entity The number of project lamps that were delivered to the CPA entity will be derived from the delivery confirmations which are signed by the CPA entity and sent to the CME.
Any comment:	N/A

Data / Parameter:	p_{usage}
Data unit:	%
Description:	Percentage of project lamps in the sample that were distributed to end users and are operating and in service in the third year of the crediting period
Source of data to be used:	Survey to be undertaken in the third year of the crediting period for each CPA
Value of data applied for the purpose of calculating expected emission reductions in section E.6	Variable
Description of measurement methods and procedures to be applied:	The percentage of project lamps in the sample that have been distributed to end users and are operating and in service in the third year of the crediting period will be estimated based on the sampling plan as described in section B.7.2
QA/QC procedures to be applied:	As per sampling plan in the monitoring plan (Section B.7.2)
Any comment:	N/A

Data / Parameter:	$DATE_{m,start}$
Data unit:	DD/MM/YYYY
Description:	Date on which project lamp m is delivered to the end user
Source of data to be used:	Warranty cards which are fill out by the end user
Value of data applied for the purpose of calculating expected emission reductions in section E.6	Variable
Description of measurement methods and procedures to be applied:	When buying a project lamp, the recipient will fill in a warranty cards which includes details about the project lamp (type, serial number, etc.) and contact details and location of the recipient. The warranty card will be filled out in threefold. One copy will be kept by the recipient of the project lamp, the second copy will be kept by the CPA entity and the third copy will be kept by the CME. CME staff will enter the information into the project database.
QA/QC procedures to be applied:	The CME will check on an annual basis a random sample of warranty cards and verify whether the dates are the same as the dates in the project database.

Any comment:	Instead of a warranty card, the recipient can also fill in a receipt, other purchase documentation or use an SMS-based platform.

Data / Parameter:	**$DATE_{man,m}$ $DATE_{man,j}$**
Data unit:	DD/MM/YYYY
Description:	Date on which project lamp m or j is manufactured.
Source of data to be used:	Manufacturing dates marked on the project lamps' boxes..
Value of data applied for the purpose of calculating expected emission reductions in section E.6	Variable
Description of measurement methods and procedures to be applied:	BFP project lamps will be delivered to the CPA entities in boxes of two to twelve project lamps (or more depending on the type of project lamps and box size). Each box will have a sticker with the date of manufacture of the project lamps in the box. Upon delivery of the boxes, the CPA will record the date of manufacture of the project lamps and store this in a database together with the date of delivery.
QA/QC procedures to be applied:	The date will be compared with the delivery date. The delivery date should per definition be later than the date of manufacture. If the date on delivery confirmation is not later than the date of manufacture than the date on the delivery confirmation will be used.
Any comment:	N/A

E.7.2. Description of the monitoring plan for a SSC-CPA:

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The monitoring plan will consist of three components:

1. Number of project lamp distributed to end users
2. Dates on which lamps are distributed to CPA entity and to the end user
3. Surveys to determine the percentage of project lamps distributed to end users that are operating and in service in year y.

1. Number of project lamps distributed to end-users

The number of project lamps distributed to end-users will be conservatively estimated based on the distribution records from the CPA entities. Each CPA entity will summarize its sales records on a quarterly basis and forward the information to Barefoot Power for further processing and record keeping. The total number of project lamps distributed to end-users will be further calculated by summing all the sales records from the CPA entities

2. Dates on which lamps are distributed

In order to monitor the dates on which the project lamps are distributed to the end users, each recipient will be required to fill in a warranty card, receipt or other purchase documentation, which will contain the date of purchase. The purchase documentation will be collected by the CPA entities and forwarded to

Barefoot Power on a quarterly basis for further processing and record keeping. In case the date of purchase is not available for a particular lamp, the date will be estimated based on available records as per the provision in section E.6.2.

3. Monitoring surveys

For project lamps that will claim emission reductions for up to seven years, the project activity will carry out a survey in the third year of each CPA to determine the percentage of project lamps distributed to end users that are operating and in service. The sampling plan for carrying out the survey has been designed in line with version 02.0 of the *Standard for sampling and surveys for CDM project activities and programme of activities* (EB 65, Annex.

A. Sampling Design

Objectives and reliability requirements: The objective of the sampling is to determine the percentage of project lamps that are operational during the third year of the crediting period with a 90/10 confidence/precision.

Target Population: The Target Population are recipients of project lamps.

Sample Method: A sample will be drawn using multistage sampling. The project activity will first draw a sample of districts (or other geographical units) and then take a random sample from the recipients within that district (or other geographical untis). Each district and recipient will have a unique number. Random samples will be drawn using a random number table or random number generator.

Sample Size

The sample size is determined based on the following formula:

$$c \geq \frac{\frac{SD_B^2}{\overline{p}^2} \times \frac{M}{M-1} + \frac{1}{\overline{u}} \times \frac{SD_w^2}{\overline{p}^2} \times \frac{(\overline{N}-\overline{u})}{(\overline{N}-1)}}{\frac{0.1^2}{1.645^2} + \frac{1}{M-1}\frac{SD_B^2}{\overline{p}^2}}$$

Where:

c	Number of districts that should be sampled
M	Total number of districts (or any other geographical unit) in the population
ū	Pre-specified number of households to be sampled withi geographical unit)
Ń	Average number of households per district or any other geographical unit
SD_w^2	District (or any other geographical unit) variance
SD_B^2	Average of the district (or any other geographical unit) variances (average within district (or any other geographical unit) variation)
p	Overall proportion
1.645	Standard normal for 90% confidence interval for two-

	tailed test (as per provisions in para 22 of AMS.III.AR, version 01)
10%	Level of precision as per provisions in para 22 of AMS.III.AR, version 01

The sample will be drawn by first randomly selecting number of sample districts obtained. Next, a random sample of the pre specified number of households/recipients will be taken from each district (or geographical unit).

Sampling Frame

The sampling frame for the districts (or other geographical units) will consist of an official list of districts (or geographical units).

The sampling frame for the recipients of project lamps will consist of the records of recipients in the project database in the relevant districts. If there are no (or insufficient) recipients for a certain district (or other geographical unit), the project will randomly select additional districts.

B. Data

Field Measurement Objectives and Data to be collected: A survey will be carried out in year three of each CPA using a closed questionnaire (see Annex 4 for a sample questionnaire). In addition to the questionnaire, the surveyors will also physically check whether the end user is in possession of the project lamp, whether the project lamp is operational and whether the project lamp carries a marker for clear, unique identification with the project activity.

Quality assurance and quality control:

Samples will be drawn by an independent entity.

Surveys will be carried out by independent persons that are not employed by the coordinating/managing entity or CPA entity and do not have a direct stake in the Programme of Activity.

One lead surveyor will review each questionnaire and the answers therein for quality control/translation accuracy.

Procedures for Administering Data Collection and Minimizing Non-Sampling Errors

Five independent surveyors will be trained, one for each district (or other geographical unit). The training will cover the following topics:

1. Explanation on the purpose of the questionnaire
2. Discussion of the questionnaire
3. Contacting households
4. Procedures in case of non-response
5. Timeframe

Procedures to administer data collections:

1. Each trained surveyor will receive enough questionnaires (including extras) and a list of recipients to be interviewed (including contact details)
2. Surveys will be carried out face-to-face in the national or local language, as appropriate
3. The surveyor will first check whether the recipient is in possession of a project lamp and whether it is operational. The surveyor will also check the mark on the project lamp.
4. Next the surveyor will carry out the short questionnaire as prepared by the coordinating/managing entity.
5. If applicable, the surveyor translates the questionnaire and returns it to the CPA entity or directly to the coordinating/managing entity.

Procedures for non-response:

1. If a recipient cannot be found according to the contact data from the sample list or if it is found that the data was erroneous, the recipient is deleted from the sample list.
2. If a recipient cannot be contacted due to temporary absence of the recipient or a relative of the recipient over age 12, the recipient will be visited a second time. If the recipient is also absent during the second visit, the recipient will be deleted from the sample list.
3. In case less than 100 responses are achieved (i.e. less than the minimum required sample size), the project will draw a new sample and survey additional recipients until the minimum of 100 recipients is reached.

Data analysis

1. Data analysis will be carried out by the coordinating/managing entity
2. All underlying data (questionnaires) will be kept both in hardcopy and electronically by the coordinating/managing entity.

Implementation

Different parties will carry out the following roles and responsibilities:

Role	Party
Training	Coordinating/managing entity and/CPA entity
Sampling	Independent entity
Surveys	Independent surveyors
Analysis	Coordinating/managing entity

The institution conducting the survey shall have relevant experience with undertaking surveys and preparing field measurement protocols.

E.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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The final draft of this baseline section has been completed on 24/07/2012.

Carbon Africa (www.carbonafrica.co.ke), acting as the carbon consultant to the project proponent, is responsible for the development of the CDM component of the project.

Company name: Carbon Africa Limited
Address: P.O. Box 14938, 00800 – Nairobi, Kenya

Contact person: Mr. Adriaan Tas
Telephone number: +254-726385657
E-mail: Adriaan@carbonafrica.co.ke

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

Organization:	Barefoot Power Pty Limited
Street/P.O.Box:	79 Morrisset Street
Building:	
City:	Bathurst
State/Region:	New South Wales
Postfix/ZIP:	2795
Country:	Australia
Telephone:	+61 424 793 485
FAX:	
E-Mail:	info@barefootpower.com
URL:	
Represented by:	
Title:	Director
Salutation:	Mr
Last Name:	Andrews
Middle Name:	Winston Alford
First Name:	Harry
Department:	Corporate
Mobile:	+977 9813603709, +61449086450
Direct FAX:	
Direct tel:	+977 9813603709, +61449086450
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

GEEREF is a fund providing global risk capital through private investment for energy efficiency and renewable energy projects in developing countries and economies in transition.

GEEREF aims to accelerate the transfer, development, use and enforcement of environmentally sound technologies for the world's poorer regions, helping to bring secure, clean and affordable energy to local people.

GEEREF is sponsored by the European Commisson, Germany and Norway with support from the European Investment Bank (EIB) and the European Investment Fund (EIF).

GEEREF is a European Commission project sponsored by the Directorate General for Environment and Directorate General for Europe Aid Co-operation(AIDCo). The project was announced by European Commission and EIB at the global climate conference in Bali in December 2007 for an overall investment amount of EUR 150m, EUR 80m of which will be funded by the Community budget.

GEEREF was registered Official Development Assistance (ODA) by the OECD Development Assistance Committee (DAC). The funding does not result in a diversion of Official Development Assistance.

Fund structure

GEEREF is a public-private partnership, offering risk sharing and co-funding opportunities for commercial investors and public investors. It will invest in private equity funds that specialise in providing equity financing in return for shareholdings to small and medium-sized regional projects and enterprises. These funds will be required to demonstrate that the projects they invest in contribute to the aims of GEEREF, are financially viable and in line with market standards.

Sources of funding

The EC, Germany and Norway have committed funds to GEEREF. In addition, several international financial institutions and commercial organisations have also expressed interest in co-financing GEEREF.

(*Source:* http://www.eif.org/who_we_are/geeref.htm accessed on 12 July 2011)

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

Sample List Template

Sample No.	Recipient ID	Name	Location	Contact	Serial number of project lamp
1					
2					
…					
125					

Questionnaire Template

Recipient information	• Name • Mobile phone (update)
Information on project lamp	• Serial Number • (approximate) date of purchase
Physical check of project lamp	• Is the household in possession of a project lamp? (Y/N) • Does the project lamp have a unique marking • Does the project lamp work? (Y/N)
Operational check of project lamp	• Does the recipient use the project lamp? (Y/N)
Max. 5 project lamps per recipient (i.e. per household or per business location)	• How many project lamps does the recipient have?
Signature of interviewee	
Signature of surveyor	

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