Component project activity design document form for small-scale CDM component project activities

(Version 04.0)

COMPONENT PROJECT DESIGN DOCUMENT (CPA-DD)	
Title of the CPA	ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region - Côte d'Ivoire
Version number of the CPA-DD	1
Completion date of the CPA-DD	24/06/215
Title of the PoA to which the CPA is included	ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region
Host Party	Côte d'Ivoire
Estimated amount of annual average GHG emission reductions	69,000 t CO2

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region
Unique PoA number: SL-PoA-Africa
Version number of the document: 2
Date: 24/06/2015

A.2. Title of the CPA

ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region - Côte d'Ivoire
Unique CPA number: SL-CPA-001-CI
Version number of the document: 1
Date: 24/06/2015

A.3. Description of the CPA

The objective of the Programme of Activities (CDM-SSC-PoA) - "ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region" is to replace kerosene-based lighting used by residential/non-residential users, with specially designed PV LED systems (henceforth 'project lamps'). Under this programme, the project lamps are also planned to be distributed in Côte d'Ivoire in number up to 750,000 solar lamps. This reduction of kerosene use will help to reduce the CO_2 emissions, thanks to the use the project solar lamps. These solar lamps will also promote the use of a clean, efficient and renewable technology in the project areas.

The photovoltaic (PV) light emitting diode (LED) system consists of several LEDs, with a rechargeable battery and a photovoltaic panel, which consists of solar cells that convert sunlight directly into electricity. LED lamps use a light-emitting diode and this type of technology is ideal for rural lighting purposes because of their efficiency, long lifetime, ruggedness and low maintenance costs.

By replacing a standard kerosene lamp with solar lamps, the household receiving the lamps has several advantages:

- Savings occurring due to reduction in use of kerosene
- Reduction of indoor air pollution because of technology replacement
- less household burns/fires accidents due to minimum use of flammable liquids
- increased time to study at night for children

According to the standard of the methodology AMS-III.AR, approximately 190 liters of kerosene per year per household (using the default values from the methodology AMS-III.AR and the maximum number of lamps per household of 5) are reduced due to the replacement of the kerosene lamps by PV LED lighting systems. From the most recent kerosene prices in Côte d'Ivoire being $1.30 /liter[1], as much as $249 can be saved per household per year in Côte d'Ivoire.

This program helps the sustainable development of the indicated region in Africa, because of the social, economic and environmental benefits derived from the program.

In terms of the social benefits, households will have a clean source of energy that reduces the illness associated to the pollution of kerosene lamps. Moreover, it increases the time spent at night by children to study[2]. The economic benefits are the savings associated to the replacement of kerosene; either by the reduction of subsidies from the government or the direct savings to households.

[1] IFC; Solar Lighting for the Base of the Pyramid: Overview of an Emerging Market; 2010, page 53
[2] Agoramoorthy, G. and M. Hsu, Lighting the Lives of the Impoverished in India's Rural and Tribal Drylands. Human Ecology, 2009. 37(4): p. 513-517

Finally, the environmental benefits are the direct reduction of pollutants such as $PM_{2.5}$ and CO_2 because of kerosene savings[3].

Pre-project scenario

The pre-project scenario as shown in the table below with 69% of households in Côte d'Ivoire depends directly on Kerosene for daily lighting needs.

Domestic lighting source for households in Côte d'Ivoire				
	Kerosene	Electricity	Gas	Others
Usage [%]	69	3	4	24

Table 1 : Pre-project scenario[4]

A.4. Entity/individual responsible for the operation of CPA

The small-scale CPA is implemented and operated by ENERCAP SAS

A.5. Technical description of the CPA

The PV LED system product provides a substitution of kerosene lamps to meet the lighting needs of the households in Côte d'Ivoire. In the country, 69% of the households rely on the use of expensive, polluting and unsafe kerosene lamps for domestic lighting, a common practice that causes indoor air pollution, especially harmful for the children. The solar lamp system shows to be a relevant alternative because it doesn't require the access to grid-connected electricity – which is another constraint in Côte d'Ivoire – in order to provide domestic lighting and it meets all minimum requirements made by the CDM methodology AMS-III AR Version 05:

- Batteries charged by renewable energy system, in this case a photovoltaic system
- A lamp rated lifetime (time at which the lamp's initial light output will decline by no more than 30%) of 5,000 hours is chosen (alternative test for 2000 hours is provided at the methodology AMS.III.AR)
- Battery charging efficiency, at time of purchase, of at least 50%
- All lamps have a warranty of one year
- Project lamps must have a configuration of diodes with a minimum illumination of 20 Lumens or 25 Lux over an area ≥ 0.1 m^2

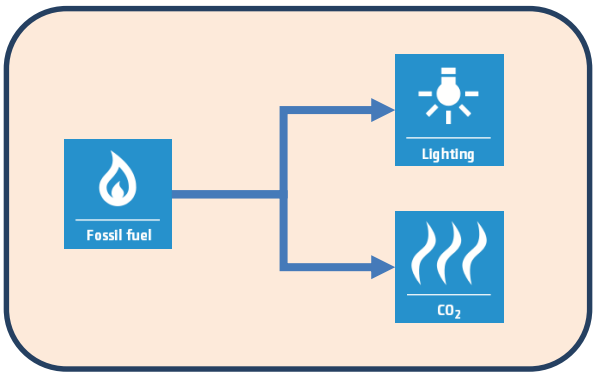
Design specifications are:

- Lamp wattage: Over 0.1 W
- Illumination : minimum illumination of 25 Lumens or 50 Lux over an area ≥ 0.1 m^2
- Lamp rated lifetime of 10000 hours (2000 hours test).
- 1 rechargeable NiMH Battery, resistant to high temperatures, with a capacity of 800-1250 mAh
- Daily Burn Time (DBT) is greater than 4 hours
- Physical protection against weather impacts: IP41 according to the DIN EN 60529/IEC 529
- Autonomous time over 5.25 hours

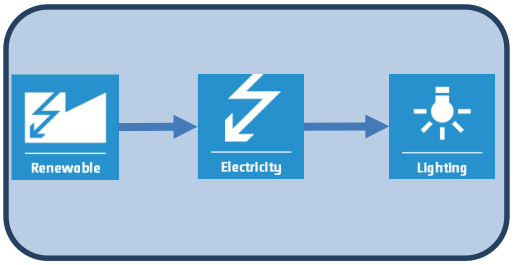
All the lamps distributed in this CPA will meet the above mentioned technical requirement.

[3] Apple, J., et al., Characterization of particulate matter size distributions and indoor concentrations from kerosene and diesel lamps. Indoor Air, 2010. 20(5): p. 399-411

[4] Rapport décennal sur la mise en œuvre des Objectifs du Millénaire pour le Développement, 2010 : p.57



Baseline Scenario



Project Scenario

A.6. Party(ies)

The small-scale CPA is implemented and operated by ENERCAP SAS.

Name of Party involved (host) indicates a host Party	Private and/or Public entity(ies) CPA implementer(s) (as applicable)	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Côte d'Ivoire (host)	Government of Côte d'Ivoire (Public)	No
France	ENERCAP SAS (Private)	Yes

Table 2: Parties involved in the project

A.7. Geographic reference or other means of identification

The project will be implemented in Côte d'Ivoire.

Côte d'Ivoire is included in the list of the countries listed under the PoA, and therefore inside of the boundary limits of the PoA. This CPA has not been included in any other CDM and/or other PoA project. The lamps to be distributed in this CPA will be clearly marked with a unique identification number to avoid repetitions. The project database for this CPA will be managed by ENERCAP.

The CPA boundary limits will cover all the regions of Côte d'Ivoire:

a) Bas-Sassandra
b) Comoé
c) Denguélé
d) District autonome Abidjan
e) District autonome Yamoussoukro
f) Gôh-Djiboua
g) Lacs
h) Lagunes
i) Montagnes
j) Sassandra-Marahoué
k) Savanes
l) Vallée du Bandama
m) Woroba
n) Zanzan

A.8. Duration of the CPA

A.8.1. Start date of the CPA

01/10/2015 or expected inclusion date of the CPA.

The PoA is expected to be registered in 2015 and therefore the distribution of the solar lamps is expected to initiate in the following year.

A.8.2. Expected operational lifetime of the CPA

As per Option 1 paragraph 11 of the methodology AMS-III.AR version 5, the operational lifetime of the CPA is 2 years or 24 months after the distribution of the solar lamps to the end-users.

A.9. Choice of the crediting period and related information

Fixed crediting period of 2 years has been selected for this CPA, as it is defined by the Option 1 of the methodology AMS-III.AR version 5, which was the method used for this CPA.

A.9.1. Start date of the crediting period

01/01/2016
The solar lamps are expected to be distributed in last quarter of 2015.

A.9.2. Length of the crediting period

2 years
As per the option 1 of the methodology applied, the emission reductions will be claimed only for two years.

A.10. Estimated amount of GHG emission reductions

Emission reductions during the crediting period	
Years	Annual GHG emission reductions (in tonnes of CO_2e) for each year
Year 1	69,000
Year 2	69,000
Total number of crediting years	2
Annual average GHG emission reductions over the crediting period	69,000
Total estimated reductions (tonnes of CO_2e)	138,000

Table 3: Estimated amount of emission reductions

A.11. Public funding of the CPA

The project is expected to be partly funded through public funds. No ODA funding would be diverted in this CPA.

A.12. Debundling of small-scale component project activities

According to the "Guidelines on assessment of de-bundling for SSC project activities, version 03 (EB54, Annex 13, par. 10) for determining the occurrence of de-bundling under a Program of Activities (PoA)"[5]:

"If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity."

The small-scale threshold defined by the methodology applied, AMS-III.AR, is the annual emissions reductions 60 $ktCO_2e$/year thus allowing every independent subsystem an annual emissions reduction of 600 tCO_2e/year. The default annual emission reduction for a subsystem is equal to

[5] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

0.092tCO_2/year, according to the Lamp Emission Factor described in the methodology AMS-III.AR, Version 05. Moreover, the size of the PV system is 0.3 W, less than the 150kW limit.

The annual emissions reductions of this product, proposed for the CPA, are well below the limit and therefore the de-bundling check is exempted for the CPA.

A.13. Confirmation for CPA

The Project is not registered as an individual CDM project and it is not part of another PoA.

A.14. Contact information of responsible persons/ entities for completing the CDM-SSC-CPA-DD-FORM

ENERCAP SAS, 2871 avenue de l'Europe, 69140 Rillieux, France, Francois Besson, francois.besson@enercap.fr

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

The environmental analysis is undertaken on the CPA level. Thus, the project activity will have certain environmental impacts of which none are to be seen negative:

- Reduced Greenhouse gas emissions
- Reduced indoor air pollution
- Reduced dependency on fossil fuels

The main adverse issue is the management of the waste of batteries/lamps produced. For this, thanks to the channel of importers defined by contract (refer to the contractor channel of a generic CPA under Part II Section A of the PoA), the batteries can be collected at the moment when it's required a new one.

However, there are no statutory environmental requirements and Law for PV LED systems in Côte d'Ivoire. («Report about Global environment facility Invest in our planet dedicated for Côte d'Ivoire, page 8»[6]).

SECTION C. Local stakeholder consultation

C.1. Solicitation of comments from local stakeholders

A local stakeholder meeting was organised by the local partner CIAT INGENIEURS CONSIELS (Côte d'Ivoire) on the 09/05/2012. The stakeholder were invited to participate during this meeting organised to explain the implementation of the project under the programme of activities and also the importance of the project replace the kerosene based lighting systems in the Côte d'Ivoire. The meeting was carried out in the following manner:

Agenda of the meeting:

08h30	Welcome address by the CIAT
8h30-9h00	Presentation of the SunLighting project Côte d'Ivoire
9h00- 9h30	Questions & answer session accompanied by an open discussion, comments and suggestions
9h30- 10h00	Feedback of the stakeholders regarding the project.
10h00	End of the meeting

[6] http://www.thegef.org/gef/sites/thegef.org/files/documents/document/3-13-12%20%20ID3959%20%20Council%20%20letter.pdf

Meeting started at 8:47 am and the presentation was hosted by the expert Théophile Madjitoloum YOMBOMBE, an associated Consultant of Enercap, in the presence of parliamentarians and a group of different socioeconomic backgrounds (list below).
The objective of this presentation was to enhance on the rationale of the solar energy lamp and its benefits to the expense of the kerosene lamp or the oil lamp otherwise.
Stakeholders at this presentation have asked some questions of understanding and clarification after the presentation. Other than operation of the lamp, the life time of the battery, instructions for use, and its advantage for the rural population of Côte d'Ivoire.
Meanwhile, some answers were provided by the host with the support of its employees. After a very efficient exchange, all listeners were satisfied. However, members, who attended the meeting have hailed the host for the project of the solar lamp and asked him to spread it to many parties and authorities such as the National Assembly. Stakeholders have also informed that they would echo the project to reach the proper authorities in order to be approved by the Côte d'Ivoire government.

The presentation ended at 9:48 with a note of thank you from the host to the audience for their presence and their collaboration.


C.2. Summary of comments received

During the round table, stakeholders' agreed that the project is aligned with a remarkable, prompt and lower cost opportunity to respond to the great demand of energy for household lighting in villages and suburban areas where there is no electricity. They have also shown keen interest to participate in the project actively. The comments have been translated and provided below in the table:

Name	**Djetadjim Chantal Yombombe**
What is your impression of this meeting?	It is an important project for the Côte d'Ivoire and I would like to see the solar lamp distribution going quickly
What do you like about this project?	The solar lamp is environment friendly and secure without any risk to use.
What do you appreciate in this project?	The solar lamp is small and it's recommended increase its size.
What would be the impact of this project of the solar lamp users?	the project impact of this project is profitable
What subject would you like to be approached in the meeting?	How the solar lamp is made?

Name	**Bere Mathieu**
What is your impression of this meeting?	A fast distribution of the solar lamp in Côte d'Ivoire
What do you like about this project?	The solar lamp is secure for the children and the families.
What do you appreciate in this project?	It's recommended to increase the size of the lamp.

What would be the impact of this project of the solar lamp users?	The solar lamp is economic and environment friendly.
What subject would you like to be approached in the meeting?	More awareness about the technology among the local population.

Name	**Alle Alex Aristide**
What is your impression of this meeting?	The meeting was held beautifully and contribute to clearly present the project
What do you like about this project?	Reduce the CO2 pollution for the population and avoid pulmonary disease. The solar lamp is cheaper and practical.
What do you appreciate in this project?	Nothing to add
What would be the impact of this project of the solar lamp users?	Users will make financial savings and sustain a positive image from it
What subject would you like to be approached in the meeting?	Exchange on the eventual reaction from the government in order to promote the awareness procedure

C.3. Report on consideration of comments received

The stakeholders' meeting was carried out in two steps. At First, the project was presented, being the presentation followed by questions. Then, the participants were able to express their feelings toward the project though a round table discussion. The comments were taken into account during the open discussion round and accordingly answered with the appropriate information.

A questionnaire was given to each stakeholder, who completed it and then returned the information to ENERCAP. We understand the importance of their participation in the project, so we are willing to take every opinion into consideration. The questionnaire that was distributed is shown below.

Name **Nom**	
What is your impression of this meeting? Quelles sont vos impressions sur cette réunion?	
What do you like about this project? Qu'est-ce que vous aimez dans ce projet?	
What do you appreciate in this project? Qu'est-ce que vous appréciez dans ce projet?	
What would be the impact of this project of the solar lamp users? Quelle serait l'impact de ce projet dans les utilisateurs des lampes?	
What subject would you like to be approached in the meeting? Quelle sujet voudriez-vous d'être aborder dans cette réunion?	

SECTION D. Eligibility of CPA and estimation of emissions reductions

D.1. Reference of methodology(ies) and standardized baseline(s)

The approved methodology for this project (SL-CPA-001-CH) is AMS-III.AR. (Version 05), *Substituting fossil fuel based lighting with LED/CFL lighting systems.*

D.2. Applicability of methodology(ies) and standardized baseline(s)

The SL-CPA-001-CH is qualified as Type III during every year. It is part of energy efficiency dealing with the replacement of polluting lamps by eco-friendly lamps.

AMS-III.AR. requirements	SSC-CPA qualification justification
1. This category comprises activities that replace portable fossil fuel based lamps (e.g. wick-based kerosene lanterns) with battery-charged light-emitting diode (LED) or compact fluorescent lamps (CFL) based lighting systems 1 in residential and/or nonresidential applications (e.g. ambient lights, task lights, portable lights).	Under this CPA, a reduction of greenhouse gas emission will be achieved by the installation of LED lamps at residential households, non-residential, schools or community centres. The installation/distribution will be taken by implementing entities. The technology used will be low greenhouse gas emitting and will achieve the lamp quality required by the methodology AMS-III,AR.
2. This methodology is applicable only to project lamps whose batteries are charged using one of the following options: (a) Charged by a renewable energy system included as part of the project lamp (e.g.a photovoltaic system or mechanical system such as a hand crank charger); (b) Charged by a standalone distributed generation system (e.g. a diesel generatorset) or a mini-grid, i.e. that is not connected to a national or regional grid; (c) Charged by a grid that is connected to regional/national grid.	Under this CPA, a reduction of greenhouse gas emission will be achieved by the installation of LED lamps. These LED lamps will use photovoltaic systems, being this option (a).
3. At a minimum project lamps shall be certified by their manufacturer to have a rated average operational life of at least: (a) 5,000 hours for Option 1, paragraph 17; (b) 10,000 hours for Option 2, paragraph 18.	According to the methodology requirements, the rated average lifetime, for option 1, must be at least 5,000 hours and they are assumed to operate for two years after distribution, which is certified by the manufacturer with one year warranty.
4. Rated average life is the life certified by the manufacturer or responsible vendor as beingthe time at which the lamp's initial light output will decline by no more than 30 per cent. In addition, for project lamps charged using Option 3(c) as provided for in paragraph 3above, the manufacturer shall certify that the battery-charging-circuit efficiency of theproject lamps, at the time of the purchase, is at least 50 per cent. For project lampscharged under option indicated in paragraph 3(b), if the mini-grid or distributedgeneration system is not entirely powered by renewable energy generation unit(s), themanufacturer shall certify that the project lamp's battery charging circuit efficiency, at thetime of purchase, is at least 50 per cent.	Laboratory certification will provide battery's charging efficiency of at least 50% at the time of purchase.

5. Project lamps shall meet warranty requirements of the Lighting Global Minimum QualityStandard. The project lamps shall have a warranty of a minimum of one year from thetime the end-user takes ownership or begins using the lamp. At a minimum, the warrantyshall cover free replacement or repair of any failed lamps, batteries, and whereapplicable solar panels. The warranty shall be clearly communicated and supportedthrough the supply chain and available to end-users of the project lamps during thewarranty period. In a situation where the project lamps are distributed throughintermediaries, the one year warranty shall commence from the time that the projectlamps are distributed to end-users. The full warranty terms shall be available in writing,in a regionally appropriate language and included with each unit.	The project lamps are with a one year warranty. The procedure of replacement will be the inclusion of an extra quantity of lamps, managed locally, for doing the replacement.
6. Project lamps shall meet or exceed the following minimum performance characteristics,which should be proven by third-party test results: **(a) Light Output -** luminous flux of 25 lumens or illuminance of 50 lux over anarea ≥0.1 m2 when suspended at a distance of 0.75 meters or self-supported.The light output over a 2,000 hour lumen maintenance test should not decline by more than 15%; **(b) Run Time and Battery Capacity -** Daily Burn Time (DBT) [3] shall meet thefollowing requirements: (i) DBT shall be equal to or greater than 4 hours; For charging Option 3(a) with solar PV, the DBT is defined by the SolarRun Time for the project lamp (as determined per paragraph 9(g)) (ii) For other technologies in Option 3(a), the DBT is defined based on typicalexpected patterns of use. (iii) For charging Options 3(b) and 3(c): a. The maximum claimed DBT shall be less than or equal to the typicalcapabilities of the regional or local energy system at deliveringreliable power sufficient for recharging; b. The autonomous (full battery) run-time of the project lamps shall be equal to or greater than 200 per cent of the DBT of the projectlamps; c. The project lamp shall be fully recharged from a discharged stateafter eight hours of charging.	The laboratory certification of the project lamp in provides all the performance characteristics required, and as proven by a third-party laboratory test facility.
7. The project design document shall explain the proposed distribution method of theproject lamps.	The document explains the following details:

It shall also explain how the proposed project activity shall: (a) Ensure that the replaced baseline lamps are those that directly consume fossilfuel. This can be done through documentation of the common practice of fuelusage for lighting in the project region (e.g. based on representative samplesurveys, official data or peer reviewed literature) that demonstrates that fossil fuelis a commonly used fuel for lighting; (b) Encourage the consumers, targeted by the project activity, to use the projectlamps and discourage hoarding; (c) Eliminate potential double counting of emission reductions that could occur, forexample, if more than one entity (e.g. lamp manufacturers, suppliers of solarand/or battery equipment, etc.) claims credit for emission reductions for theproject lamps. At a minimum, project lamps shall be marked as CDM projectlamps; (d) Ensure compliance with prevailing regulations pertaining to the use and disposalof batteries.	(a) Official data regarding the fuel usage for lighting is presented at Appendix 3. In Côte d'Ivoire kerosene is the main source for lighting. (b) Consumers targeted by the project activity will be encouraged to use the lamps through publicity campaigns to inform users of the benefit of using PV Solar lamps and hoarding will be discouraged by limiting the number of lamps distributed to each household; (c) The project lamps will have a unique permanent identification clearly connecting them with this CPA so that it is marked as being within the CPA only once. (d) Côte d'Ivoire does not regulate use and disposal of batteries, therefore the project will strive to apply internationally acceptable practice in order to minimize any adverse environmental impacts to the local environment.
8. The project design document shall include the minimum requirements for the design specifications of Project Lamps including the following specifications: (a) Lamp wattage (in Watts) and luminous flux output (in lumens); (b) Rated lamp life (in hours); (c) Where applicable, the type and rated capacity of the renewable energy equipment used for battery-charging (in Watts); (d) Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere Hours); (e) Type of charge controller (e.g. active or passive); (f) Autonomous Time and Daily Burn Time; (g) Solar Run Times(s) (SRT) for products with solar energy charging systems. If regional solar data are available, the maximum, minimum and average estimated SRT values for each month of a typical year shall be provided. If regional solar data are not available the standard solar day (5 kWh/m2) shall be used to estimate SRT; (h) Where applicable, the amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid); (i) Physical protection against environmental factors (e.g. rain, heat, insect ingress)	The CPA provides clear information about the technical specification of the project lamps. Supporting documentation will be sent to the DOE on request, such as technical specifications from the manufacturer and independent test results if available.
9. Measures are limited to those that result in emissions reductions of less than or equal to 60 kt CO2 equivalent annually	This CPA within the PoA does not surpass the limit of 60kt.

Table 4: AMS-III.AR requirements

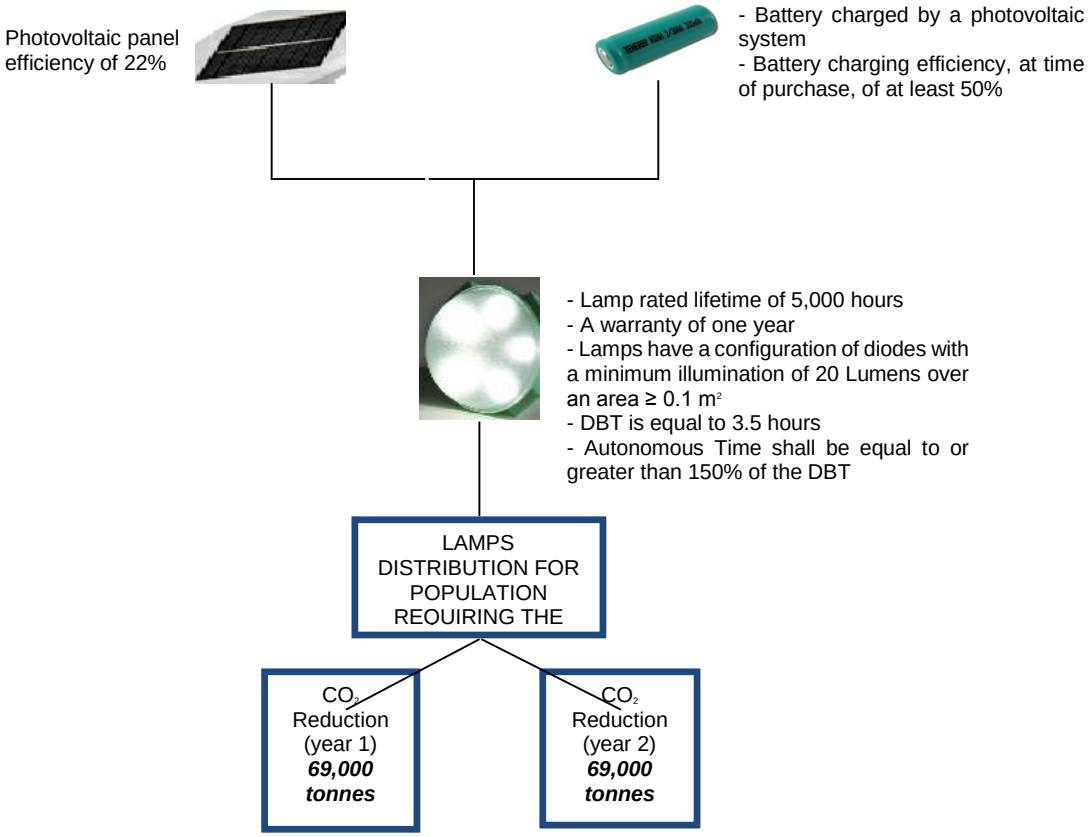
D.3. Sources and GHGs

The project boundary is located in Côte d'Ivoire, one of the targeted countries of the PoA-DD under validation process, and it includes the physical and geographical sites that decrease the emission of greenhouse gas within the CPA project. Therefore, in the table below, the sources and gases included in the SSC-CPA boundary are listed:

Source		Gas	Included?	Justification / Explanation
Baseline	GHG emissions generated from the combustion of kerosene fossil fuel	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	GHG emissions generated by the project activity	CO_2	No	Minor emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source

Table 5: Sources and gases included in the project boundary

The lamp that we selected meets all the technical parameters of the methodology



Energy and mass balances are absent in this diagram because they are not relevant in this case since the energy and mass flow of each solar lamp is minor.

D.4. Description of the baseline scenario

The SL-CPA-001-CH will be implemented under the SL-PoA-001: "ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region". The latest approved version of Tool for the demonstration and assessment of additionality, version 6.1.0, EB 69 Annex 20 and the Guidelines on the demonstration of additionality for small-scale CDM project activities Version 09, EB 68, Annex 27, are used to identify the most plausible baseline scenario and demonstrate additionality, as per the methodology applied to this project activity. The following three alternatives have been considered to determine the most plausible baseline scenario:

a. The proposed project activity undertaken without being registered as a CDM project activity;

b. Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario;

c. If applicable, continuation of current practices (kerosene used for lighting);

a. The proposed project activity undertaken without being registered as a CDM project activity

The mandatory replacement of kerosene-based lamps in the proposed regions with efficient PV LED systems without being registered as a CDM project activity is not applicable, as there are no mandated legal requirements in the proposed regions for the uptake of solar lamps. In addition, the country is massively poor and so the rural households who are suffering from financial scarcity[9]. Consequently, the investment of this project would not take place without CERs aid.

b. Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario

Furthermore, other options such as widespread electrification of rural areas are unrealistic as currently, the electricity demand in these regions far outstrips generation capacity. According to an AICD paper such a deployment would mean a commitment of $27 million per year, which is far from the financial capacities of the country[10]. Thus, there is inadequate power supply to consumers with access to electricity.

c. If applicable, continuation of current practices (kerosene used for lighting)

The current practice is the use of kerosene-based systems for lighting purposes in households across the proposed regions (see Appendix 3). In the absence of the proposed CDM project activity, the continuation of the combustion of kerosene fuel for lighting purposes is envisaged across the proposed regions due to the relatively high cost of solar lamps.

After the barrier analysis, the remaining scenario the proposed project activity undertaken without being registered as a CDM project activity. Hence, the implementation of the CDM project activity is crucial to undergo the investment of this project.

D.5. Demonstration of eligibility for a CPA

The proposed CPA will be implemented under the PoA: "ENERCAP SunLighting™ Africa – Programme to replace kerosene lamps with micro PV LED systems in the Sub-Sahara region". Therefore all the identified barriers are applicable to the CPA in Côte d'Ivoire as described in the table below:

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[7] Rapport décennal sur la mise en œuvre des Objectifs du Millénaire pour le Développement, 2010 : p.6

[10] AICD, Powering Up: Costing Power Infrastructure Spending Needs in Sub-Saharan Africa, in BACKGROUND PAPER 5 (PHASE II), A.I.C. Diagnostic, Editor. 2009.

Barrier	Compliance
Alternative scenarios derived from A.4.3 of the PoA-DD (Sub-step 1a) are still valid for the CPA	Yes
Barriers at A.4.3 (Step 3) are still affecting the CPA implementation	Yes
Common practice at A.4.3 (Step 4) is still valid for the CPA	Yes
The CPA needs the CER revenues, otherwise the CPA cannot be implemented	Yes

Table 6: Barriers

The assessment of additionality has been conducted at PoA level and therefore the CPA Implementer is only required to affirm the barrier analysis as described in the table above.

As considered in the PoA, the present CPA demonstrates the eligibility criteria as per the following points:

(a) The LED solar lamp will replace portable fossil fuel based lamps, mainly kerosene lamps, in residential and/or non-residential applications
(b) The project lamps will use rechargeable batteries charged by renewable photovoltaic energy systems
(c) The manufacture of the project lamps will certify that the product has an average life of 5,000 hours
(d) The manufacture will certify that the solar lamps' battery charging efficiency is at least 50% at the time of the customer's purchase
(e) Each project lamp shall provide, at least, a one year warranty which specifically covers free replacement or repair of failed lamps, batteries and where applicable solar panels
(f) All solar lamps manufactures carry identification which enables them to be marked as being within the "Project" and avoid double counting
(g) The disposal of batteries shall be in compliance with the regulations of each African country
(h) Detailed technical specification and supporting documentation of the solar lamps will be provided
(i) No more than five solar lamps per household shall be recognised for generating emission reductions within the project
(j) In the absence of the project, the prevailing practice, the use of kerosene lamps in households across sub Saharan Africa, will be carried on in each country taking part under this PoA.
(k) The project lamps will serve for lighting to local users
(l) The affirmation obtained from public funders will be delivered in the CPA including a confirmation that the funding is excluded from Official Development Assistance. Since both the private and public investments for the CPA have not yet been completely assured, therefore, detailed explanations will be provided in the additionality of the CPA.

D.6. Estimation of emission reductions

D.6.1. Explanation of methodological choices

According to the methodology AMS-III.AR. Version 5, the following choices are applied for SSC-CPA-001-CH:

Technology/Measure

The type of LED based lighting system under this PoA is only charged by a renewable energy system (photovoltaic system).

Boundary

Since the project lamps are charged by a renewable system, the project boundary will include the physical, geographical site of the renewable energy system.

LED Lamp effective useful life

According to the methodology AMS-III,AR, it is necessary to choose between one of the two options for the LED lamp effective useful life, at the moment of the distribution for the batch of lamps delivered under the CPA. This option must be registered under the PoA management system:

Project Lamps are able to operate for two years after project lamp distribution to end-users. Therefore, the emission reductions can only be claimed for two years.

Baseline Emissions

For the chosen Option 1 Baseline Standard of AMS-III.AR v.5.0, the calculation shall use a default annual baseline emissions factor for the project lamps distributed to end-users. The following assumptions are made about the equivalent baseline lighting system:

$$DV = FUR * O * U * EF / 1000 * LF * n * NTG$$ **(Eq2 of AMS-III.AR v.5.0)**

Where:

DV Lamp Emission Factor (default is 0.092tCO_2e per Project Lamp)
FUR Fuel use rate (0.03 liters/hour)
O Utilization rate (3.5 hours/day)
U Annual utilization (365 days/year)
EF Fuel emissions factor (2.4 kgCO_2/liter)
LF Leakage factor (1.0)
n Number of fuel-based lamps replaced per Project Lamp (1.0)
NTG Net-to-gross adjustment factor (1.0)

Project Emissions

Since the mechanism used is the paragraph 3(a) of AMS-III.AR v.5.0, there are not project emissions associated to the PoA ($PE_y = 0$).

Emission Reduction

Annual emission reductions are calculated for the CPA are as following the equation:

$$ER_y = \sum_{i,j} N_{i,j} \times \left(BE_{y,i} - PE_{y,i,j}\right) \times \left(OF_{y,i,j}\right)$$ **(Eq5 of AMS-III.AR** v.5.0**)**

Where:

ER_y	Emission reductions in year y (tCO_2e)
BE_y	Baseline Emissions per project lamp in year (tCO_2e)
$N_{i,j}$	Number of project lamps distributed to end users of type i with charging method j
$PE_{y,i,j}$	Average project Emissions in year y(tCO_2e) per Project Lamp
$OF_{y,i,j}$	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 22, for years 4, 5, 6 and 7[8].

[8] The years refer to the operational years of project lamps (e.g. for project lamps deployed in year 3 of the crediting period years 1, 2 and 3 relate to the years 3, 4 and 5 of the crediting period and so forth).

D.6.2. Data and parameters fixed ex-ante

Given that in this CPA option 1of AMS-III.AR version 5 is selected, all parameters used are default values given in the methodology.

D.6.3. Ex-ante estimates of emission reductions

For the evaluation of the CPA baseline emissions the default annual baseline emissions factor as provided by the methodology AMS-III.AR version 5 is used. The following assumptions are made about the equivalent baseline lighting system.

$$DV = FUR * O * U * \frac{EF}{1000} * LF * n * NTG \textbf{(Eq2)}$$

Where:

DV Lamp Emission Factor (default is 0.092 tCO_2e per Project Lamp)
FUR Fuel use rate (0.03 liters/hour)
O Utilization rate (3.5 hours/day)
U Annual utilization (365 days/year)
EF Fuel emissions factor (2.4 $kgCO_2$/liter)
LF Leakage factor (1.0)
n Number of fuel-based lamps replaced per Project Lamp (1.0)
NTG Net-to-gross adjustment factor (1.0)

Baseline emissions

$$BE_y = DV \times GF_y \times DB_y \textbf{(Eq3)}$$

Where:

BE_y	Baseline Emissions per project lamp in year (tCO_2e)
GF_y	Grid Factor in year y, which is equal to 1.0 since the charging option defined in paragraph 3(a) is used[9].
DB_y	Dynamic Baseline Factor (change in baseline fuel, fuel use rate, and/or utilization during crediting period) in year y. Calculated as either: Option 1: default of 1.0 in the absence of relevant information, Option 2: value of 1.0+FFg where FFg is the documented national growth rate of kerosene fuel use in lighting from the preceding years (use the most recent available data of three or five years average (fraction)

Project Emissions

Since the mechanism used is defined in paragraph 3(a) of AMS.III.AR, there are not project emissions associated to the PoA ($\mathrm{PE_y} = 0$).

Equation 3: Emissions reduction

Annual emission reductions are calculated as:

[9] Combined with the demonstration of fossil fuel for lighting per paragraph 8 (a) it is assumed all of the baseline emissions would be from fossil fuel burning for lighting.

$ER_y = \sum_{i,j} N_{i,j} \times (BE_{y,i} - PE_{y,i,j}) \times (OF_{y,i,j})$ **(Eq4)**

As per the paragraph 24 of the AMS-III.AR v.5.0, we assume that 100% of lamps are in service for the first 3 years. Hence, according to the methodology for Option 1, the annual emission reductions resulted from the project activity will be:

$ER_y = 750000 * 0.092$

$ER_y = 69000 tCO_2$

ER_y	Emission reductions in year y (tCO_2e)
BE_y	Baseline Emissions per project lamp in year (tCO_2e)
$N_{i,j}$	Number of project lamps distributed to end users of type i with charging method j
$PE_{y,i,j}$	Average project Emissions in year y(tCO_2e) per Project Lamp
$OF_{y,i,j}$	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[10].

The emission reductions shall be considered from the date of completion of distribution of the project lamps to end users.

D.6.4. Summary of the ex-ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	0	69,000	0	69,000
Year 2	0	69,000	0	69,000
Total (tonnes of CO_2 e)	**0**	**138,000**	**0**	**138,000**
Total number of crediting years	2			
Annual average over the crediting period	0	69,000	0	69,000

Table 7: Ex-ante estimation of emission reductions

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

D.7.1. Data and parameters to be monitored

Data parameters that will be monitored:

Data / Parameter:	*Data per transaction/distribution*
Unit:	
Description:	General database with the information of each transaction/distribution. This data will come from the entities in charge of the distribution of lamps (e.g. import/distributors sales records, government distribution) and recorded into the ENERCAP database.

Source of data	ENERCAP Management System Database
Value(s) applied	Ni,j= 750,000
Measurement methods and procedures	All information will be collected locally from and stored in the ENERCAP database. This data will be collected each time the lamps are distributed/sold under the CPA by the entities in charge of the distribution (e.g. government, NGO's, importer/distributor).
Monitoring frequency	According to the parties agreement
QA/QC procedures	Data will be collected using the standard company procedures and stored for the crediting period and an additional two years after the end of the CPA period. Cross reference with documentation that provides the registration inputs (e.g. public notary visit at the site of distribution, distribution/sales records).
Purpose of data	Calculation of baseline emissions Database Management
Additional comment:	The sales/distribution date is determined when the solar lamp is sold/distributed by ENERCAP SAS/the distributor. This database will record at least the following: *Option 1 chosen in E.6.1.:* According to AMS-III.AR version 5, the following information needs to be gathered when the lamps are delivered/sold to the households: - number of lamps sold/distributed ($N_{i,j}$) - type of solar lamp distributed (e.g. power, battery, charging method) - manufacturer of the lamp - date of sale or distribution - date of supply - option of LED effective useful life - option for E.6.2 - place where the lamp was delivered - rural/urban classification - CPA details information - lamp identification

Data / Parameter:	$OF_{y,i,j}$
Data unit:	Percentage
Description:	Percentage of distributed lamps which are in service and operational in year y
Source of data	Monitoring survey at year 3 of crediting period
Value(s) applied	Percentage of lamps distributed that are operational
Measurement methods and procedures	***Lamps delivered under Option 1 of E.6.1*** If this option is chosen, then for years 1 and 2 (after the lamps are delivered), 100% of lamps will be considered as operative providing that data of distribution is according to the requirements of the methodology. The verification shall be done on a PoA level, meaning all lamps delivered under option 1 can be verified by the DOE at the same time, with the CME deciding which CPAs are presented for verification and at what time.
Monitoring Frequency	When the distribution process occurs
QA/QC procedures to be applied:	***Lamps delivered under Option 1 of E.6.1*** Cross reference with documentation that provides the registration inputs (e.g. public notary visit at the site of distribution, distribution/sales records)
Purpose of data	Calculation of baseline emissions

Additional comment:	

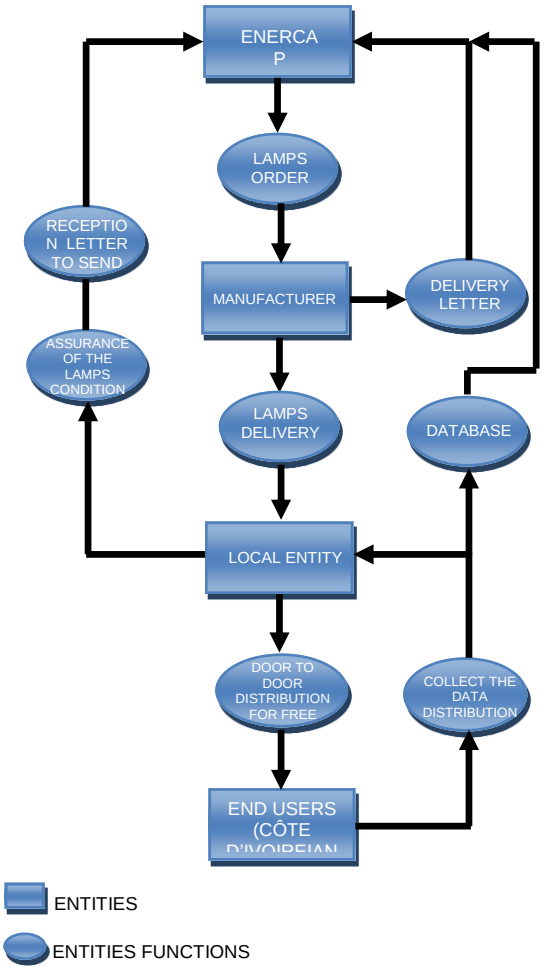
D.7.2. Description of the monitoring plan:

i. Roles and responsibility

The coordinating and managing entity will be responsible for executing the monitoring, building an appropriate database and ensuring the quality of the data gathered at the distribution or selling of the lamps. Local partners and/or NGOs may be contracted to fulfil these tasks, but foreseen by the CME.

ii. Workflow information

The following diagram is the expected flow of information for this CPA. It shows the responsibilities of each entity regarding the distribution of LED lamps for the end users.



iii. Recording project lamp distribution data

At the moment of the distribution of the lamps, the option of monitoring for the batch delivered must be clearly established.

Option 1 chosen in E.6.1.:

According to AMS-III.AR version 5, the following information needs to be gathered when the lamps are delivered/sold to the households:

- number of lamps sold/distributed
- type of solar lamp distributed (e.g. power, battery, charging method)
- manufacturer of the lamp
- date of sale or distribution

- date of supply
- option of LED effective useful life
- option for E.6.2
- place where the lamp was delivered
- rural/urban classification
- CPA details information
- lamp identification

iv. Monitoring

Lamps delivered under Option 1 of E.6.1

Under this chosen option, then for years 1 and 2 (after the lamps are delivered) 100% of lamps will be considered as operative providing that data of distribution is according to the requirements of the methodology. The verification shall be done at a PoA level, meaning all lamps delivered under option 1 can be verified by the DOE at the same time, being the CME deciding which CPA's are presented for verification and at what moment, when it's financial attractive for the CME.

SECTION E. Approval and authorization

In order to promote the CDM project “SL-CPA-001-CH” and to assist the Government of Côte d’Ivoirein achieving sustainable development, an approval has been received from the national authority to implement the project in Côte d’Ivoire.

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Appendix 1. Contact information of CPA implementer(s) and responsible person(s)/ entity(ies) for completing the CDM-SSC-CPA-DD-FORM

CPA implementer and/or responsible person/ entity	☒ CPA implementer(s) ☐ Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization:	ENERCAP SAS
Street/P.O.Box:	2871 av de l'Europe
Building:	
City:	Rillieux-La-Pape
State/Region:	
Postfix/ZIP:	69140
Country:	France
Telephone:	+ 33 4 78 55 90 66
FAX:	
E-Mail:	contact@enercap.fr
URL:	www.enercap.fr
Represented by:	
Title:	CEO
Salutation:	Mr.
Last Name:	Vial
Middle Name:	
First Name:	Alexandre
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	contact@enercap.fr

CPA implementer and/or responsible person/ entity	☐ CPA implementer(s) ☒ Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization:	ENERCAP SAS
Street/P.O.Box:	2871 av de l'Europe
Building:	
City:	Rillieux-La-Pape
State/Region:	
Postfix/ZIP:	69140
Country:	France
Telephone:	+ 33 4 78 55 90 66
FAX:	
E-Mail:	contact@enercap.fr
URL:	www.enercap.fr
Represented by:	
Title:	CEO
Salutation:	Mr.
Last Name:	Besson
Middle Name:	
First Name:	François

Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	francois.besson@enercap.fr

Appendix 2. Affirmation regarding public funding

This CPA, included under the PoA, receives public funding excluding from Official Development Assistance.

Appendix 3. Applicability of methodology(ies) and standardized baseline(s)

i: Official data regarding the fuel usage for lighting

Domestic lighting source for households in Côte d'Ivoire				
	Kerosene	Electricity	Gas	Others
Usage [%]	69	3	4	24

Source : Rapport décennal sur la mise en œuvre des Objectifs du Millénaire pour le Développement, 2010 : p.57

It can thus be assumed that Kerosene is the most used fuel for lighting for rural households in Côte d'Ivoire and so it represents the common practice.

ii: Management of disposal batteries

A monitoring process will be defined with the local entity regarding the management of disposal batteries.

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

NA

Appendix 5. Further background information on monitoring plan

NA

Appendix 6. Summary of post registration changes

NA

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