Monitoring report form for CDM programme of activities

(Version 02.0)

Complete this formin accordance with the instructionsattached at the end of this form.

MONITORING REPORT		
Title of the PoA	Ethiopia Off-Grid Renewable Energy Program	
UNFCCC reference number of the PoA	10285	
Version numbers of the PoA-DD applicable to this monitoring report	12.0	
Version number of this monitoring report	9.0	
Completion date of this monitoring report	18/02/2019	
Monitoring period number	1	
Duration of this monitoring period	01/08/2016 to 31/10/2017	
Monitoring report number for this monitoring period	1	
Coordinating/managing entity	Development Bank of Ethiopia	
Host Parties	Host Party of the PoA	Is this the host Party ofa CPA covered in this monitoring report? (yes/no)
	Federal Democratic Republic of Ethiopia	Yes
Sectoral scopes	1: Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	AMS-III.AR. Version 5 - Substituting fossil fuel based lighting with LED/CFL lighting systems AMS-I.F. Version 3 - Renewable electricity generation for captive use and mini-grid AMS-I.L. Version 3 - Electrification of rural communities using renewable energy AMS-I.B. Version 12 - Mechanical energy for the user with or without electrical energy Applied Standardized Baseline: Not Applicable	
	Amount achieved	Amount achieved

Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	before 1 January 2013	from 1 January 2013
	0	38,913 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	27,600 tCO_2e	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The Ethiopia Off-Grid Renewable Energy Program (the PoA) is a nation-wide program for Ethiopia that targets the large segment of the population without access to electricity for basic uses. Due to poor grid coverage and the dispersed nature of settlements in rural areas, only 14% of the population are connected to the electricity grid[1]. Meanwhile, more than 12 million rural households rely on sources other than the electricity grid for energy for lighting, with the majority utilizing kerosene lamps.[2] This PoA promotes scaling-up of the uptake of off-grid renewable energy technologies to provide electricity for lighting and other domestic, commercial, or institutional energy needs for households and other users either not connected to the grid, or not served by the grid due to acute shortage of electricity in the grid.

The Government of Ethiopia (GoE) is pursuing dramatic expansion of electricity generation and grid connection;[3] however, even with tremendous investments to rapidly scale up grid connection in Ethiopia, millions of families will still be living without electricity by 2025, leaving a significant market niche that the PoA could contribute to address. Conscious of this reality, the PoA will promote goals related to off-grid energy access of the GoE's Electricity Network Reinforcement and Expansion Project (ENREP), which includes targets of 150,000 solar household solar PV systems, 3,000 institutional solar PV systems and 3,000,000 small solar lighting systems (lamps/lanterns).[1]The GoEwishes to achieve this through the use of market-based instruments such as carbon finance, which will be available through this PoA.

[1]World Bank. *Project Appraisal Document for Electricity Network Reinforcement and Expansion Project (ENREP)*. Page 9. 29 May 2012.

[2]Central Statistical Agency, Federal Democratic Republic of Ethiopia. *Welfare Monitoring Survey 2011, Statistical Report: Indicators on Living Standard, Accessibility and Households Assets, Volume II*. Table 8.4 (b). April 2012.

[3]Ministry of Finance and Economic Development (Ethiopia). *Growth and Transformation Plan 2010/11 – 2014/15*. Page 72. November 2010.

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: DBE Off-grid renewable energy solar lamps CPA CPA Type: Generic CPA Type 1	12.0	1	AMS-III.AR Substituting fossil fuel based lighting with LED/CFL lighting systems (Version 5.0)[4] AMS-I.D Grid connected renewable electricity generation Version (18.0)[5] AMS-I.F Renewable electricity generation for captive use and min-gird Version (3.0)[6] General guidelines for SSC CDM methodologies Version (22.1)[7] Guidelines on the demonstration of additionality of small-scale project activities Version (9.0)[8] Standard: Sampling and surveys for CDM project activities and programmes of activities Version (7.0)[9] Guideline: Sampling and surveys for CDM project activities and programmes of activities Version (4.0)[10]

[4] https://cdm.unfccc.int/methodologies/DB/4K7KI9GY79UEHUKF3140PCID64IXCV

[5] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[6] https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

[7] https://cdm.unfccc.int/Reference/Guidclarif/index.html

[8] https://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

[9] https://cdm.unfccc.int/Reference/Standards/index.html

[10] https://cdm.unfccc.int/Reference/Guidclarif/index.html

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: DBE Off-grid renewable energy captive use mini-hydro power CPA CPA Type: Generic CPA Type 2	12.0	1	AMS-I.F. Renewable electricity generation for captive use and mini-grid(Version 3)[11] Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 2.0)[12] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 2.0)[13] Tool to calculate the emission factor for an electricity system (Version 5.0)[14] Project emissions from cultivation of biomass (Version 1.0)[15]
Title: DBE Off-grid renewable energy solar PV CPA CPA Type: Generic CPA Type 3	12.0	1	AMS-I.L Electrification of Rural Communities Using Renewable Energy(Version 3)[16] AMS-I.D Grid connected renewable electricity generation (Version 18.0)[17] AMS-I.F Renewable electricity generation for captive use and min-gird Version (3.0)[18] General guidelines for SSC CDM methodologies Version (22.1)[19] Guidelines on the demonstration of additionality of small-scale project activities (Version 9.0)[20] General guidance on leakage in biomass project activities (attachment C to Appendix B)(Version 3.0)[21]

[11] https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view

[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view

[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf/history_view

[15] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v1.pdf

[16] https://cdm.unfccc.int/methodologies/DB/CCZKY3FSL1T28BNEGDRSCKS0CY0WVA

[17] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[18] https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

[19] https://cdm.unfccc.int/Reference/Guidclarif/index.html

[20] https://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

[21] https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid04.pdf

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: DBE Off-grid renewable energy rural mini-hydro power CPA CPA Type: Generic CPA Type 4	12.0	1	AMS-I.L. Electrification of rural communities using renewable energy(Version 3.0)[22] AMS-I.D Grid connected renewable electricity generation Version (18.0)[23] AMS-I.F Renewable electricity generation for captive use and min-gird (Version 3.0)[24] General guidelines for SSC CDM methodologies (Version 22.1)[25] Guidelines on the demonstration of additionality of small-scale project activities (Version 9.0)[26] General guidance on leakage in biomass project activities (attachment C to Appendix B)(Version 3.0)[27]

[22] https://cdm.unfccc.int/methodologies/DB/CCZKY3FSL1T28BNEGDRSCKS0CY0WVA

[23] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[24] https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

[25] https://cdm.unfccc.int/Reference/Guidclarif/index.html

[26] https://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

[27] https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid04.pdf

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: DBE Off-grid renewable energy mini-hydro pumps CPA CPA Type: Generic CPA Type 5	12.0	1	AMS-I.B. Mechanical energy for the user with or without electrical energy(Version 12)[28] AMS-I.A: Electricity generation by the user (Version 16.0)[29] AMS-I.D: Grid connected renewable electricity generation (Version 18)[30] AMS-I.F: Renewable electricity generation for captive use and mini-grid (Version 3.0)[31] Project emissions from cultivation of biomass (Version 1.0)[32] Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 3.0)[33] General guidelines for SSC CDM methodologies Version 22.1[34]

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Title: DBE Off-grid renewable energy solar lamps CPA 1 Reference Number: 10285-0001	Title: DBE Off-grid renewable energy solar lamps CPA CPA Type: CPA Type 1	12.0	Type: Renewable Duration: 01/08/2016 to 31/07/2023	Yes
Title: DBE Off-grid renewable energy solar home system CPA 1 Reference Number: 10285-0002	Title: DBE Off-grid renewable energy solar PV CPA CPA Type: CPA Type 3	12.0	Type: Renewable Duration: 30/11/2017 to 29/11/2024	No
Title: DBE Off-grid renewable energy solar lamps CPA 2 Reference Number: 10285-0003	Title: DBE Off-grid renewable energy solar lamps CPA CPA Type: CPA Type 1	12.0	Type: Fixed Duration: 01/02/2018 to 31/01/2025	No

[28] https://cdm.unfccc.int/methodologies/DB/M204DLP0XMSWSZ9H4SIZ6W86M8RHCM

[29] https://cdm.unfccc.int/methodologies/DB/8FKZFJ7SG551TS2C4MPK78G12LSTW3

[30] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

[31] https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

[32] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-16-v1.pdf

[33] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view

[34] https://cdm.unfccc.int/Reference/Guidclarif/index.html

A.2. Coordinating/managing entity

The CME is the Development Bank of Ethiopia (DBE). DBEis a state owned financial institution. The DBE is headquartered in Addis Ababa, with further staff in the branches and regions of Ethiopia. The address of the DBE is the following:

Development Bank of Ethiopia
Kirkos
Addis Ababa
Ethiopia

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

The Development Bank of Ethiopia, the CME, has worked to implement the PoA as per the management system in the PoA-DD. At the time of monitoring, three CPAs have been included under the PoA. Two Type 1 CPAs, covering solar lamps and one type 3 CPA covering solar PV systems. This monitoring report covers only the first solar lamp CPA included at the time of registration. The PoA was registered on 01/07/2016.

The PoA supports the implementation of four different off-grid renewable energy technologies, including (1) solar lamps, (2) solar PV systems, (3) mini-hydroelectricity plants and (4) solar pumps for irrigation.

(1) Solar Lamps

These comprise zero-emissions off-grid lighting products or systems that are stand-alone, rechargeable and can be installed and operated by their user. Each unit has a retail price typically less than US$100 and includes three main components: usually, a 1 to 5 W solar panel as the electricity source, a rechargeable battery, and a lantern or lamp, usually with an LED bulb. The solar panel is placed in the sun during the day to generate electricity that recharges the battery, and at night the electricity is available to power the lamp.[35]These units will provide lighting for individual householdsand may also provide cell-phone charging or similar. Only units that comply with the Lighting Global Minimum Quality Standards[36] and have a minimum warranty period of one (1) year will be eligible to be included in the program. Prior to the project, off-grid households relied on kerosene lamps for lighting, most of which are relatively inefficient tin lamps with a simple wick and no cover.[37] Burning of kerosene generates CO_2.

*(*2) Solar PV Systems

Solar PV Systems provide zero-emissions electricity supply to homes, institutions, or SMEs for a variety of uses, such as lighting, television sets and other small appliances. Each system will consist of at least aPV module to convert solar energy into electrical energy, a battery to storethe electrical energy,a charge controller to protect the system from attaining an overcharged and undercharged condition, and cables and connecting devices. System capacities are expected to range between approximately 20 Wto 150 kW. Only units that have a warranty period of five (5) years will be eligible to be included in the program. Prior to the project, off-grid households, institutions, or SMEs relied on kerosene lamps for lighting, most of which are relatively inefficient tin lamps with a simple wick

[35] World Bank. *Lighting Africa - Lighting Africa*. Accessed at http://www.lightingafrica.org/.Accessed on January 2014.

[36] Lighting Global (IFC/ World Bank). *Lighting Global Minimum Quality Standards, Version 4.0*. January 2014.

[37] World Bank. *The Off-Grid Lighting Market in Sub-Saharan Africa: Market Research Synthesis Report. Lighting Africa*. February 2011.

and no cover.[6]In the baseline, off-grid lighting would have been provided by kerosene while batteries or diesel generators would have charged small appliances.Burning of kerosene and diesel generates CO_2.

(3) Mini-HydroelectricPlants

These plants use hydroelectric technology to provide zero-emissions electricity for users such as off-grid communities, mini-grids, and so forth. Typical installations are expected to have a capacityless than or equal to 5 MW, although units up to 15 MW will be eligible. Prior to the project, off-grid users relied on kerosene lamps for lightingand diesel or other fossil fuel generators for general electricity needs. Hence the plants will replace kerosene lamps and generation from diesel generators or other existing fossil fuel fired units that generate CO_2.

(4) Solar Pumps for Irrigation

These solar powered water pumps provide access to groundwater supply for individual farmers or groups of farmers to enhance farming productivity and predictability. The units will be targeted to farmers in drought-prone regions, for example Somali and Afar states. Each individual unit is expected to include at a minimum solar PV panels, a motor, and a pump, with a pumping capacity of an estimated 15 – 50 L/sec, subject to change depending upon the specific requirements of each system's user(s). Each solar pump will offset a diesel-fired pump with similar capacity that would have generated CO_2 emissions in the baseline.

The inclusion of CPAs was conducted as per the table in the PoA-DD covering the various responsibilities for CPA inclusion. In the case of the included CPAs, the CME is also the CPA Implementer, so everything from development of the documentation through review of the documents and submission for inclusion was handled by the CME.

The CME also underwent training on the CDM, CPA inclusion, monitoring, verficiation, and issuance. The training was conducted over 2 days starting on 15/06/2017. The training was conducted by Ci-Dev and Climate Focus.

The figure below shows the entities involved and the relationships between those entities for CPA types 1 and 3, the only CPA types included under the PoA at the time of monitoring.

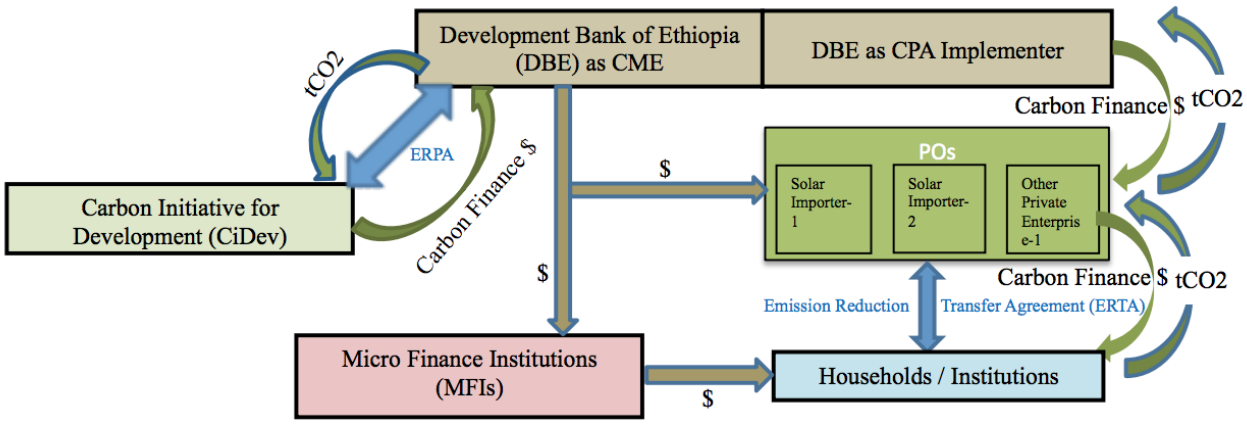

Figure 1.Overview of Management System for solar lamp and solar PV system CPAs

As per the diagram, the CME acted as the CPA Implementer and worked with private operators (POs) and microfinance institutions (MFIs) to disseminate solar technologies to households and insitutions in Ethiopia.

The CPA covers efficient lamps that are solar powered and Lighting Africa certified. All lamps adhere to the minimum requirements of the methodology. The exact models and brand of lamps is provided for each specific CPA.

For the CPA included in this monitoring report a sampling approach was not undertaken as it can be assumedas per methodology AMS-III.AR Version 5 that lamps are 100% functional during their two years of operation.Under DBE Off-grid renewable energy solar lamps CPA 1, Lighting Africa certified solar lamps were sold or distributed to end-users.

B.2. Post-registration changes to PoA

B.2.1. Corrections

The following PRC was completed prior to this monitoring period:
Reference Number: PRC-10285-001
Date of Approval: 02/10/2018

Corrections covered under the PRC are the following:

Revisions have been made to various sections of the design document as the document was updated to the latest template. From Version 4.0 to Version 8.1.

The time period covered by a generic Type 1 CPA was updated from 2 years to approximately 3 years.

There are no other corrections to the PoA

B.2.2. Inclusion of monitoring plan

There was a post-registration change to include the monitoring plan into the PoA-DD. The monitoring plan has been approved prior to submission of this moniroing report under the following PRC:

Reference Number: PRC-10285-001
Date of Approval: 02/10/2018

B.2.3. Permanent changes to theregisteredmonitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

There are no permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologyies, standardized baseline, or other applies standards or tools.

B.2.4. Changes to programme design

The following PRC was completed prior to this verification:
Reference Number: PRC-10285-001
Date of Approval: 02/10/2018

Changes to the programme design covered under the PRC are the following:

For generic CPA Type 1, the use of Option 1 or Option 2 under paragraphs 17 and 18 of AMS-III.AR Version 5.0 has been added to the generic CPA.

The eligibility criteria for CPA Type 1 have been revised to reflect the use of Option 1 or Option 2 under paragraph 17 and 18 of AMS-III.AR Version 5.0. Specifically, eligibility criterion 2, double counting, and eligibility criterion 12, methodology applicability/technology, were revised to reflect the use of Option 1 or Option 2 in the CPA.

PART II Monitoring of CPAs

Title: DBE Off-grid renewable energy solar lamps CPA 1

Reference Number: 10285-0001

SECTION C. ImplementationofCPAs

C.1. Description of implemented CPAs

The CPA targets poor and vulnerable households mainly in rural areas[38], who rely primarily on fossil fuels for lighting, andprovides improved energy access to such households, with associated benefits for poverty alleviation, while simultaneously reducing greenhouse gas emissions from the exploitation of fossil fuels. This CPA includes the distribution of solar lamps/solar lanterns (referred to collectively as "solar lamps") that provide lighting powered by solar energy, for households or other end-users in the entirety of Ethiopia. It was expected that this CPA will include approximately 240,000 solar lamps to be installed in Ethiopia between 20/01/2015 – 19/01/2018. The first solar lamp under the CPA was sold on 21/01/2015.[39]The CPA has distributed 417,615solar lamps over at the time of monitoring.All lamps are solar powered and certified by Lighting Africa. The lamp models disrubutedunder the CPA are the following:

Table 1. List of Lighting Africa Certified Solar Lamp Technologies under the CPA

Model	Manufacturer	Number Distributed
d.light S2	d.Light Limited	149,091
d.light S20	d.Light Limited	31,519
d.light S300	d.Light Limited	33,637
d.light D20	d.Light Limited	8,520
Greenlight Planet Sun King Eco	Greenlight Planet	105,665
Greenlight Planet Sun King Mobile	Greenlight Planet	5,754
Greenlight Planet Sun King Pro 2	Greenlight Planet	37,129
Greenlight Planet Sun King Solo	Greenlight Planet	1,894
Omnivoltaic Power OmnivoltaicBeacon MB2-090	Omnivoltaic Power	393
Omnivoltaic Power OmnivoltaicBeacon MB2-200	Omnivoltaic Power	24,089

[38] Urban and peri-urban households may also benefit from the activity

[39] Evidence of Start Date of Off-Grid CPA.png

Omnivoltaic Power OmnivoltaicBeacon MB2-290	Omnivoltaic Power	9,449
Omnivoltaic Power OmnivoltaicBeacon MB2-380	Omnivoltaic Power	9,569
Omnivoltaic Power OVPilot X	Omnivoltaic Power	906
Total		417,615

The volumes of lamp models by retailers are shown in the emission eduction calculations.[40] For technical specifications for each technology covered by the CPA are provided below.

d.Light S300

Design Aspect	Requirement	Technology Performance[41]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	100 lumens (high setting) and 29 lumens (low setting) Wattage is up to 3.3 Watts on high setting[42]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 100% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 1.6 watt monocrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery is a lithium iron phosphate battery
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.1 hours at the high brightness setting and autonomous time is 5 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using	Not applicable	-

[40] Emission Reduction Calculation for Monitoring Report_V3.xlsx

[41] Lighting Global.D.Light S300 Technical Specifications. Accessed on October 10th 2015 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG-SSS_dl-s3004.pdf

[42] Assuming 30-90 lm/W for LED bulbs as per *Rapid Tables: How to convert lumens to watts* accessed at http://www.rapidtables.com/calc/light/how-lumen-to-watt.htm

mechanical means or a centralized charging system (e.g. the national grid)		
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

d.Light D20

Design Aspect	Requirement	Technology Performance[43]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	170 lumens (high setting), 56 lumens (low setting), and 25 lumens with the lantern at high setting Wattage is up to 5.7 Watts on high setting[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 98% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 5.4 watt polycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium based chemistry
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.1 hours at the high brightness setting and autonomous time is 5 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-

[43] Lighting Global.D.Light D20 Technical Specifications. Accessed on October 10th 2015 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG-SSS_dl-d20.pdf

Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

d.Light S20

Design Aspect	Requirement	Technology Performance[44]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	29 lumens Wattage is up to 1.0 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 103% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 0.4 watt monocrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium based chemistry
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.5 hours. Autonomous burn time is 6.5 hours.
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

[44] Lighting Global.D.Light S20 Technical Specifications. Accessed on December 4h 2017 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG_SSS-dl-S20_AR.pdf

d.Light S2

Design Aspect	Requirement	Technology Performance[45]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	33 lumens Wattage is up to 1.1 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 97% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 0.33 watt monocrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium based chemistry
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 3.9hours.[46] Autonomous burn time is 5.3 hours.
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Sun King Pro 2

Design Aspect	Requirement	Technology Performance[47]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens	160 lumens Wattage is up to 5.3 Watts[13]

[45] Lighting Global.D.Light S2 Technical Specifications. Accessed on December 4th 2017 at https://www.lightingglobal.org/wp-content/uploads/2013/12/d.Light_S2_ar-corrected-170627.pdf

[46] Despite being below the minimum 4 hours of DBT, the product is certified to meet the Lighting Global Minimum Quality Standards

[47] Lighting Global.Sun King Pro 2 Technical Specifications. Accessed on February 5th 2018 at https://www.lightingglobal.org/wp-content/uploads/2014/02/LG-SSS_glp_sunkingpro2_AR-1.pdf

	No separate minimum wattage requirement	
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 96% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 3 watt monocrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 5.5 hours and the autonomous time is 5.9 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Sun King Eco

Design Aspect	Requirement	Technology Performance[48]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	32 lumens Wattage is up to 1 Watt[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall	Option 2 is chosen. 101% of the original output remains after 2,000 hours of run time

[48] Lighting Global.Sun King Eco Technical Specifications. Accessed on February 5th 2018 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG-SSS_GreenlightPlanet_SunKingEco_AR.pdf

	not decrease by more than 15% during 2,000 hours of continuous operation.	
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 0.73 watt amorphous silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 5.8 hours and the autonomous time is 5.8 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Sun King Mobile

Design Aspect	Requirement	Technology Performance[49]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	98 lumens Wattage is up to 3.2 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 96% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 1.6 watt polycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate

[49] Lighting Global.Sun King Mobile Technical Specifications. Accessed on October 10th 2015 at https://www.lightingglobal.org/wp-content/uploads/2014/02/LG-SSS_glp-sunkingmobile.pdf

the batteries (in Ampere hours)		
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 5.4 hours and the autonomous time is 5.4 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Sun King Solo

Design Aspect	Requirement	Technology Performance[50]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	51 lumens Wattage is up to 1.7 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 94% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 0.78 watt amorphous silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 5.4 hours

[50] Lighting Global.Sun King Solo Technical Specifications. Accessed on October 10th 2015 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG-SSS_glp-sunkingsolo_v3.pdf

		and the autonomous time is 5.8 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Omnivoltaic Beacon MB2-090

Design Aspect	Requirement	Technology Performance[51]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	92 lumens Wattage is up to 3.1 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 93% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 1.3 watt polycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 5.1 hours and the autonomous time is 5.7 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours

[51] Lighting Global.Omnivoltaic Beacon MB2-090 Technical Specifications. Accessed on December 4th 2017 at https://www.lightingglobal.org/wp-content/uploads/2013/12/LG_SSS-Omnivoltaic_MB2-090_v6.pdf

Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Omnivoltaic Beacon MB2-200

Design Aspect	Requirement	Technology Performance[52]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	210 lumens Wattage is up to 7 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 93% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 2.6 watt amorphous silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.4 hours and the autonomous time is 5.3 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-

[52] Lighting Global.Omnivoltaic Beacon MB2-200 Technical Specifications. Accessed on October 10th 2015 at https://www.lightingglobal.org/wp-content/uploads/2014/01/LG-SSS_mar-mb22001.pdf

Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Omnivoltaic Beacon MB2-290

Design Aspect	Requirement	Technology Performance[53]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	210 lumens Wattage is up to 3.9 Watts[53]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 93% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 3.9 watt apolycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.2 hours and the autonomous time is 5.3 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

Omnivoltaic Beacon MB2-380

[53] Lighting Global. Omnivoltaic Beacon MB2-290 Technical Specifications. Accessed on December 4th 2017 at https://www.lightingglobal.org/wp-content/uploads/2014/01/LG-SSS_mar-mb2290_ar-HYBRID-v2-2.pdf

Design Aspect	Requirement	Technology Performance[54]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens No separate minimum wattage requirement	210 lumens Wattage is up to 7 Watts[13]
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 93% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 3.9 watt polycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium iron phosphate
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 4.3 hours and the autonomous time is 5.3 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

OmnivoltaicOVPilot X

Design Aspect	Requirement	Technology Performance[55]
Lamp wattage (in Watts) and luminous flux output (in lumens)	Luminous flux output: 25 lumens	74 lumens Wattage is up to 2.5 Watts[13]

[54] Lighting Global.Omnivoltaic Beacon MB2-380 Technical Specifications. Accessed on December 4th 2017 at https://www.lightingglobal.org/wp-content/uploads/2014/01/LG-SSS_mar-mb2380_ar-HYBRID-v2-1.pdf

[55]Lighting Global.OmnivoltaicovPilot X Technical Specifications. Accessed on December 4th 2017 at https://www.lightingglobal.org/wp-content/uploads/2016/10/LG_SSS_omni-ovpilotX_AR-v2.pdf

	No separate minimum wattage requirement	
Rated lamp life (in hours)	5,000 hours (Option 1, paragraph 17) or 10,000 hours Option 2, paragraph 18). For Option 2, in place of long-term measurement, the relative luminous flux shall not decrease by more than 15% during 2,000 hours of continuous operation.	Option 2 is chosen. 98% of the original output remains after 2,000 hours of run time
Type and rated capacity of the renewable energy equipment used for battery-charging (in Watts)	PV module No separate minimum rated capacity requirement for PV module	PV module is a 2 watt polycrystalline silicon module
Type (e.g. NiMH, Lead-Acid, Li-ion), and rated capacity of the batteries (in Ampere hours)	Li-ion battery preferable No minimum rated capacity of batteries	Battery uses lithium ion
Type of charge controller (e.g. active or passive)	Passive charge controller	Passive charge controller
Autonomous time and DBT	DBT at least 4 hours	Run time per day of solar charging (DBT) is 8.9 hours and the autonomous time is 12 hours
Solar Run Times(s) (SRT) for products with solar energy charging systems	3.5 hours	The solar run time is 4.1 hours
Amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid)	Not applicable	-
Physical protection against environmental factors (e.g. rain, heat, insect ingress)	Lamps shall comply with Lighting Africa / Lighting Global Quality Test Method	Product passed Lighting Global Minimum Quality Standards, including physical ingress protection test

All technologies to be distributed were be stand-alone, off-grid lighting products where the energy comes from a rechargeable battery, which are charged by a solar panel.These units provided lighting for individual households.

The CPA reduced GHGs by substituting lighting powered by renewable, solar energy for the use of lamps that rely on burning fossil fuels, namely kerosene. This substitution reduced mainly CO_2emissions. In the existing scenario, end-users targeted by the CPA used primarily kerosene for lighting.[56]

A long term line of credit was made available by the World Bank Group's (WBG) International Development Association (IDA) in 2013 for market development of renewable energy and energy efficient products. The credit line has addressed financial constraints across the off-grid technologies' value chains regarding access to finance through DBE by providing working capital loans to private companies importing, distributing and selling renewable technologies. This access

[56] Central Statistical Agency, Federal Democratic Republic of Ethiopia. *Welfare Monitoring Survey 2011, Statistical Report: Indicators on Living Standard, Accessibility and Households Assets, Volume II*. Table 8.4 (b). April 2012.

to foreign credit has allowed private companies to obtain required upfront capital to import, distribute, install and service solar technologies.

Solar lamps under the CPA are sold to end-user through different private solar importers who borrow loan under IDA credit line. The solar importers operating under the CPA are Vera International Business, Rensys, Universal Electronics, Dama Trade, and Lydetco. Depending on individual business models, sometimes these importers also act as distributors and even as retailers making sales directly to consumers.

Under the IDA credit line, the private solar importers receive financing from the CME to import solar products eligible under the CME's PoA. The agreement between the CME and the private solar importers specifies that the carbon credit rights for products imported through the IDA credit line are conceded to the CME and the private solar importers are required to provide the necessary information for monitoring and tracking of the solar products imported. The CME receives regular reports (monthly or quarterly) from the retailers/importers on the volumes of solar lamps sold by model. The summary of the monthly sales since the start of the CPA are shown in the emission reduction calculation excel sheet.[57]

The following diagram shows the different monitoring points of the CPA.

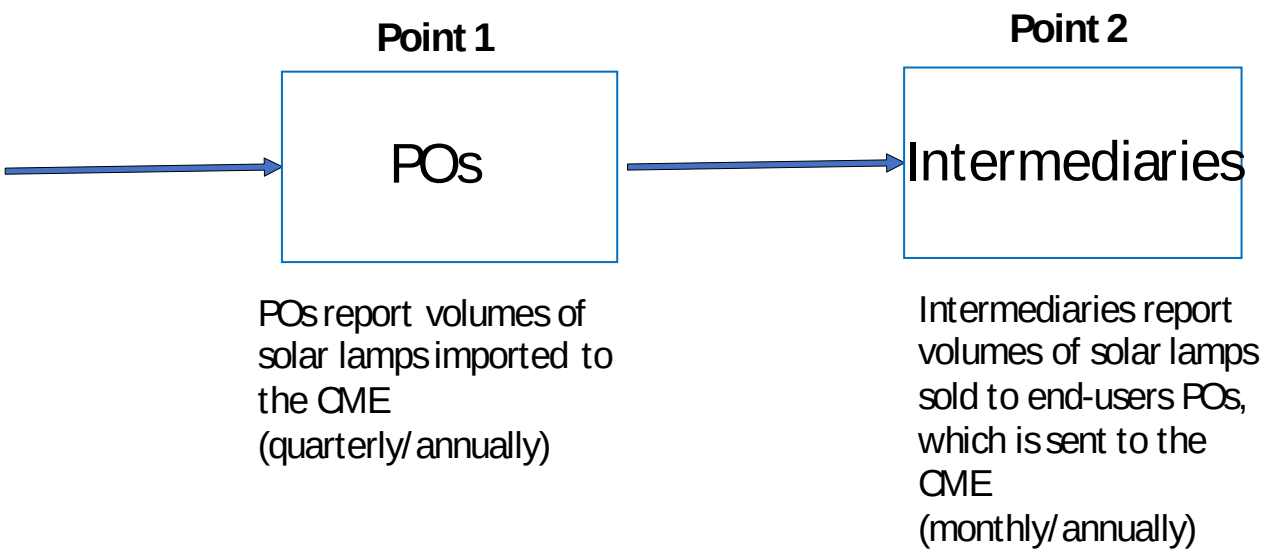

Figure 2. Monitoring Points of the CPA

The emission reduction caluclations are based on the sales information from Monitoring Point 2. The volumes sold can be validated from importation records collected at Monitoring Point 1.

C.2. Location of CPAs

The geographical boundary is the borders of the Federal Democratic Republic of Ethiopia. The CPA was implemented across Ethiopia, as shown in Figure 1 below.

[57] Emission Reduction Calculation for Monitoring Report_V3.xlsx

Figure 3. Map of Ethiopia

The capital city, Addis Ababa, is located at 9.0300º N and E 38.7400º E.

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines

There are no temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines during this monitoring period, for any CPAs covered in this monitoring report.

C.3.2. Corrections

Reference Number: PRC-10285-002
Date of Approval: 04/02/2019

Corrections covered under this PRC are the following:

Revisions have been made to various sections of the CPA design document as the document was updated to the latest template. From Version 4.0 to Version 8.1.

The project lamp models under the CPA have been updated to reflect the project lamp models distributed under the CPA.

The CPA was revised to use Option 1 in place of Option 2 under paragraphs17 and 18 of AMS-III.AR Version 5.0.

The eligibility criteria for the CPA have been revised to reflect the use of Option 1 under paragraph 17 AMS-III.AR Version 5.0. Specifically, eligibility criterion 2, double counting, and eligibility criterion 12, methodology applicability/technology, were revised to reflect the use of Option 1 in the CPA.

C.3.3. Changes to the startdate of the crediting period

There are no changes to the stard date of the crediting period fixed at the inclusion of any of the CPAs covered in this monitoring report.

C.3.4. Inclusion of monitoring plan

There have been post-registration changes to include a monitoring plan into the CPA-DD, for which the delayed submission of the monitoring plan was chosen by the CME at the time of inclusion of the CPA.

Change notified to the secretariat prior to this monitoring period:

None

Changes that have been notified as applicable to this monitoring period:

The addition of the monitoring plan to the CPA-DD submitted in the following PRC:

Reference Number: PRC-10285-002
Date of Approval: 04/02/2019

C.3.5. Permanent changestothe includedmonitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

There are no permanent changed to the monitoring plans included in the CPA-DD, or permanent deviation of monitoring from the applied methodolgoies, or standardized baseline, or other applied standards or tools for the CPA covered in this monitoring report.

C.3.6. Changes to project design

There are no changes to the project design of the CPA included in this monitoring report.

SECTION D. Description of monitoring system of CPAs

Operational and Management Structure

The CME is also the CPA Implementer for the CPA and is responsible for implementing the monitoring plan for this CPA. Within the office, the CME's PoA Manager was the individual with overall responsibility and sign-off for the implementation of monitoring. The CME directly coordinated with the Partner Organizations (POs), to collect the information on the volume of lamps sold and the sales datesfor the program database.

The POs are importers selling directly to customers or distributing products under the CPAto retailers. The full list of POs as well as the model and volume of lamps under the CPA is shown below. The monitoring report covers lamp sales from the start date of the CPA through June 2017.

Sales reports from POs to intermediaries do not include the exact sales date, only the month the lamps were sold. As such, the conservative assumption that lamps are with the intermediaries frothe 1st day of the following month is applied. As per the methodology, lamps are assumed to be operational 120 days after reaching the intermediaries. Therefore, lamps sold after June 2017 are not operational within the monitoring period of the CPA as they are deemed to be with the intermediaries from July 1st and operational 120 days after that, which is outside of the monitoring period. Lamps are also deemed inactive 2 years after reaching the customers, as per Option 1 under paragraph 17 of the methodology.

Importer	Model	Total Lamps
Dama	OVPilot X	906
	MB2-90	393
	MB2-200	24,089
	MB2-290	9,449
	MB2-380	9,569
	Sunking Pro 2	2,225
	Sunking Mobile	345
Vera	D-Light S2	115,024
	D-Light S20	7,560
	D-Light S300	33,637
	D-Light D20	8,520
Rensys	D-Light S2	34,067
	D-Light S20	23,959
Lydetco	Sun King Pro 2	14,438
	Sun King Solo	1,894
	Sun King Eco	8,643
	Sun King Mobile	5,409
Universal	Sunking Eco	97,022
	Sunking Pro 2	20,466

Responsibilities and Institutional Arrangements for Data Collection and Archiving

POs reported directly to the CPA implementer on the distribution of solar lamps, including relevant information for the program database related to solar lamp identification, date of sale, identity and any contact information of the end-user, if available. For quality control, it was ensured that only Lighting Africa certified solar lamps were included under the CPA.

POs involved in importation report the volumes imported to the CME at Monitoring Point 1. POs involved in sales to intermediariesreportedthe volumes sold to the CME at Monitoring Point 2, after receiving the information from the intermediaries.

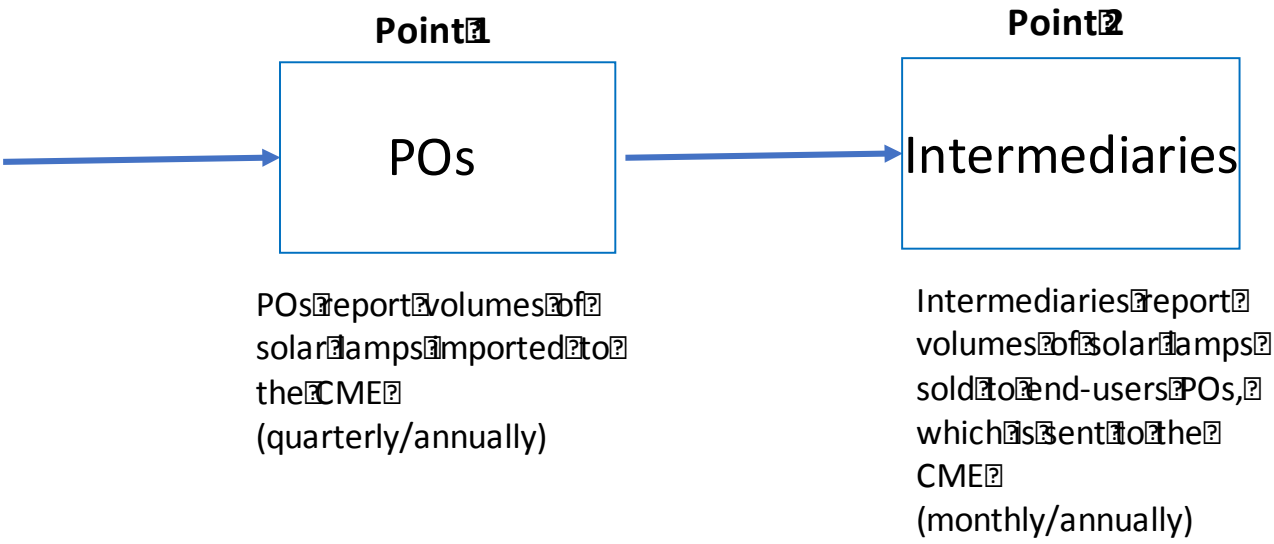

Figure 4. Monitoring Points of the CPA

For the monitoring of the CPA, the sales data reported to the CME, through the POs, at Monitoring Point 2 were aggregated and used to determine the parameters required for calculating the emission reductions under the CPA. Sales to intermediaries under Monitoring Point 2 are typically reported monthly. Lamps under the CPA were assumed to be operational 120 days from the start of the following month, e.g. lamps reported as sold in the sales report of May 2015 were deemed operational 120 days from 01/06/2015. POs under the CPA are registered private companies, non-profits, or importers and abide by all legal, licensing, and environmental requirements of the Ethiopian government.

No survey or sampling was conducted at this stage as it is assumed, following the methodology, that 100% of lamps are operational. Lamps whose operational life exceeded 2 years were removed from operation under the CPA.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data/Parameter	DV
Unit	tCO_2 per project lamp
Description	Lamp Emission Factor
Source of data	AMS-III.AR Version 5
Value(s) applied	0.092
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	FUR
Unit	L/hour
Description	Fuel Use Rate
Source of data	AMS-III.AR Version 5

Value(s) applied	0.03
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	O
Unit	Hours/day
Description	Utilization Rate
Source of data	AMS-III.AR Version 5
Value(s) applied	3.5
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	U
Unit	Days/Year
Description	Annual Utilization
Source of data	AMS-III.AR Version 5
Value(s) applied	365
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	EF
Unit	$kgCO_2$/liter
Description	Fuel Emissions Factor
Source of data	AMS-III.AR Version 5
Value(s) applied	2.4
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	n
Unit	-
Description	Number of fuel-based lamps replaced per project lamp
Source of data	AMS-III.AR Version 5
Value(s) applied	1

Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	GF,y
Unit	-
Description	Grid Factor in year y
Source of data	AMS-III.AR Version 5
Value(s) applied	1.0
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Applicable to lamps that are charged with renewable energy

Data/Parameter	LF
Unit	-
Description	Leakage Factor
Source of data	AMS-III.AR Version 5
Value(s) applied	1.0
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of leakage
Additional comments	

Data/Parameter	NTG
Unit	-
Description	Net-to-gross adjustment factor
Source of data	AMS-III.AR Version 5
Value(s) applied	1.0
Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	DBy
Unit	-
Description	Dynamic Baseline Factor in Year y
Source of data	AMS-III.AR Version 5
Value(s) applied	1.0

Choice of data or measurement methods and procedures	Methodology default value
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Default value in absence of relevant information

E.2. Data and parameters monitored

Data/Parameter	$N_{i,j}$
Unit	-
Description	Number of project lamps distributed to end users of type *i* with charging method *j*
Measured/calculated/ default	Measured
Source of data	Sales Records
Value(s) of monitored parameter	Summation of lamps sold of type *i* with charging method *j* during year y. All lamps are charged through solar panels, i.e. have the same charging method *j*.While the battery type and wattage of the different lamp models varies, they are deemed the same type *i* as the emission reductions per lamp are identical across all models. The attached excel sheet showing the emission reduction calculations shows the monthly or annual lamp sales for the different solar vendors. Lamps sold are assumed to be in operation from the start of the fllowing month. For annual sales, lamps are assumed operational from the start of the following year. Only the solar vendor Universal reported annual sales for the Sunking Pro 2 in 2015.[58] The total number of lamps sold during the monitoring period is 417,615.
Monitoring equipment	N/A
Measuring/reading/recording frequency	Continuous
Calculation method (if applicable)	Summation of project lamps distributed
QA/QC procedures	The sales records maintained by the CME are cross-checked with import records maintained by the CME and the sales records maintained by the distributors
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	

Data/Parameter	$OF_{y,i,j}$
Unit	Fraction
Description	The 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
Measured/calculated/ default	The CPA uses Option 1 under paragraph 17 of the methodology. The value is equal to 100% for year 1 and 2. After 2 years of operation lamps are not credited.
Source of data	Surveys
Value(s) of monitored parameter	The CPA uses Option 1 to determine the lamp effective useful life, the value is assumed to be 100% for lamps in year 1 and 2.
Monitoring equipment	-

[58]Emission Reduction Calculation for Monitoring Report_V3.xls

Measuring/reading/recording frequency	-
Calculation method (if applicable)	No applicable
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

E.3. Implementation of sampling plan

There was no sampling for this monitoring period.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

As described in section E.2, the number of lamps in operation during the monitoring period is 417,615. As per the methodology, the Lamp Emission Factor, *DV*, is calculated based on the Utilization Rate, *O*. As the monitoring period covers more than 365 days and lamps are sold continuously throughout the monitoinrg period, the number of lamps-days was determined from the number of project lamps distributed, $N_{i,j}$. The number of lamp-days is then divided by 365 to represent lamp-years, which are multipled by the Lamp Emission Factor, DV. The start date of the CPA is 21/01/2015, so only lamps deemed operational from 01/02/2015 have been included in the CPA.

For the Sunking Pro 2 lamps sold by Universal in 2015, an annual sales report was submitted in place of a monthly report. As such, the lamps are deemed to be with the intermediaries from 01/01/2016 and with end-users 120 days later. The 2-year operational life starts from the day the lamps are assumed to be with end-users.

The total number of operational lamps days are determined in the attached emission reduction calculation worksheet.[59] Lamps reported sold in a given month were deemed operational 120 days after the start of the subsequent month. The total lamp days for all operational lamps during the CPA were then added together and divided by 365 to determine the total operational lamp-years during the monitoring period. Lamps whose operational life exceeded 2 years were removed from the CPA.

Total Lamps sold: 417,615
Total Lamp Days: 154,383,526
Number of full-time project lamps = 154,383,526 lamp-days ***/*** 365 days/year = 422,969 lamp-years

Baseline emissions for the monitoring period were calculated as follows:

$ER_y = \Sigma_{i,j} N_{i,j} * BE_{y,i} * OF_{y,i,j}$

Where:

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 be equal to 100% for years 1 and 2

With:
$BE_y = DV * GF_y * DB_y$

[59] Emission Reduction Calculation for Monitoring Report_V3.xlsx

Where

BE_y Baseline emissions per project lamp in year *y* (t CO_2e)
GF Grid Factor in year *y*, Equal to 1.0 since charging option defined in paragraph 3(a) is used
DB_y Dynamic Baseline Factor (change in baseline fuel, fuel use rate, and/or utilization during crediting period) in year *y*, Option 1: default of 1.0 in the absence of relevant information

Project emissions are zero, following paragraph 23 of AMS-III.AR Version 5: "There are no project emissions (PE_y = 0) if the project lamp charging mechanism utilized is as defined in: (a) Paragraph 3(a)."

And:

$DV = FUR * O * U * EF$ / 1000 * $LF * n * NTG$
= 0.03 L/hr * 3.5 hr/day * 365 day/yr * 2.4kgCO_2/L / 1000 * 1 * 1 * 1
= 0.092 tCO_2

$BE_y = DV * GF_y * DB_y$
= 0.092 tCO_2 * 1.0 * 1.0
= 0.092 tCO_2

The operational fraction $OF_{y,l,j}$ is assumed to be 100% for all lamps for the first three years of operation. All lamps under the activity are either vintage 1 or 2. The number of full-time operational lamps as per the monitoring exercise is 422,969.[60]

$ER_y = \Sigma_{i,j} N_{i,j} * BE_{y,i} * OF_{y,i,j}$
= 422,969 * 0.092 tCO_2 * 100%
= 38,913 tCO_2

F.2. Calculation of project emissions or actual net removals

As per AMS-III.AR Version 5, the project emissions assumed to be 0 as all technologies under the project activity fall under paragraph 3(a) of the methodology. As per paragraph 23 of the methodology, project emissions are 0.

F.3. Calculation of leakage emissions

As per AMS-III.AR Version 5, the leakage factor is assumed to be 1.0 therefore leakage is not calculated.

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before01/01/2013	From 01/01/2013	Total amount
10285-0001	38,913	0	0	0	38,913	38,913
Total	38,913	0	0	0	38,913	38,913

[60]Emission Reduction Calculation for Monitoring Report_V3.xlsx

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (tCO_2e)	Amount estimated ex ante (tCO_2e)
10285-0001	38,913	27,600
Total	38,913	27,600

F.6. Remarks on increase in achieved emission reductions

The emission reductions achieved during the monitoring period are determined as follows:

Estimated ex ante emission reductions from CPA:
01/08/2016 – 31/12/2016: 9,200 tCO_2e
01/01/2017 – 31/12/2017: 22,080 tCO_2e

As the monitoing period only covers through 31/10/2017 this represents 10/12 fraction of the year. As such the anticpated ex ante emission reductions for the monitoring period are:

9,200 tCO_2e + 22,080 tCO_2e * 10/12 = 27,600 tCO_2e

The emission reductions during the monitoring period are higher than the estimated ex ante emissions. The reason for the higher than expected emission reductions is the higher than expected volume of solar lamps sold/distributed in the CPA since the start of the CPA, allowing for more lamps to be operational during the monitoring period.

The initial estimate targeted 240,000 solar lamps. Under the CPA 417,615 lamps were sold/distributed. This is a 74 per cent increase of the projected number of solar lamps. The achieved emission reductions are 41 per cent larger than the estimate. The resulting increase in ERs is not equal to the increase in lamps, sold as these lamps were sold throughout the monitoring period.

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Document information

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