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

(Version 03.0)

Complete this form in accordance with the Attachment "Instructions for filling out the component project activity design document form for CDM small-scale component project activities" at the end of this form.

COMPONENT PROJECT DESIGN DOCUMENT (CPA-DD)	
Title of the CPA	Green Light for Africa PoA– SSC-CPA 0001 – KPLC Kenya
Version number of the CPA-DD	3
Completion date of the CPA-DD	30/03/15
Title of the PoA to which the CPA is included	Green Light for Africa
Host Party(ies)	Republic of Kenya
Estimated amount of annual average GHG emission reductions	31,099

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

Green Light for Africa

A.2. Title of the CPA

Green Light for Africa PoA– SSC-CPA 0001 – KPLC Kenya

A.3. Description of the CPA

This SSC-CPA is developed under the Green Light for Africa SSC-POA. The Green Light for Africa Programme of Activities involves the replacement of incandescent lamps (ICLs) with self-ballasted compact fluorescent lamps (CFLs) amongst residential users in Kenya, and Zimbabwe.

Goal of the SSC-CPA

The goal of this SSC-CPA is to replace (approximately) 870,000[1] ICLs with high quality CFLs across Kenya in a manner compliant with the Green Light for Africa SSC-PoA.

Confirmation the SSC-CPA is a voluntary action and the Implementer is aware and agreed that their activity is subscribed to the Green Light for Africa SSC-PoA.

The implementer for this SSC-CPA, The Kenya Power and Lighting Co. Ltd. ("KPLC"), is undertaking this activity voluntarily.

The implementer of this SCC-CPA is aware of and has agreed that their activity is being subscribed to the Green Light for Africa SSC-PoA. The CPA implementer has signed a contractual agreement to that effect with the SSC- PoA CME.

Approved SSC baseline and monitoring methodology to be applied

As per the Green Light for Africa SSC-PoA, AMS II.J/Version 4, Sectoral Scope 03, EB 54, will be applied in this SSC-CPA. The Emission Factor (*EF*) is calculated in accordance with provisions under AMS-I.D/ Version 17, Sectoral Scope 01, EB 61, and the *"Tool to calculate the emission factor of an electricity system",* Version 02.2.1, EB 63, Report Annex 19.

Technology to be employed

This SSC-CPA will replace ICLs in residential applications with self–ballasted CFLs.

CFLs used in this SSC-CPA have the following attributes and/or specifications:

- Have an integrated ballast as a non-removable part;
- Are new equipment and not transferred from another activity;
- Will meet light output requirements in accordance with the relevant national or international standards or values detailed in Table 1A AMS II.J/Version 4. Evidence of compliance with this requirement will be provided to the verifying DOE at the first verification.
- Will have a known ex ante rated average life determined in accordance with IEC 60969 or an equivalent national standard. Evidence of compliance with this requirement will be provided to the verifying DOE at the first verification.
- Be marked, in addition to the standard lamp specifications, for clear unique identification for the project as follows. The SSC-CPA CFLs will be marked legibly and in a permanent manner with the following labelling:

[1] Figure based on previous CFL rollout and KPLC expected capacity to successfully implement a similar project.

- The manufacturer's name or trade mark;
- The letters "GOK/KPLC" – "NOT FOR SALE" (in capital letters)

CFL distribution method

CFLs will be distributed by the following method(s):

i. Directly installing the CFLs in households.

KPLC staff or their suitably-qualified agents will directly install SSC-CPA CFLs in eligible households free of charge. KPLC staff or their suitably-qualified agents will check for householder eligibility, install CFLs, collect and store ICLs replaced, return ICLs replaced to a central storage facility and document all required information (refer "Record Keeping System" for details).

A limit of 3 CFLs per eligible household (6 per electricity meter for households sharing the same meter), will be distributed.

Actions to encourage installation of CFLs in high use locations

KPLC staff or their suitably-qualified agents will oversee that CFLs are installed in high use areas. In addition, KPLC staff or their suitably-qualified agents will communicate the value and importance of installation of CFLs in high use areas to householders.

System to avoid double counting

The following procedures will be implemented to manage potential double counting issues:

- CFL supplier tender documentation will make explicit that all carbon rights from the distribution of the CFLs are the ownership of KPLC.
- Project households will sign a form voluntarily agreeing to relinquish any rights over the CERs generated from the project CFLs to KPLC.
- KPLC staff or their suitably-qualified agents will ask all potential recipients of project CFLs whether they have participated in the program previously and how many CFLs they have received. If the householder has previously participated in the program and received the maximum number of CFLs, or the maximum number of CFLs has been provided for their shared electricity meter, then no further project CFLs will be provided to the household.
- KPLC staff or their suitably-qualified agents will visually inspect light sockets to ensure project CFLs are currently not installed. If project CFLs are currently installed and the maximum number of bulbs has been received for either that household or their shared electricity meter, then no further project CFLs will be provided to the household.
- During coding of hardcopy data forms (refer "Record Keeping System" for details) a check will be made for duplicate "Customer Account Number" fields (unique unambiguous identifier for participating households). Where duplicate numbers are found, the earliest transaction will be included in the SSC-CPA and the others excluded.

ICL destruction methods

KPLC staff or their suitably-qualified agents will collect all replaced ICLs at the time of installation of the project CFLs. ICLs will then be returned to regional centres for secure storage. Reconciliation of ICL numbers replaced and in storage will be undertaken by KPLC or their suitably-qualified agents with guidance from the CME.

KPLC will arrange for destruction/recycling of the ICLs. An appropriate independent third party will verify the destruction/recycling of the ICLs. Evidence of ICL destruction/recycling will be provided to verifying DOEs.

Leakage associated with this SSC-CPA is thus avoided through the destruction/scrapping of the replaced ICLs as described above.

Record Keeping System

At the time of install/exchange of project CFLs, KPLC staff or their suitably-qualified agents will record on official hardcopy forms the following information:

- GPS coordinates of the households that will receive CFLs
- Number of CFLs installed.
- Nameplate power rating of CFLs supplied.
- Date of supply.
- The number and nameplate rated power of ICLs replaced.
- Customer Account Number corresponding to the meter of the householder receiving CFLs.
- Signature of householder that they relinquish any rights over the CERs generated from the project CFLs to KPLC.

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Deleted: <#>address where the exchange was undertaken.

Data captured in these hardcopy forms will then be coded by KPLC or their suitably-qualified agents and stored electronically in a database, which will be managed by the CME. During this coding, checks will be undertaken by KPLC or their suitably-qualified agents, with guidance from the CME, for accuracy and completeness of data collected. Hardcopy forms will be securely stored in a central location by KPLC or their suitably-qualified agents.

Documented third party evidence will be held verifying the destruction/recycling of the ICLs replaced in the SSC-CPA.

Chronology of Events

A chronology of key events for this SSC-CPA under this PoA is provided in Table 1 below. Note that the Pilot program was undertaken by Kenya Power and Lighting Co. and involved the installation of 1.25 million 11W CFLs in Kenyan households.

Table 1: Chronology of Events

Item	Event	Date	Evidence
1	Prior Consideration submitted to UNFCCC	9 Apr 2010	"KPLC Efficient Lighting CDM Project" with Kenya as Host Party at *cdm.unfccc.int*
2	Start of Pilot program	3 May 2010	News article at *http://www.dyerandblair.com/index.php?mact=News,cntnt01,print,0&cntnt01articleid=68&cntnt01showtemplate=false&cntnt01returnid=82*
3	Contract signed with CME	16 Dec 2010	"2010 SB + KPLC - Confirmation EE Lighting 101216.doc"
4	CFL Specifications to be issued	Aug 01 2012	"August_2012SpecCompactFluorescentLamps_ver_01.docx"
5	CFL Tender to be issued	Estimated from 15Oct l 2012	"KPLC Concept CFL paper – AfD.docx", p.8
6	CFL Purchase to be order issued	Estimated by 15NoV 2012	"KPLC Concept CFL paper – AfD.docx", p.8
7	Start of Distribution / retrofit	Estimated from 1 Jan 2013	"KPLC Concept CFL paper – AfD.docx", p.8

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

The entity/individual responsible for this SSC-CPA (henceforth referred to as the CPA implementer) is The Kenya Power and Lighting Co. Ltd. (KPLC). Contact details for the CPA implementer are detailed in Annex 1.

A.5. Technical description of the CPA

This SSC-CPA will replace ICLs in residential applications with self–ballasted CFLs.

CFLs used in this SSC-CPA have the following attributes and/or specifications:

- Have an integrated ballast as a non-removable part;
- Are new equipment and not transferred from another activity;
- Will meet light output requirements in accordance with the relevant national or international standards or values detailed in Table 1A AMS II.J/Version 4. Evidence of compliance with this requirement will be provided to the verifying DOE at the first verification.
- Will have a known ex ante rated average life determined in accordance with IEC 60969 or an equivalent national standard. Evidence of compliance with this requirement will be provided to the verifying DOE at the first verification.
- Be marked, in addition to the standard lamp specifications, for clear unique identification for the project as follows. The SSC-CPA CFLs will be marked legibly and in a permanent manner with the following labelling:
  - The manufacturer's name or trade mark;
  - The letters "GOK/KPLC" – "NOT FOR SALE" (in capital letters)

A.6. Party(ies)

Name of Party involved (host) indicates 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)
Republic of Kenya (host)	The Kenya Power and Lighting Co. Ltd	No
Republic of Kenya	Standard Bank Plc (Coordinating/Managing Entity)	No

A.7. Geographic reference or other means of identification

Figure 1: Geographical boundary of Kenya

The SSC-CPA is located across Kenya in grid-connected households.

The SSC-CPA project boundary is the physical location of each CFL installed. Information identifying this boundary will be recorded in the record keeping system associated with this SSC-CPA and in the PoA CME's project database.

A.8. Duration of the CPA

A.8.1. Start date of the CPA

01/01/2013. This is the date when CFL installation will start.

A.8.2. Expected operational lifetime of the CPA

The expected operational lifetime of the SSC-CPA: 10 years. This is covered by the life of CFLs i.e. 11.74 years based on 3.5 daily usage.

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

Fixed Crediting period:10 years. In accordance with paragraph 10 of the chosen methodology AMS-II.J/Version 4, CERs can only be earned for the average life of project CFLs, not to exceed one crediting periodof up to 10 years.

A.9.1. Start date of the crediting period

01/01/2013

A.9.2. Length of the crediting period

10 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
2013	38,881
2014	37,152
2015	35,423
2016	33,693
2017	31,964
2018	30,235
2019	28,505
2020	26,776
2021	25,047
2022	23,317
Total number of crediting years	10
Annual average GHG emission reductions over the crediting period	31,099
Total estimated reductions (tonnes of CO_2e)	310,993

A.11. Public funding of the CPA

There is no public funding from Annex 1 Parties for this project.

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

As per Section B.1 of the Green Light for Africa SSC-PoA, the maximum wattage of ICL that will be replaced under this SSC-CPA is 200W[2].

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[2] Analysis from 2010 phase 1 rollout done by KPLC shows the maximum wattage of ICL replaced was 100watt.

Under the methodology to be applied (AMS II.J/Version 4) the small-scale threshold is 60 GWh per year. 1% of this threshold is 0.6 GWh.

The CFL wattage equivalent to a 200W ICL is 40 W[3]. Hence the maximum annual energy saving potential from an independent subsystem taking 3.5[4] hours usage per day is:

*3.5*365*(200 – 40) = 0.0002 GWh*

As demonstrated in the above calculation the 0.0002 GWh per CFL (independent subsystem) is much less than the de-bundling requirement hence the SCC-CPA complies with EB 54, Annex 13, Version 03 guidance.

As per Paragraph 9, EB 54, Annex 13, version 03 *"Guidelines for Assessment of De-bundling for SSC Project Activities"* if the independent subsystems/measures included in the CPA of a PoA are no greater than 1% of the small scale threshold defined by the methodology applied, then that CPA is exempted from performing a de-bundling check.

A.13. Confirmation for CPA

This SSC-CPA is neither registered as an individual CDM project activity nor is part of another Registered PoA.

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

Anil Bhatta
Consultant to Standard Bank Plc
anil.cces@gmail.com

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

Environmental analysis is done at CPA level.

The PoA involves the distribution and installation of CFLs for residential lighting.

The World Bank[5] identifies three main environmental issues associated with CFLs: embodied energy; mercury content; and waste and recycling. Findings from this report are summarised below:

- Embodied energy is defined as the energy that was used in the work to make any product, bring it to market, and dispose of it.It takes approximately five times more energy to produce one CFL compared to one ICL. However, because CFL lamps last on average between 6 and 15 times longer than ILs, the amount of energy needed for the production of one CFL is comparable to the production of between 6 and 15 ICLs. Therefore the impacts of energy savings from the CFL clearly outweigh the environmental impact of its production and its end of life.Therefore using CFLs in place of ICLs reduces the overall energy use and the environmental impact of lighting. More than 97 percent of energy consumed during the lifecycle of a lamp is in the use phase and, because CFLs are up to 80 percent more efficient than an average inefficient incandescent lamp, the savings are very large.

[3]PoA 3223 : CFL lighting scheme – "Bachat Lamp Yojana", CDM-SSC-PoA-DD version 09 (2009), page 18 (6th paragraph)

[4]Default operating hours value from AMS II.J/Version 4

[5]The World Bank, Large –Scale Residential Energy Efficiency Programs Based on CFLs, (2009), page 48 (1st paragraph)

- Mercury is an important component of CFLs. It should be noted, however, that mercury is present in CFLs in a very small amount. Studies conducted by the European Commission have pointed out that, even in the worst possible case that a CFL goes to a landfill, it will have saved during its lifetime more mercury emissions from electricity production in coal power plants than is contained in the CFL itself, so the overall mercury pollution balance is positive. No mercury is emitted from lamps when in use, which is why they are safe, both in regard to human health and the environment.
- Disposal of mercury can be an environmental issue. Collection of CFLs and recycling of the mercury can address this issue. The lamp recycling process produces the following material streams: glass, ferrous and nonferrous metals, and fluorescent powders that contain mercury. Although most of these materials can be reused, almost all of them have practically no material value to the recycler. To stimulate more efficient use of the recovered material, it is essential government and/or environmental authorities to stimulate the recycling industry. Improvements in lamp design are aimed at further reducing or altogether eliminating environmentally sensitive substances, minimizing the variety of materials used, and improving the ease of disassembly.

In response to these environmental impacts the CME will ensure that SSC-CPA Implementers:

- Inform project participants (e.g householders, distribution channel outlets) of the safe handling procedures for CFLs and ICLs in line with manufacturer and/or country guidelines;
- Where possible recycle (rather than destroy) ICLs replaced;
- Communicate and implement country regulations or guidelines related to the disposal of CFLs.

The National Environment Management Authority (NEMA) instructed KPLC to compile a project report for review. This according to a letter by the Authority's Director General would suffice for such an environmentally enhancing project.

SECTION C. Local stakeholder comments

C.1. Solicitation of comments from local stakeholders

A public participation meeting was organised on 25th August 2011 at the Simba Hills Room, Kenyatta International Conference Centre (KICC), Nairobi, Kenya. The public participation meeting was advertised in the Daily Nation on 18th August 2011.

In addition to the advert in the Daily Nation, personal invitations were sent to the representatives of the local stakeholders such as national government, departments, non-government organisations, carbon consultants, private businesses, electricity utility,

13 people attended the meeting. Attendees were asked to leave their contact details and the attendees provided their contact details to the CME. A list of attendees, copies of invitations and advertising materials have been provided to the DOE for validation.

C.2. Summary of comments received

In the advert and the personal invitations interested parties who were not able to attend were invited to submit comments and queries by e-mail or telephone. No comments or queries, other than requests for copies of the presentation, were received by email following the stakeholder consultation session.

A presentation was made describing the project followed by a question and answer session in which attendees were invited to make comments and ask questions. The questions and comments made and responses give are shown in Table 8 in questions 1 to 6. Questions 7 to 11 were asked by a stakeholder during the site visit on 9th December 2011.

Q.No	Questions/Comments	Answers
1.	Other than South Africa (Eskom) which other countries have implemented such projects successfully? What are the challenges?	Cool nrg has implemented similar CDM project in Mexico. A number of similar non-CDM projects have been implemented in UK and Australia. Cool nrg had made a Guinness Book of World Record by distributing largest number of energy saving light bulbs on a single dayin 2008. Challenges are: - The exactness of implementing exactly what you said you would in the PDD - there is no room for deviation from this or you may not generate any revenue - The long lead-time from project design until the project generates revenue, and securing finance for this period considering the high costs of registration, verification, implementation etc. that must be covered, with an uncertain revenue stream (when & amount) - Monitoring: obtaining reliable data on an ongoing basis, particularly in non-industrial environments, is a challenge
2.	How do we tailor projects to local regulations e.g. Kenya constitution?	It will require co-ordination between different government bodies e.g. ministry of energy, ministry of finance, local distributors, media organisations etc. The project has to be consistent with sovereign aims. CFL distribution and substitution of ICLs has to be done in a reliable and audited way Getting through the UN CDM process is key in securing CER generation. They are significant challenges throughout the CDM process and is not easy to get through. If the steps are wrong or goals not achieved then no CER is generated. Further, compliance with local standards is a key.
3.	CDM is a difficult topic to understand. Several acronyms. Low level of following/understanding in the local context. Cool nrg/ Stanbic should have a page to distribute to people.	Thank you for your feedback. We will consider this for our future presentation. Please note that all the CDM related acronyms were explained in the beginning of the presentation. People who came in late might have missed it.
4.	How do lighting suppliers come into the picture? Kenya is a price sensitive market. Sub standard goods are in the market; many people don't care because they only look at the price. Is there a way of getting around this?	The lighting suppliers will have to contact CFC Stanbic. Regarding the potential use of sub standard goods, the standards for the lights are set out in the project design document (PDD). If compliant bulbs are not used then CERs will likely not be issued.
5.	What is the budget for this programme?	The project cost varies from CPA to CPA. The project cost will depend on the size and number of CFL being

Q.No	Questions/Comments	Answers
		distributed.
6.	How do we contact you?	Contact us on forums@stanbic.comor carbon@standardbank.com
7.	How are energy-saving bulbs disposed of at the end of their life?	The project activity has a draft project report in line with Kenyan NEMA guidelines (EMCA, 1999). The project developer's representative, Cool nrg, has a registered large-scale lighting PoAin Mexico which considered best practice collection, storing and destruction of failed project CFLs.
8.	What is the lifespan and applicable Standards for the project CFLs?	The average life for the bulbs to be used in the project will be at least 10,000 hours. CPA 1 inKenya is currently proposing 15,000 hours, and the project implementer, KPLC's,stipulated standards for bulb procurement are consistent with relevant international standards i.e. IEC 60968 and IEC 60969.
9.	Counterfeits are prevalent for energy saving bulbs. How do you plan to avoid this, such as coding mechanisms to ensure that genuine bulbs are in use?	The bulbs will be marked for clear unique identification for the project. The project implementer may consider ways of eliminating counterfeits and appreciates the option suggested.
10.	Why is CPA 1 in Kenya only planning to replace 3 CFLs per household?	The methodology restricts the number of bulbs per household to 6. As there may be more than one household per electricity meter, the PoA has imposed limits of 3 per household, 6 per electricity meter.

C.3. Report on consideration of comments received

There were no comments that could not be resolved on the spot and required follow-up action.

SECTION D. Eligibility of CPA and estimation of emissions reductions

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

Methodology applied: AMS II.J/Version 04

Tool applied: "Tool to calculate the emission factor of an electricity system", Version 02.2.1, EB 63, Report Annex 19.

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

Demonstration of applicability of EB 54, Version 04 of AMSII.J

No.	AMSII.J technology/ measure	Conformance for SSC CPA
1	SSC-CPA comprise activities that lead to efficient use of electricity through the adoption of self-ballasted compact fluorescent lamps (CFLs) to replace incandescent lamps (ICLs) in residential applications. The CFLs adopted to replace existing equipment will be new equipment and not transferred from another activity.	✓ CFLs will replace ICLs ✓ Residential households only ✓ CFLs are new ✓ CFLs not transferred

		from another activity
2	The total lumen output of the CFLs used will be equal to or more than that of the ICL being replaced; lumen output of ICL & CFL shall be determined in accordance with relevant national or international standard/s or values in Table 1 of the methodology.	✓ CFL lumens >= ICL lumens ✓ ICL & CFL lumens are determined using relevant standards or Table 1 of AMS-II.J version 04. Please section B.2 above.
3	The aggregate electricity savings by a single project activity may not exceed the equivalent of 60 GWh per year. Each CPA will demonstrate through Emission reduction calculations that single project activity doesn't exceed the equivalent 60 GWh per year.	✓ Annual energy saving of 38.88GWh.
4	The rated average life of the CFLs shall be known ex ante. IEC 60969 or an equivalent national standard shall be used to determine the average life. The project design document shall cite the standard used. If the average life value is not available ex ante, it shall be made available for verification before or at the same time that the results of the second ex post monitoring survey are available for verification. The laboratory conducting and certifying the tests to determine CFL average life shall comply with the requirements of a relevant national or international standard.	✓ Rated life of CFLs is stated, or else will be available when 2nd ex-post monitoring survey is available for verification ✓ Rated life is determined using IEC 60969 or equivalent ✓ Standard used is cited ✓ Lab undertaking average life tests complies with relevant standards (please see section B.2 above)
5	CFLs utilised under the project activity will, in addition to the standard lamp specifications, be marked for clear unique identification for the project.	✓ CFLs are marked for clear unique project identification (please section A.2 above)
6	The SSC-CPA design document explains the proposed method of distribution of efficient lighting equipment and how ICL collection and destruction will be conducted and documented. The Project design document shall also explain how the proposed procedures eliminate double counting of Emission Reductions.	✓ CFL distribution method is explained ✓ ICL collection & destruction method is documented ✓ How proposed procedures eliminate double counting is explained (please see section A.2 above)
7	The project activity will ensure that replaced ICLs are exchanged and destroyed and will undertake at least one of the following actions: • Directly installing the CFLs;	✓ ICLs are to be collected in exchange for CFLs ✓ ICLs are to be

	• Charging at least a minimal price[6] for efficient lighting equipment; • Restricting the number of lamps per household distributed through the project activity to six.	destroyed ✓ 1 of the following actions is to be undertaken for CFLs: o Direct installation o Charging minimal price o Restricting each household to 6 (please see section A.2 above)
8	Whether the CFLs are directly installed or not directly installed, the project design document will define actions to be taken to encourage CFLs being installed in locations within the residences where the utilisation hours are relatively high. For CFLs not directly installed these actions may include educating the CFL recipients of the best uses for CFLs.	✓ Actions are defined to encourage CFLs being installed in locations with high utilisation hours (may include education on best uses for CFLs) (please see section A.2 above)

D.3. Sources and GHGs

The SSC-CPA is located in Kenya.

The SSC-CPA project boundary is the physical location of each CFL installed. Information identifying this boundary will be recorded in the record keeping system associated with this SSC-CPA and in the PoA CME's project database.

The CFLs installed are energy efficient in comparison to the ICLs replaced and therefore their installation reduces the need for electricity.

The electricity supplied by the grid in Kenya is, in part, fossil fuel based. Therefore, indirectly GHG emissions from the grid-connected power plants are reduced. Table below describes gases to be included in the SSC-CPA boundary.

Kenya Electricity Generating Company (KENGEN)'s generation division is responsible for all power generation functions owned by KENGEN. Other sources of generation are from independent power producers (IPPs) which feed the National grid of Kenya and isolated off-grid areas as well.

KENGEN's generation system consists mainly of hydroelectricity and thermal based generation[7]. There has been continued increase in electricity demand while hydro capacity has over the years declined due to climate change[8]. This has seen the fossil-fuel-based emergency units run at full capacity with plans to increase thermal capacity to meet the growing demand as well as cater for thedeclinein hydroelectric generation KPLC's planned generation capacity expansion for the period between 2011 -2015 includes development of additional thermal 280MW from Independent Power Producers (IPPs)[9]

Gases to be included in the SSC-CPA boundary

[6]For example cost equivalent of an incandescent lamp being replaced.

[7]SREP Investment Plan for Kenya, Climate Investment Funds (2011), page 19, Table 1

[8]SREP Investment Plan for Kenya, Climate Investment Funds (2011), page 13 (last paragraph)

[9]Annual Report, KPLC (2011), page 15

	Source	Gas	Included?	Justification
Baseline	Power plants servicing the grid	CO_2	Yes	Main emission source
		CH_4	No	Emission source small – excluded for simplification
		N_20	No	Emission source small – excluded for simplification
Project Activity	Power plants servicing the grid	CO_2	Yes	Main emission source
		CH_4	No	Emission source small – excluded for simplification
		N_20	No	Emission source small – excluded for simplification

D.4. Description of the baseline scenario

In accordance with simplified baseline and monitoring methodology AMSII.J (version 04) "*Demand-side activities for efficient lighting technologies"*, the baseline scenario is defined as the scenario prior to implementation of the project activity. This is the continued use of incandescent lamps (ICLs).

The following are the alternative scenarios to the proposed project activity;

1. **Mandatory phase out and replacement of ICLs with new lighting devices with greater efficiency without being registered as a CDM project activity.**

This alternative is not applicable as there is no mandated legal requirement for replacing ICLs with CFLs in Kenya.

2. **Voluntary replacement of ICLs with new lighting devices with greater efficiency through subsidised programs facilitated by relevant authorities (e.g. governments, energy utilities, etc) without being registered as a CDM project activity.**

Under this scenario relevant authorities (e.g. governments, energy utilities, etc) would facilitate and subsidize the cost of programs that would provide more efficient lighting technologies (e.g. CFLs) to households.

Due to the barriers which limit consumers in developing countries from autonomously replacing ICLs with more efficient lighting technologies (refer Alternative 3 below) to achieve large-scale implementation of efficient lighting technology programs are required that assure high-quality CFLs at a reasonable and affordable price. These programs are generally developed and delivered by relevant authorities (e.g. governments, energy utilities, etc)[10].

These program approaches reduce the cost of CFLs, assure product quality and can remove consumer price barriers. Without the use of CDM these programs in developing countries are generally financed through loans or grants from multilateral development banks or self-financed by governments/utilities[11]. Investment barriers are the most significant barriers to implementation of these large-scale programs.

In 2010, KPLC, the local in Kenya installed 1,250,000 11W CFLs in Kenyan households as a pilot for this PoA. Considering the above said pilot in Kenya and that no other programs have been undertaken in Kenya at the time of preparing this PoA, this scenario is viewed as very unlikely to occur and not identified as the baseline scenario.

[10]The World Bank, "Large-Scale Residential Energy Efficiency Programs based on CFLs" (2009), page ES-4 (last paragraph)

[11]The World Bank, "Large-Scale Residential Energy Efficiency Programs based on CFLs" (2009), page ES-9 (first paragraph)

3. **Autonomous replacement of ICLs by households with new lighting devices with greater efficiency.**

Most of the lighting in the domestic sector in developing countries is provided by inefficient ICLs. CFLs offer developing country households the opportunity to reduce energy consumption. Despite the fact that CFLs can provide benefits for a range of stakeholders, the uptake of CFLs in developing countries has been very slow with penetration of no more than 10-15 percent in most countries[12]. This low penetration and slow uptake in developing countries is due to a range of barriers.

This low penetration and slow uptake of CFLs in developing countries is due to:

- Low ROI to the customer due to low tariffs in the domestic sector;
- High first costs;
- Lack of knowledge and awareness regarding benefits of CFLs;
- Lack of understanding of quality issues;
- Limited product availability in rural areas; and
- Perceived risk that the CFL may fail soon after installation.

These above barriers inhibit consumers in developing countries from autonomously replacing ICLs with CFLs at scale. This leads to no material change in the baseline and higher emissions than would occur if CFLs were installed. There is therefore a need for CFL programs that provide high-quality CFLs at a reasonable and affordable price to achieve large-scale implementation.

4. **Continued use of ICLs.**

Given the scenarios and barriers outlined in the above scenarios the most likely scenario, in absence of this PoA, is continued use of ICLs by households in countries included in this PoA. As such this scenario is identified as the baseline scenario.

D.5. Demonstration of eligibility for a CPA

As justification of why this SSC-CPA is eligible to be included in the Green Light for Africa SSC-PoA,the SSC-CPA implementer confirms compliance with the eligibility criteria to enrol a CPA under the PoA (as stated under section B.5 of the PoA) as shown in Table below:

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Compliance with Eligibility Criteria

	Eligibility criteria	**Conformance with eligibility Criteria**
1.	The geographic boundary of the SSC CPA, including anytime induced boundary, is unambiguously identified and consistent with the geographic boundary set in the PoA.	Yes. The geographical boundary of the CPA is the Republic of Kenya
2.	The CPA operator must demonstrate that double counting does not occur with the particular SSC CPA.	
2.a	CFLs utilized by the SSC CPA will marked for unique identification for the project.	Yes. CFLs under this CPA will be permanently marked for clear unique identification.
2.b	The SSC CPA that has not been registered (either as	Yes. Prior to including CPA,

[12]The World Bank, "Large-Scale Residential Energy Efficiency Programs based on CFLs" (2009), page 4 (first paragraph)

	a CDM project activity or as a CPA of another PoA).	the CME has checked the CDM project database to confirm the project has not been registered as a single CDM project. In addition the CPA implementer signed an ERPA confirmation with the CME on 8th February 2012 as part of a Master agreement signed on 16th October 2010 between the CME and the CPA implementer which will ensure that the CPA has not been included in another PoA.
3.	Each SSC CPA will involve the distribution of Compact Fluorescent lamps (CFLs) to replace Incandescent lamps (ICLs). CFLs distributed under each SSC CPA will be compliant with all specifications under EB 54 Version 04 of AMSII.J.	
3.a	The total lumen output of the CFL should be equal to or more than that of the ICL being replaced; lumen output of ICL & CFL shall be determined in accordance with relevant national or international standard/s. Values in Table 1 may be used as an alternative option to such standards. If a lamp wattage is not in Table 1, linearly interpreted value shall be used to determine the minimum light output requirements	Yes. The minimum light output of the CFLs in lumens shall be as follows: • 13 - 15W (to replace 25-60W ICLs) ≥ 715 lumens • 20 - 23W (to replace 75-100W ICLs) ≥1350 lumen[13]s. The lumen output of ICL and CFL will be measured according to IEC 60969 *"Self-ballasted lamps for general lighting services – performance requirements[14]"*
3.b	The average life or the rated average life of the CFLs shall be known ex ante. IEC 60969 (Self Ballasted Lamps For General Lighting Services - Performance Requirements) or an equivalent national standard shall be used to determine the average life. The project design document shall cite the standard used. If the average life value is not available ex ante, it shall be made available for verification before or at the same time that the results of the second ex post monitoring survey, as required per paragraph 18 (b) of the methodology, are available for verification. The laboratory conducting and certifying the tests to determine CFL average life shall comply with the requirements of a relevant national or international standard, e.g., ISO/IEC 17025.	Yes. The average rated average life of the CFLS to be installed by this CPA is shall be 15,000 hours[15]. IEC 60969 *"Self-ballasted lamps for general lighting services – performance requirements"* shall be used to determine the average life[16].

[13]Evidence: June 2012 specification for compact fluorescent lamps (CFLS)

[14]Evidence: June 2012 specification for compact fluorescent lamps (CFLS)

[15]Evidence: June 2012 specification for compact fluorescent lamps (CFLS)

[16]Evidence: June 2012 specification for compact fluorescent lamps (CFLS)

4.	The start date of the SSC-CPA will not be prior to 25/10/2011 i.e. the date on which the SSC-PoA-DD was for the first time published for global stakeholder consultation. For CPAs applying for inclusion in the PoA, this may be the date when the first procurement contract is signed or the date when the CFL installation starts.CPA implementers must present official documentation describing above activities to serve as evidence.	Yes. The start date of this SSC-CPA is 01/01/2013. This is the date when CFL distribution/retrofit starts. The CPA entity has provided a paper to the French Development Agency as evidence to the CME.
5.	Each proposed SSC-CPA follows EB 54 Version 04 of AMSII.J "*Demand-side activities for efficient lighting technologies"*	Yes. The CPA meets all the applicability criteria of version 04 of AMSII.J as stipulated in the section E.2 of the PoA DD. This is demonstrated in table 4 below.
6.	The SSC CPA implementer will undertake local stakeholder consultation and environmental analysis[17]	Yes. The CPA implementer has confirmed with the CME that it does not need another local stakeholder consultation and environmental analysis. The CPA is covered by the stakeholder report documented in section D.2 as well as EIA License issued on 30th July 2012.
7.	Where Public Funding is accessed, SSC CPA implementer will provide affirmation in the SSC-CPA DD that this funding does not result in a diversion of official development assistance.	Yes. No public funding will be accessed by the CPA implementer.
8.	CFL distribution, exchange and destruction	
8.a	Each proposed SSC-CPAs will involve the distribution of CFLs targeting grid connected residential households.	Yes, CPA implementer has confirmed that the CPA will target only grid connected residential households.
8.b	Further, the CPA will ensure that replaced ICLs are exchanged and destroyed.	Yes. The CPA implementer has confirmed replaced ICLs are exchanged and destroyed. In this regard, the CPA implementer has provided a Project Report approved by National Environment Management Authority (NEMA) which includes an Environmental Management Plan for handling and destruction of the collected ICLs.
8.c	CPA implementers will undertake at least one of the following actions described in paragraph 7 of version	Yes. CPA implementer has confirmed that CFLs will be

[17]CPA specific local stakeholder consultation and environmental analysis will not be required for CPA that is 1)located in a country where the former has been conducted or 2) EIA license has been issued by the relevant institution to confirm that an environmental analysis has been conducted.

	7 of AMSII.J	directly installed. This is one of the actions described in paragraph 7 of version 7 of AMSII.J
8.d	CPA implementers will define actions to be taken to encourage CFLs being installed in locations within the residences where the utilization hours are relatively high, for example common areas. For CFLs not directly installed these actions can include educating the CFL recipients of the best uses for CFLs.	Yes. Actions are defined to encourage CFLs being installed in locations with high utilisation hours (may include education on best uses for CFLs) (please see section A.2 above)
9.	The CPA shall follow the guidelines in the latest version of the *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities* and *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities*	Yes. The CME has confirmed that the sampling plan described in Annex 4 of this CPA DD is consistent with the latest Annex 4 of EB 69 version 03.0 "*Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities*" and Annex 5 of EB 69 version 02.0, "*Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities*"
10.	The aggregate electricity savings by a single project activity may not exceed the equivalent of 60 GWh per year. Each CPA will demonstrate through Emission reduction calculations that single project activity doesn't exceed the equivalent 60 GWh per year.	Yes. The CPA will result in annual energy saving of 38.88GWh which does not exceed the threshold.
11.	The SSC CPA is not a debundled component of a Largescale project activity in accordance with the latest approved version of the *Guidelines on assessment of debundling for SSC project activities.*	Yes. A detailed and transparent debundling check has been carried out in section A.4.6 below. This is in line with the latest approved version of the *Guidelines on assessment of debundling for SSC project activities.*
12.	The CME approves the participation of the CPA in the PoA.	Yes. The CME has signed an agreement with the CPA implementer to confirm participation of the CPA in the PoA

D.6. Estimation of emission reductions

D.6.1. Explanation of methodological choices

The approved methodology to be applied (AMS II.J/Version 4) has a number of methodical choices. Outlined below are explanations of those choices as to be applied to this SSC-CPA.

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Methodological Choice 1 – Lumen Output Equivalence

Paragraph 2 of the approved methodology to be applied states that lumen output of ICL & CFL shall be determined in accordance with relevant national or international standard/s or values in Table 1 may be used as an alternative option to such standards.

Values in Table 1 will be used to determine lumens equivalence for this SSC-CPA.

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Methodological Choice 2 – Rated Average Life

Paragraph 4 of the approved methodology to be applied states that the average life or the rated average life of the CFLs shall be known ex ante. IEC 60969 (Self Ballasted Lamps For General Lighting Services - Performance Requirements) or an equivalent national standard shall be used to determine the average life.

Given that at the time of preparing this PoA no national standards for CFL performance requirements exist in the countries to be included in the PoA, IEC 60969 will be used in a typical CPA. If an appropriate national standard is created it may be used as an alternative if deemed more appropriate by the CME.

Methodological Choice 3 – Limit undesirable secondary market effects

Paragraph 7 of the approved methodology to be applied states that project participants are required to undertake at least one of the following actions to limit undesirable secondary market effects:

(i) Directly installing the CFLs;

(ii) Charging at least a minimal price for efficient lighting equipment;

(iii) Restricting the number of lamps per household distributed through the project activity to six.

This SSC-CPA has clearly defined and described which of these measures it is undertaking.

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Methodological Choice 4 – Determining operating hours

Paragraph 11 of the approved methodology to be applied states that operating hours of the project (and baseline) lamps will be determined by using one of the following two options:

- Option 1: A default value of 3.5 hours per 24 hrs period for daily operating hours;
- Option 2: Instead of using a default value of 3.5 hours for O_i, a measured value can be used for the ex ante estimate using the sampling requirements indicated in the definition of O_i for equation (2).

The default value of 3.5 hours per 24 hrs period for daily operating hours will be used for this SSC-CPA.

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Methodological Choice 5 – Technical grid losses

Paragraph 12 of the approved methodology to be applied states that the average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. Reliability of the data used (e.g., appropriateness, accuracy/uncertainty, especially exclusion of non technical grid losses) shall be established and documented by the project participant. A default value of 10% shall be used for average annual technical grid losses, if no recent data is available or the data cannot be regarded accurate and reliable.

If, as determined by the CME, recent, accurate and reliable data available for the host country is available this will be used to determine technical grid losses for a typical SSC-CPA. If however the CME determines that such data is not available the default value of 10% will be used.

Methodological Choice 6 – Net-to-gross adjustment factor

Paragraph 12 of the approved methodology to be applied states that the net-to-gross adjustment factor default value of 0.95 is to be used unless a more appropriate value based on a lighting use survey from the same region and not older than 2 years is available.

Unless, as determined by the CME, a more appropriate value based on a lighting use survey from the same region and not older than 2 years is available, this SSC_CPA will use the default net-to-gross value of 0.95.

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Methodological Choice 7 – Ex post monitoring

Paragraph 17 of the approved methodology to be applied states that subsequent (to the first survey) *ex post* monitoring surveys are carried out at one of the following intervals that define the minimum requirements for the frequency of the survey:

- Option 1: Once every 3 years;
- Option 2: Once for every 30% of the elapsed Rated Average Life or Average Life of the lamp.

Option 1 (minimum requirement of once every 3 years) will be used for this SSC-CPA. The SSC-CPA is free however to choose a monitoring period more frequent than the selected option.

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The electricity saved by the project activity in year *y* is calculated as indicated in equations (1) and (2) below:

$$NES_y = \sum_{i=1}^{n} Q_{PJ,i} \times (1 - LFR_{i,y}) \times ES_i \times \frac{1}{(1 - TD_y)} \times NTG \quad \textbf{(1)}$$

Where:

$$ES_i = (P_{i,BL} - P_{i,PJ}) \times O_i \times 365/1000 \quad \textbf{(2)}$$

The Lamp Failure Rate ($LFR_{i,y}$) is the % of lamps that have failed during a year. The average life, or the rated average life, is used to calculate the Lamp Failure Rate as follows:

$$\text{If } y^* X_i < L_i, LFR_{i,y} = y^* X_i * (100 - R_i)/(100 \times L_i) \quad \textbf{(3)}$$

Emissions reduction is net electricity savings (*NES*) times an Emission Factor (*EF*) calculated in accordance with provisions under AMS-I.D./ Version 17.

$$ER_y = NES_y \times EF_{CO2,ELEC,y} \quad \textbf{(4)}$$

D.6.2. Data and parameters fixed ex-ante

Data / Parameter	NES_y
Unit	kWh
Description	Net electricity saved in Year *y*

Source of data	Result of calculation using equation (1) in approved methodology (AMS II.J./Version 4)
Value(s) applied	Year: NES 1: 59,771,411 2: 57,112,938 3: 54,454,466 4: 51,795,993 5: 49,137,520 6: 46,479,048 7: 43,820,575 8: 41,162,103 9: 38,503,630 10: 35,845,158
Choice of data or Measurement methods and procedures	Compliant with the approved methodology to be applied (AMS II.J./Version 4).
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$Q_{PJ,i}$
Unit	Number
Description	Number of CFLs distributed under the project activity
Source of data	*Ex ante* forecast from CPA implementer *Ex post* from SSC-CPA record keeping system
Value(s) applied	870,000 (approximately)
Choice of data or Measurement methods and procedures	SSC-CPA Implementer has planned the project and forecast the number of CFLs to be distributed. *Ex post* the actual number of CFLs distributed will be recorded in the SSC- CPA record keeping system (which is approved by the PoA CME).
Purpose of data	Calculation of project emissions
Additional comment	This value is approximate and shall be equal to or less than the documented number of all baseline ICLs destroyed.

Data / Parameter	$LFR_{i,y}$
Unit	Number (fraction)
Description	% of lamps that have failed during a year
Source of data	*Ex ante* calculated using equation 3, paragraph 14 of the approved methodology (AMS.II.J/Version 4) *Ex post* source of data will be the *ex post* monitoring survey

Value(s) applied	<table><tr><th>Year</th><th>LFR</th></tr><tr><td>2013</td><td>4.26</td></tr><tr><td>2014</td><td>8.52</td></tr><tr><td>2015</td><td>12.78</td></tr><tr><td>2016</td><td>17.03</td></tr><tr><td>2017</td><td>21.29</td></tr><tr><td>2018</td><td>25.55</td></tr><tr><td>2019</td><td>29.81</td></tr><tr><td>2020</td><td>34.07</td></tr><tr><td>2021</td><td>38.33</td></tr><tr><td>2022</td><td>42.58</td></tr></table>
Choice of data or Measurement methods and procedures	Choice of data is as specified in paragraph 14 of the approved methodology to be applied (AMS II.J/Version 4).
Purpose of data	Calculation of project emissions
Additional comment	As per paragraph 18 of the approved methodology to be applied (AMS II.J/Version 4): If the *ex post* monitoring surveys indicate that the failure rate is equal to or less than the $LFR_{i,y}$ value for subsequent years $LFR_{i,y}$shall continue to be determined using Equation (3). If the *ex post* monitoring surveys indicate that the failure rate is greater than the value indicated using equation (3) a new value for L_i shall be determined using equation (3) and new values of $LFR_{i,y}$ shall be used beginning from the first calculation year after completion of the *ex post* survey.

Data / Parameter	ES_i
Unit	kWh
Description	Estimated annual electricity savings for equipment type *i*, for the relevant technology
Source of data	Result of calculation using equation (2) in approved methodology (AMS II.J./Version4)
Value(s) applied	<table><tr><th>Year</th><th>ES</th></tr><tr><td>1</td><td>64</td></tr><tr><td>2</td><td>64</td></tr><tr><td>3</td><td>64</td></tr><tr><td>4</td><td>64</td></tr><tr><td>5</td><td>64</td></tr><tr><td>6</td><td>64</td></tr><tr><td>7</td><td>64</td></tr><tr><td>8</td><td>64</td></tr><tr><td>9</td><td>64</td></tr><tr><td>10</td><td>64</td></tr></table>
Choice of data or Measurement methods and procedures	Compliant with the approved methodology to be applied (AMS II.J./Version4).
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$P_{i, BL}$

Unit	Watts
Description	Rated power of the baseline ICLs
Source of data	*Ex ante* forecast from CPA implementer This forecast is based on figures obtained from 2010 Ministry of Energy/KPLC Efficient Lighting bulb rollout project.
Value(s) applied	68.127
Choice of data or Measurement methods and procedures	SSC-CPA Implementer has planned the project and forecast the wattage of ICLs to be replaced based on the results of a sample from a previous exchange program, as shown in the following table.

		ICL Wattage					
		25	**40**	**60**	**75**	**100**	**Total**
A	Number	2,395	14,711	39,778	28,887	20,136	**105,907**
B	**%**	2%	14%	38%	27%	19%	**100%**
AxB	Watts	0.6	5.6	22.5	20.5	19.0	**68.127**

Ex post the actual wattage of ICLs replaced will be recorded in the SSC- CPA record keeping system (which is approved by the PoA CME).

Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$P_{i, PJ}$
Unit	Watts
Description	Rated power of the project CFLs
Source of data	*Ex ante* forecast from CPA implementer *Ex post* from SSC-CPA record keeping system
Value(s) applied	17.703 This is the average of proposed CFL wattages: 13, 14 and 15W to replace 25 – 60 W ICLs and 20, 21, 22, and 23W to replace 75 – 100W ICLs.

Green Light CPA 1	CFL Wattage		
	14	**22**	**Total**
%	54%	46%	100%
Watts	7.5	10.2	**17.703**

Choice of data or Measurement methods and procedures	SSC-CPA Implementer has planned the project and forecast the wattage of CFLs to be distributed. *Ex post* the actual wattage of CFLs distributed will be recorded in the SSC- CPA record keeping system (which is approved by the PoA CME).
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	O_i
Unit	Hours
Description	Average daily operating hours of the lighting devices replaced

Source of data	Methodology default value
Value(s) applied	3.5 hours per 24 hours period
Choice of data or Measurement methods and procedures	Option 1 selected to use the default value as per paragraph 11 (ii) of the applied methodologyAMS-II.J/Version 4.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	TD_y
Unit	Number (fraction)
Description	Average annual technical grid losses (transmission and distribution)for the grid serving the locations where the CFLs are installed
Source of data	Technical and Commercial Losses Study, Manitoba Hydro / KPLC, 2006, Chapter 2, pg.9
Value(s) applied	14.72%
Choice of data or Measurement methods and procedures	Stipulated by the applied methodology. Most recent data available from the national utility. Any commercial / non-technical grid losses have been excluded.
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	*NTG*
Unit	Number (fraction)
Description	Net-to-gross adjustment factor
Source of data	Methodology default value
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	Stipulated by the applied methodology
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	*y*
Unit	Number
Description	Counter for year
Source of data	To be determined from data from CME project database
Value(s) applied	Year number from CME project database
Choice of data or Measurement methods and procedures	The CME will maintain a project database. The system must maintain appropriate records documenting, amongst other variables: – Start date of SSC-CPA – Year counter
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	X_i

Unit	Hours
Description	Number of operating hours per year of equipment
Source of data	Number days per year multiplied by default average daily operating hours (3.5 hours per 24 hours)
Value(s) applied	1,277.50
Choice of data or Measurement methods and procedures	Stipulated by the applied methodology
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	R_i
Unit	Number
Description	% of lamps of type operating at the end of rated average life
Source of data	Methodology default value
Value(s) applied	Default value of 50
Choice of data or Measurement methods and procedures	Stipulated by the applied methodology
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	L_i
Unit	Hours
Description	Rated Average Life for CFLs
Source of data	CFL specifications
Value(s) applied	15,000
Choice of data or Measurement methods and procedures	Stipulated by the applied methodology
Purpose of data	Calculation of project emissions
Additional comment	CFLs specified have a rated average life of 15,000 hours. The actual value will depend on factors such as product availability. Note the minimum allowable rated average life is to be 10,000 hours.

Data / Parameter	ER_y
Unit	tCO_2e
Description	Emission reductions in year *y*
Source of data	Result of calculation using equation (4) in approved methodology (AMS II.J./Version4)

Value(s) applied	Year / ER_y: 1 – 38,881; 2 – 37,152; 3 – 35,423; 4 – 33,693; 5 – 31,964; 6 – 30,235; 7 – 28,505; 8 – 26,776; 9 – 25,047; 10 – 23,317
Choice of data or Measurement methods and procedures	Compliant with the approved methodology to be applied (AMS II.J./Version4).
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$EF_{CO2,ELEC,y}$
Unit	tCO_2/MWh
Description	Emission Factor for displacement of electricity in the grid serving the households that participate in the SSC-CPA calculated in accordance with AMS-I.D,/Version 17.
Source of data	KPLC's2011metered generation data and KPLC'sGEF calculation tool
Value(s) applied	$0.6505tCO_2/MWh$
Choice of data or Measurement methods and procedures	Stipulated in accordance with the provisions in AMS-I.D./ Version 17. Refer Annex 3 'Calculation of Baseline Electricity Emissions from Grid" and source calculations "120405 Dispatch Tool Green Light.xls".
Purpose of data	Calculation of project emissions
Additional comment	Detailed workings are provided in Appendix 4.

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D.6.3. Ex-ante calculation of emission reductions

As per the Green Light for Africa PoA, and according to the methodology to be applied (AMS-II.J/Version4), *ex ante* calculations are done as per the following steps, with Option 1 selected to use the default value for 'daily operating hours' as per paragraph 11 (ii) of methodology AMS-II.J/Version 4:

(i) Estimate the nameplate/rated power (Watts) of the baseline ICLs to be replaced;

(ii) Operating hours of project (and baseline) lamps is determined by using default value of 3.5 hours per 24 hr period;

(iii) Calculate the annual gross electricity savings by comparing the nameplate/rated power rating of the CFL with that of the baseline ICL and multiplying by annual hours of operation and the estimated number of CFLs that are part of the project;

(iv) Calculate the annual Net Electricity Saving (*NES*), for each year of the assumed crediting period, by correcting the gross electricity savings for leakage, a Net-To-Gross adjustment (*NTG*) factor, transmission and distribution losses, and Lamp Failure Rate (*LFR*).

The electricity saved by the project activity in year *y* is calculated as indicated in equations (1) and (2) below:

$$NES_y = \sum_{i=1}^{n} Q_{PJ,i} \times (1 - LFR_{i,y}) \times ES_i \times \frac{1}{(1 - TD_y)} \times NTG \quad (1)$$

Where:

$$ES_i = (P_{i,BL} - P_{i,PJ}) \times O_i \times 365/1000 \quad (2)$$

Where:

NES_y	Net electricity saved in year *y* (kWh)
$Q_{PJ,i}$	870,000
$LFR_{i,y}$	Lamp Failure Rate for equipment type *i*in year *y* (fraction) from equation (3)
ES_i	Estimated annual electricity savings from equation (2)
TD_y	0.1472
NTG	0.95
$P_{i, BL}$	68.127(Watts)
$P_{i, PJ}$	17.703(Watts)
O_i	3.5 hours per 24 hour period

The Lamp Failure Rate ($LFR_{i,y}$) is the % of lamps that have failed during a year.The average life, or the rated average life, is used to calculate the Lamp Failure Rate as follows:

$$\text{If } y * X_i < L_i, LFR_{i,y} = y * X_i * (100 - R_i)/(100 \times L_i) \quad (3)$$

$$\text{If } y * X_i > or = L_i, LFR_{i,y} = 1$$

Where:

$LFR_{i,y}$	Lamp Failure Rate for equipment type *i* in year *y* (fraction)
L_i	15,000(hours)
R_i	0.50
X_i	1,227.50
y	Counter for year

Emissions reduction is net electricity savings (*NES*) times an Emission Factor (*EF*) calculated in accordance with provisions under AMS-I.D./ Version 17.

$$ER_y = NES_y \times EF_{CO2,ELEC,y} \quad (4)$$

Where:

$EF_{CO2,ELEC,y}$	0.6505 (tCO_2/MWh)
ER_y	Emission Reductions in year *y* (tCO_2e)

Table 6 below details *ex ante* calculations of LFR, ES, NES and ER values based on equations 1-4 above.

Table 6: Estimated emission reductions over the crediting period(detailed workings in Annex 4)

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YEAR	LFR	ES (kW h)	NES (kW h)	ER (tCO_2/MW h)
1	0.04	64	59,771,411	38,881
2	0.09	64	57,112,938	37,152
3	0.13	64	54,454,466	35,423
4	0.17	64	51,795,993	33,693
5	0.21	64	49,137,520	31,964
6	0.26	64	46,479,048	30,235
7	0.30	64	43,820,575	28,505
8	0.34	64	41,162,103	26,776
9	0.38	64	38,503,630	25,047
10	0.43	64	35,845,158	23,317
Total:			**478,082,842**	**310,993**

Ex post monitoring surveys

The first *ex post* monitoring survey will be carried out within the first year after installation of all efficient lighting, and will provide a value for the proportion of CFLs still installed and operating under the project activity. The results of this survey will be used to determine the quantity of CFLs ($Q_{PJ,i}$) installed and operating under the project activity and determine the *ex post*Lamp Failure Rate ($LFR_{i,y}$) for use in *ex post* Emission Reduction calculations.

Subsequent *ex post* monitoring surveys will be carried out once every 3 years (at a minimum) to determine the *ex post*Lamp Failure Rate ($LFR_{i,y}$) for use in *ex post* Emission Reduction calculations.

Changes to Lamp Failure Rate

The Net Electricity Savings shall be modified for changes to the Lamp Failure Rate as may be indicated by *ex post* monitoring survey results. The modifications shall be made using the following methods:

- If Rated Average Life values were used initially for calculating LFR_y, per equation (3), as soon as Average Life values are available they shall be used for calculation of subsequent year $LFR_{i,y}$ values.
- If the ex post monitoring surveys indicate that the failure rate is equal to or less than the $LFR_{i,y}$value indicated using equation (3) with *ex ante* or prior year, ex post monitoring values, for subsequent years $LFR_{i,y}$ shall continue to be determined using Equation (3) and the established Average Life values for Li.

However, for subsequent years, L_i values in $LFR_{i,y}$ equation (3) shall be adjusted if the *ex post* monitoring surveys indicate that the failure rate ($LFR_{i,y}$) is greater than the value indicated using equation (3) with Average Life or prior year ex post monitoring values. In this situation, a new value for L_i shall be determined using equation (3) and new values of $LFR_{i,y}$ shall be used beginning from the first calculation year after completion of the *ex post* survey.

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	N/A	N/A	N/A	38,881
Year 2	N/A	N/A	N/A	37,152
Year 3	N/A	N/A	N/A	35,423
Year 4	N/A	N/A	N/A	33,693
Year 5	N/A	N/A	N/A	31,964
Year 6	N/A	N/A	N/A	30,235
Year 7	N/A	N/A	N/A	28,505
Year 8	N/A	N/A	N/A	26,776
Year 9	N/A	N/A	N/A	25,047
Year 10	N/A	N/A	N/A	23,317
Total	N/A	N/A	N/A	**310,993**
Total number of crediting years	10			
Annual average over the crediting period	N/A	N/A	N/A	**31,099**

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

D.7.1. Data and parameters to be monitored

Data / Parameter	Start date of monitoring period
Unit	Date
Description	Start date of monitoring period
Source of data	SSC-CPA record keeping system
Value(s) applied	dd/mm/yyyy recorded by SSC-CPA Implementer
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Each Monitoring Period
QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	End date of monitoring period
Unit	Date
Description	End date of monitoring period
Source of data	CME program database
Value(s) applied	dd/mm/yyyy recorded by CME
Measurement methods and procedures	Data recorded in CME program database
Monitoring frequency	Each monitoring period
QA/QC procedures	Data documented and stored so as to be verifiable by DOE

Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	Physical geographic location of each measure (each CFL) installed
Unit	Text or Number
Description	GPS Coordinates of houses where CFL have been installed
Source of data	SSC-CPA record keeping system
Value(s) applied	NA
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time CFLs are distributed to the beneficiaries
QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	Q_{PJ}
Unit	Number
Description	Number of CFLs distributed
Source of data	SSC-CPA record keeping system
Value(s) applied	Number recorded for each SSC-CPA and used in calculating Net Electricity Saved (NES)
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time CFLs are distributed
QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$P_{i, PJ}$
Unit	Watts
Description	Nameplate/ rated power rating of CFLs supplied
Source of data	SSC-CPA record keeping system
Value(s) applied	Wattages recorded for each SSC-CPA and used in calculating Net Electricity Saved (NES)
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time CFLs are supplied/distributed

QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	Date of supply
Unit	Date
Description	Date of supply/distribution of CFLs supplied
Source of data	SSC-CPA record keeping system
Value(s) applied	NA
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time CFLs are distributed/supplied to the houesholds
QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	$P_{i, BL}$
Unit	Watts
Description	Nameplate/ rated power rating of ICLs replaced
Source of data	SSC-CPA record keeping system
Value(s) applied	Wattages recorded for each SSC-CPA and used in calculating Net Electricity Saved (NES)
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time ICLs are replaced
QA/QC procedures	SSC-CPA record keeping system approved by CME CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	Identification of the recipient of the equipment
Unit	Text/number
Description	Unambiguous identification of the recipient of the CFLs
Source of data	SSC-CPA record keeping system
Value(s) applied	Double counting control measure
Measurement methods and procedures	Data recorded in SSC-CPA record keeping system
Monitoring frequency	Every time CFLs are distributed to the households
QA/QC procedures	SSC-CPA record keeping system approved by CME

	CPA implementation Quality Assurance Check undertaken by CME Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	LFR
Unit	Number (fraction)
Description	% of lamps that have failed during a year
Source of data	*Ex post* monitoring survey
Value(s) applied	Results from periodic surveys used in calculating Net Electricity Saved (NES)
Measurement methods and procedures	Refer Appendix 5 for detail of *Ex post* survey design
Monitoring frequency	The first survey will be conducted within the first year after installation of project CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10 (depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years.
QA/QC procedures	CME will outsource surveying to credible 3rd party specialist provider CME will randomly check household surveyed by third party provider Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

Data / Parameter	Emission reductions attributable for each monitoring period
Unit	tCO_2e
Description	Emission reductions attributable for each monitoring period
Source of data	CME program database
Value(s) applied	NA
Measurement methods and procedures	Application of AMSII.J/Version 4
Monitoring frequency	Every monitoring period
QA/QC procedures	Data documented and stored so as to be verifiable by DOE
Purpose of data	Calculation of project emissions
Additional comment	

D.7.2. Description of the monitoring plan

As per the Green Light for Africa SSC-PoA and as described in Paragraph 19 of the applied approved methodology (AMS II.J/Version4) monitoring includes (i) recording of lamp distribution data, and (ii) *ex post* monitoring surveys, these including:

(i) During SSC-CPA implementation, the following data is to be recorded:

- Number of pieces of equipment distributed under the project activity, identified by the type of equipment and the date of supply;
- The number and power of the replaced devices;
- Data to unambiguously identify the recipient of the equipment distributed under the project activity;

(ii) The Emission Reductions are calculated *ex ante* and adjusted *ex post* following the monitoring surveys.

SSC-CPA implementation record keeping system

At the time of install/exchange of project CFLs, KPLC staff or their suitably-qualified agents will record on official hardcopy forms the following information:

- GPS location of the households that receive CFLs
- Number of CFLs installed.
- Nameplate power rating of CFLs supplied.
- Date of supply.
- The number and nameplate rated power of ICLs replaced.
- Customer Account Number corresponding to the meter of the householder receiving CFLs.
- Signature of householder that they relinquish any rights over the CERs generated from the project CFLs to KPLC.

Anil Bhatta 27/2/2015 6:04 PM
Deleted: <#>The address where the exchange was undertaken.

Data captured in these hardcopy forms will then be coded by KPLC or their suitably-qualified agents and stored electronically in a database, which will be managed by the CME. During this coding checks will be undertaken by KPLC or their suitably-qualified agents, with guidance from the CME, for accuracy and completeness of data collected. Hardcopy forms will be securely stored in a central locationby KPLC or their suitably-qualified agents.

Documented third party evidence will be held verifying the destruction/recycling of the ICLs replaced in the SSC-CPA.

Information from the SSC-CPA record keeping system will be consolidated and stored in the CME project database.

Ex post monitoring survey

Annex 5 of the Green Light for Africa SSC-PoA details the survey principles that shall be followed for the *ex post* monitoring survey related to determining number of CFLs placed in service and operating under the project activity, these being:

- The sampling size is determined by minimum 90% confidence interval and the 10% maximum error margin; the size of the sample shall be no less than 100;
- Sampling must be statistically robust and relevant i.e., the survey has a random distribution and is representative of target population (size, location);
- The method to select respondents for interviews is random;
- The survey is conducted by site visits;
- Only persons over age 12 are interviewed;
- The project document must contain the design details of the survey.

The PoA CME is responsible for undertaking the ex post monitoring survey.

In accordance with the Green Light for Africa SSC-PoA, the sampling plan for the *ex post* monitoring survey is presented below.

The sampling plan for the proposed CPA described below has been developed using Version 03, EB 69 Annex 4, "*Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities"*.

(a) Sampling Design:

(i) Objectives and Reliability Requirements:

The sampling objective is to obtain a statistically robust estimate of key variables used in calculation of Emission Reductions, specifically, the Lamp Failure Rate ($LFR_{i,y}$).

The objective is to determine parameter LFRi,y for the monitoring period with a 90/10 confidence/precision. The sampling is conducted at the CPA-level. This means that each CPA under the PoA will be sampled individually in order to obtain the lamp failure rate. The data to be collected will consist of identifying and recording the number of CFLs, marked with clear unique identification as part of the PoA, that are installed and operating in households participating in the SSC-CPA. Only CFLs with original markings will be counted.

(ii) Target population

The target population is those households that have participated in the SSC-CPA(s).

(iii) Sampling Method

A "Simple Random Sample" will be taken from the sampling frame (households that have participated in the SSC-CPA). The random sample will be undertaken by the outsourced third party expert provider of market research services (refer implementation section) using an industry best practice approach. The approach to sampling will be transparently documented in their report.

(iv) Sample Size

As per the applied methodology, the desired precision is a minimum 90% confidence interval and the 10% maximum error margin.

To determine the sample size (n), the approximate equation on paragraph 54, EB 69 Annex 5, *"Guidelines for Sampling for CDM Project Activities and Programme of Activities"* is applied as below:

$$n = \frac{1.645^2(1-p)}{0.1^2 \times p}$$

Where:

n = Sample size
p = Expected proportion
1.645 = Required 90% confidence
0.1 = 10% relative precision

As per paragraph 11 (a) of the '*Standard for sampling and surveys for CDM project activities and programme of activities*' Version 3, the project proponent may usethe larger of the two proportions in the sample size calculation. Therefore in year 1 where a Lamp Failure Rate of 4.26% has been used, a proportion of 95.74% may be applied to the sample size equation.

Therefore the sample size will be given by:

$$n \quad \frac{1.645^2 \times (1 \quad 0.9574)}{0.1^2 \times 0.9574}$$

$$n \quad 13 \text{ (rounded up from 12.04)}$$

Please note that as per paragraph 20 of AMS-II.J Version 4, a minimum sample size of 100 is required to determine the number of CFLs placed in service and operating under the project activity. As the calculated sample size is less than 100,as per paragraph 20 of AMS-II.J Version 4, a minimum sample size of 100 will be surveyed for the first monitoring period. Therefore:

$$n \quad 100 \text{ (minimum)}$$

Surveys will be conducted through site visits to a random sample of households that have participated in the SSC-CPA(s). Only persons over age 12 will be interviewed as part of the survey. The first survey will be conducted within the first year after installation of project CFLs. The project activity has chosen option 1 of paragraph 17 (b) of the applied methodology i.e. subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years.

Table 7: Sample size for ex-post monitoring surveys for the first CPA[18]:

Year	1	4	7	10
Lamp Failure Rate, LFR (%)	4.26	17.03	29.81	42.58
Proportion of Operational Lamps (%)	95.74	82.97	70.19	57.42
Calculated sample size, n (households)	12.04	55.56	114.92	200.69
Required sample size, n (households)	100	100	115	201

(v) Sampling frame

A sampling frame is a list of all members of a population used as a basis for sampling. The sampling frame to be used here is all households that have participated in the SSC-CPA(s).

(b) Data to be collected

(i) Field measurements

The variables to be measured under each CPA are as follows:

- Lamp Failure Rate ($LFR_{i,y}$) for CFLs distributed under the CPA

The first survey will be conducted within the first year after installation ofproject CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years.

(ii) Quality Assurance/Quality Control

The data collection will be undertaken by an expert third party service provider (e.g. market research company). In contracting an expert third party service provider, the CME will conduct a"Request for Tender" process that will specify and assess providers experience, capacity and

[18] Source: CPA 0001 ex ante emission reduction calculations

skills in designing and delivering similar surveys.

The CME will select and establish a contract with the preferred expert third party service provider. In broad terms they will be required to:

- Randomly select households from CME Project Database related to the SSC-CPA to be surveyed
- Visit identified households and assess:
  - Number of CFLs installed
  - Type of CFL installed (if more than one type of CFL was distributed under the SSC-CPA)
  - If installed CFLs carry the clear unique identification of the Green Light for Africa Programme of Activities
  - If installed CFLs carrying unique identification operating
- Provide robust and transparent collection and collation of data
- Provide written report(s)

(iii) Analysis

Lamp Failure Rate (LFRi,y)data will be collected, and will be used to calculate emission reductions for relevant monitoring period (s). The first survey will be conducted within the first year after installation of project CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10

(iv) Implementation:

The first survey will be conducted within the first year after installation of project CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years. The CME will outsource the Lamp Failure Rate survey to an experienced and qualified third party firm.

SECTION E. Approval and authorization

Letter of Approval received from the Kenyan DNA

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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	X CPA implementer(s) ☐ Responsible person/ entity for completing the CDM-CPA-DD-FORM
Organization	The Kenya Power and Lighting Co. Ltd.
Street/P.O. Box	Kolobot Rd, Parklands / PO Box 30099
Building	Stima Plaza, 3rd Floor
City	Nairobi
State/Region	Nariobi County
Postcode	00100
Country	Kenya
Telephone	+254 20 3201 369
Fax	+254 20 3748 666
E-mail	customercare@kplc.co.ke
Website	www.kplc.co.ke
Contact person	Margaret Kanini
Title	Senior Engineer, Head of Demand Side Management Section
Salutation	Engineer
Last name	Kanini
Middle name	
First name	Margaret
Department	Demand Side Management
Mobile	
Direct fax	+254 20 3748 666
Direct tel.	+254 20 3201 369
Personal e-mail	MKanini@KPLC.co.ke

CPA implementer and/or responsible person/ entity	☐ CPA implementer(s) X Responsible person/ entity for completing the CDM-CPA-DD-FORM
Organization	Carbon & Clean Energy Solutions
Street/P.O. Box	1/42 Gladstone Parade
Building	
City	Melbourne
State/Region	Victoria
Postcode	3046
Country	Australia
Telephone	+61393234850
Fax	
E-mail	anil.cces@gmail.com
Website	
Contact person	Anil Bhatta
Title	Consultant
Salutation	
Last name	Bhatta
Middle name	

First name	Anil
Department	
Mobile	+61402643154
Direct fax	
Direct tel.	
Personal e-mail	anil.cces@gmail.com

CPA implementer and/or responsible person/ entity	X CME ☐ Responsible person/ entity for completing the CDM-CPA-DD-FORM
Organization	Standard Bank Plc
Street/P.O. Box	20 Gresham Street
Building	
City	London
State/Region	
Postcode	EC2V 7JE
Country	United Kingdom
Telephone	+44 20 3145 5000
Fax	+44 20 3189 6930
E-mail	co2@standardbank.com
Website	www.standardbank.com
Contact person	Geoff Sinclair
Title	Head of Carbon Sales and Trading
Salutation	
Last name	Sinclair
Middle name	
First name	Geoff
Department	
Mobile	
Direct fax	+44 20 3189 6930
Direct tel.	+44 20 3145 5000
Personal e-mail	geoff.sinclair@standardbank.com

Appendix 2. Affirmation regarding public funding

There is no public funding from Annex 1 Parties for this project.

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

The section is left blank intentionally

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

Calculation of Baseline Electricity Emissions from Grid

As per paragraph 12, AMS I.D./Version 17, the grid emission factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the *'Tool to calculate the Emission Factor for an electricity system'*.

OR

(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations shall be based on data from an official source (where available)[19]and made publicly available.

The combined margin CO_2 emission factor

The national grid emission factor for Kenya has been calculated using a UN-accredited calculator reserved by KPLC. The tool applies official electricity and fuel consumption data for the year 2010 obtained from KPLC dispatch center as read via SCADA networks and fuel audit records. The tool also uses default IPCC values for fuel emission factors, net calorific values and plant efficiencies.

The calculated value for the Combined Margin (CM) CO_2, $EF_{grid,CM,y}$is based on version 02.2.1 of the *"Tool to calculate the emission factor for an electricity system"*.The tool applies the following six steps:

STEP 1. Identify the relevant electricity systems;

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);

STEP 3. Select a method to determine the operating margin (OM);

STEP 4. Calculate the operating margin emission factor according to the selected method;

[19]Plant Emission Factors used for the calculation of Emission Factors should be obtained in the following priority:

1. *Acquired directly* from the dispatch center or power producers, if available; or
2. *Calculated*, if data on fuel type, fuel Emission Factor, fuel input and power output can be obtained for each plant;
   If confidential data available from the relevant host Party authority are used, the calculation carried out by the project participants shall be verified by the DOE and the CDM-PDD may only show the resultant carbon Emission Factor and the corresponding list of plants;
3. *Calculated*, as above, but using estimates such as: default IPCC values from the 2006 IPCC Guidelines for National GHG Inventories for net calorific values and carbon Emission Factors for fuels instead of plant-specific values technology provider's name plate power plant efficiency or the anticipated energy efficiency documented in official sources (instead of calculating it from fuel consumption and power output). This is likely to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than name plate performance would imply; conservative estimates of power plant efficiencies, based on expert judgments on the basis of the plant's technology, size and commissioning date; or
4. *Calculated*, for the simple OM and the average OM, using aggregated generation and fuel consumption data, in cases where more disaggregated data is not available.

STEP 5. Calculate the build margin (BM) emission factor;

STEP 6. Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

Delineation by the DNA

The DNA in Kenya has not published a delineation of the project electricity system and connected electricity system. In this regard, the definition for the project electricity system and any connected electricity system has been done in accordance with the version 02.2.1 of the tool.

A grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

For the purpose of determining the grid emission factor, the relevant project electricity system is the national electricity grid of Kenya.

A connected electricity system is an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

Electricity is imported from the Ugandan grid via 132 kV transmission line. However, the Ugandan grid is not described as a connected electricity system based on the following arguments:

- The imports from Uganda are less than 0.5% of Kenya's total[20], and exports are similarly small[21]. The result is close to net zero imports / exports over the interconnector.
- Kenya Power transmits excess units generated by Aggreko Limited to Uganda Electricity Transmission Company Limited (UETCL), whereas UETCL transmits back its own excess power to the Company at the same charge rate as that billed to them. This serves as a system balance with no real import or export activity being carried and hence is not a connected electricity system.

The Kenyan DNA has not published a delineation of the project electricity system and connected electricity system. For the purpose of determining the grid emission factor, the relevant project electricity system is the national electricity grid of Kenya.

Imports:

For the purpose of determining the operating margin emission factor, the applied GEF calculator uses 0tCO_2/MWh for net electricity imports from UETCL, which is the relevant connected electricity system.

Exports:

There are no exports from the national grid of Kenya.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

[20]Annual Report, KPLC (2011), page 88

[21]Annual Report, KPLC (2011), page 115

The project activity has selected **Option I** where only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The project activity applies Dispatch data analysis OM method based on the following reasons:

- Hourly generation data is available from the KPLC's dispatch center;
- Off-grid power plants are not included in the project electricity system;
- KPLC provides an accredited tool that uses dispatch data for OM calculation.

Data vintage for the whole crediting period:

The project activity uses *ex ante* data vintage for the calculation of GEF. The dispatch data analysis OM method requires annual monitoring of *EFgrid,OM-DD,y*.Therefore, *EFgrid,OM-DD,y* will be updated annually as per the provisions in the tool.

Step 4: Calculate the operating margin emission factor according to the selected method

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the grid power unitsthat are actually dispatched at the margin during each hour *h* where the project is displacing gridelectricity. The emission factor is calculated using equation (5) below:

$$EF_{grid,OM-DD,y} = \frac{\sum_{h} EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}} \quad \textbf{(5)}$$

Where:

$EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{PJ,h}$ = Electricity displaced by the project activity in hour *h* of year *y* (MWh)

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* inyear*y* (tCO_2/MWh)

$EG_{PJ,y}$ = Total electricity displaced by the project activity in year *y* (MWh)

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

Hourly fuel consumption data:

Where this is available, $EF_{EL,DD,h}$is calculated using equation (6) below:

$$EF_{EL,DD,h} = \frac{\sum_{i,n} FC_{i,n,h} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{n} EG_{n,h}} \quad \textbf{(6)}$$

Where:

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year *y* (tCO_2/MWh)

$FC_{i,n,h}$ = Amount of fossil fuel type *i*consumed by grid power unit *n* in hour *h* (Mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i*in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i*in year *y* (tCO_2/GJ)

$EG_{n,h}$ = Electricity generated and delivered to the grid by grid power unit *n* in hour *h* (MWh)

n = Grid power units in the top of the dispatch (as defined below)

i = Fossil fuel types combusted in grid power unit *n* in year *y*

h = Hours in year *y* in which the project activity is displacing grid electricity

y = Year in which the project activity is displacing grid electricity

Else:

The hourly emissions factor was calculated based on the energy efficiency of the grid power unitand the fuel type used, as follows in equation (7) below:

$$EF_{EL,DD,h} = \frac{\sum_{n} EG_{n,h} \times EF_{EL,n,y}}{\sum_{n} EG_{n,h}} \quad \textbf{(7)}$$

Where:

$EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour *h* in year*y* (tCO_2/MWh)

$EG_{n,h}$ = Net quantity of electricity generated and delivered to the grid by grid power unit *n* in hour*h* (MWh)

$EF_{EL,n,y}$ = CO_2 emission factor of grid power unit *n* in year *y* (tCO_2/MWh)

n = Grid power units in the top of the dispatch (as defined below)

h = Hours in year y in which the project activity is displacing grid electricity

Determination of $EF_{EL,m,y}$

Wheredata on fuel consumption and electricity generation is available,the emission factor ($EF_{EL,m,y}$)was determined using **Option A1** as shown in equation (8) below:

$$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

(8)

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type *i*consumed by power unit *m* in year *y* (Mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i*in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i*in year *y* (tCO_2/GJ)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

m = All power units serving the grid in year *y* except low-cost/must-run power units

I = All fossil fuel types combusted in power unit *m* in year *y*

y = The relevant year

For power units where data on electricity generation only and the fuel types used isavailable, the emission factor was determined using Option A2 based on the CO_2 emission factor of the fueltype used and the efficiency of the power unit, as follows in equation (9) below:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \cdot 3.6}{\eta_{m,y}} \quad \textbf{(9)}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type *i*used in power unit *m* in year *y* (tCO_2/GJ)

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit *m* in year *y* (ratio)

m = All power units serving the grid in year *y* except low-cost/must-run power units

y = The relevant year

Determination of the set of grid power units *n* that are in the top of the dispatch

The applied GEF calculator applies merit (dispatch) orders for power plants based on incremental costs. This data is provided by the national Dispatch Center at Kenya Power which is in line with the provisions of the tool.

The merit order[22] is used for stacking of each grid power plant generation at each hour h. For purposes of deriving the set of grid power units *n*that are in the top of the dispatch, the greater of either:

a) 10%; or
b) The quantity of electricity displaced by the project activity during hour *h* divided by the total electricity generation by grid power plants during that hour *h*.

The above choice was made with regard to net electricity savings as a percentage of the total grid generation.

Step 5: Calculate the build margin (BM) emission factor

Data vintage:

The method for calculation chosen is **Option I**, where the build margin emission factor is calculated *ex ante* based on data for 2011 which is the most recent year.

Capacity additions:

Capacity additions from retrofits of power plants were not included in the calculation of the build margin emission factor.

Power units m for build margin calculation:

The sample group of power units *m* used to calculate the build margin was determined as per the following procedure, consistent with the data vintage selected above:

[22]Source: KPLC monthly ranking order based on variable costs

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units) and determine their annual electricity generation (AEGSET-5-units, in MWh);

Table 13 Dispatch Tool: Set of 5 plants built most recently (excluding CDM)

Power Station	Commisioning date	CDM	Electricity generation Based on Data Import EGm,y	Emission Factor of Plant Efel,m,y	Set of 5 plants built most recently (excl. CDM) $SET_{5-units}$
AGGREKO (Muhoroni)	10/1/2011		17,081	0.7164	1
AGGREKO (Embakasi) 7	9/23/2011		27,821	0.6811	2
AGGREKO (Embakasi) 6	9/22/2011		75,868	1.1112	3
WELLHEAD OLKARIA	9/1/2011				4
KIPEVU DIESEL 3	1/12/2011		597,637	0.5993	5
AGGREKO (Embakasi) 5	1/2/2010		71,027	0.5303	
NGONG WIND TOTAL	1/1/2010		17,436		
IMENTI TEA FACTORY	12/1/2009				
AGGREKO (Embakasi) 4	10/1/2009		165,192	0.5161	
AGGREKO (Naivasha)	9/1/2009			0.6617	
RABAI POWER	8/2/2009		386,779	0.5939	
AGGREKO (Embakasi) 3	8/1/2009			0.6617	
IBERAFRICA 2	7/1/2009		382,836	0.6800	
AGGREKO (Embakasi) 2	5/1/2008			0.6617	
SONDU MIRIU	11/1/2007		367,626		
AGGREKO (Eldoret)	1/3/2006			0.6617	
AGGREKO (Embakasi) 1	1/2/2006			0.6617	
FIAT	1/1/2006			0.6617	
OLKARIA 2	1/1/2003	cdm	843,448		
TSAVO	1/2/2001		384,054	0.6313	
MUMIAS POWER	1/1/2001	cdm	80,217		
ORPOWER4 STEAM	1/1/2000		365,871		
GITARU	1/2/1999		721,992		
KIPEVU DIESEL	1/1/1999		234,390	0.6424	
IBERAFRICA 1-old	5/1/1997		381,123	0.6831	
KIPEVU GT 2	1/3/1997		22,115	0.6443	
KIPEVU GT 1	1/2/1997			0.8364	
TURKWEL	1/1/1991		502,851		
KIAMBERE	1/1/1988		758,890		
OLKARIA 1	1/2/1981		231,133		
MASINGA	1/1/1981		152,025		
KAMBURU	1/1/1976		362,503		
KIPEVU STEAM	1/1/1972			0.7248	
KINDARUMA	1/1/1968		144,156		
GOGO	1/1/1958		5,982		
SOSIANI	1/3/1955		1,280		
SAGANA	1/2/1955		8,049		
TANA	1/1/1955		77,525		
WANJII	1/1/1954		42,911		
MESCO	1/1/1933				
NDULA	1/1/1925				
Total EG	**7,429,820**				**718,407**

b) Determine the annual electricity generation of the project electricity system, excluding powerunits registered as CDM project activities (AEGtotal, in MWh). Identify the set of power units,excluding power units registered as CDM project activities, that started to supply electricity tothe grid most recently and that comprise 20% of AEGtotal (if 20% falls on part of the generationof a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determinetheir annual electricity generation(AEGSET-≥20%, in MWh);

Table 14 Dispatch Tool: Set of plants that started to supply electricity most recently and comprises 20% of EG (excluding CDM)

Power Station	Commisioning date	CDM	Electricity generation Based on Data Import EGm,y	Set of plants that started to supply electricity most recently and comprises 20 % of EG (excl. CDM) $SET_{>20\%}$
AGGREKO (Muhoroni)	10/1/2011		17,081	1
AGGREKO (Embakasi) 7	9/23/2011		27,821	2
AGGREKO (Embakasi) 6	9/22/2011		75,868	3
WELLHEAD OLKARIA	9/1/2011			4
KIPEVU DIESEL 3	1/12/2011		597,637	5
AGGREKO (Embakasi) 5	1/2/2010		71,027	6
NGONG WIND TOTAL	1/1/2010		17,436	7
IMENTI TEA FACTORY	12/1/2009			8
AGGREKO (Embakasi) 4	10/1/2009		165,192	9
AGGREKO (Naivasha)	9/1/2009			10
RABAI POWER	8/2/2009		386,779	11
AGGREKO (Embakasi) 3	8/1/2009			12
IBERAFRICA 2	7/1/2009		382,836	13
AGGREKO (Embakasi) 2	5/1/2008			
SONDU MIRIU	11/1/2007		367,626	
AGGREKO (Eldoret)	1/3/2006			
AGGREKO (Embakasi) 1	1/2/2006			
FIAT	1/1/2006			
OLKARIA 2	1/1/2003	cdm	843,448	
TSAVO	1/2/2001		384,054	
MUMIAS POWER	1/1/2001	cdm	80,217	
ORPOWER4 STEAM	1/1/2000		365,871	
GITARU	1/2/1999		721,992	
KIPEVU DIESEL	1/1/1999		234,390	
IBERAFRICA 1-old	5/1/1997		381,123	
KIPEVU GT 2	1/3/1997		22,115	
KIPEVU GT 1	1/2/1997			
TURKWEL	1/1/1991		502,851	
KIAMBERE	1/1/1988		758,890	
OLKARIA 1	1/2/1981		231,133	
MASINGA	1/1/1981		152,025	
KAMBURU	1/1/1976		362,503	
KIPEVU STEAM	1/1/1972			
KINDARUMA	1/1/1968		144,156	
GOGO	1/1/1958		5,982	
SOSIANI	1/3/1955		1,280	
SAGANA	1/2/1955		8,049	
TANA	1/1/1955		77,525	
WANJII	1/1/1954		42,911	
MESCO	1/1/1933			
NDULA	1/1/1925			
Total EG	**7,429,820**			**1,741,679**

c) From SET5-units and SET≥20% select the set of power units that comprises the larger annualelectricity generation (SETsample);

Identify the date when the power units in SETsample started to supply electricity to the grid.If none of the power units in SETsample started to supply electricity to the grid more than 10 yearsago, then use SETsample to calculate the build margin.

There being no power plant identified in this set, the build margin was calculated as the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which electricity generation data is available, calculated as shown in equation (10) below:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (10)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

Table 15 Dispatch Tool: Calculation of the Build Margin ($EF_{grid,BM,y}$)

Power Station	Electricity generation Based on Data Import EGm,y	Emission Factor of Plant Efel,m,y	Set of 5 plants built most recently (excl. CDM) SET_{5_units}	Set of plants that started to supply electricity most recently and comprises 20 % of EG (excl. CDM) $SET_{>20\%}$	Select the set of power units that comprises the larger annual energy generation SET_{sample}	Sub-Step: excluding plants > 10 years from "SET>20%" $SET_{excl>10years}$	Including CDM projects step by step until the set comprises 20% of EG $SET_{sample-CDM}$	Including plants > 10 years step by step until the set comprises 20% of EG $SET_{sample-CDM->10yrs}$
AGGREKO (Muhoroni)	17,081	0.7164	1	1	**1**	1	1	1
AGGREKO (Embakasi) 7	27,821	0.6811	2	2	**2**	2	2	2
AGGREKO (Embakasi) 6	75,868	1.1112	3	3	**3**	3	3	3
WELLHEAD OLKARIA			4	4	**4**	4	4	4
KIPEVU DIESEL 1	597,637	0.5993	5	5	**5**	5	5	5
AGGREKO (Embakasi) 5	71,027	0.5303		6	**6**	6	6	6
NGONG WIND TOTAL	17,436			7	**7**	7	7	7
IMENTI TEA FACTORY				8	**8**	8	8	8
AGGREKO (Embakasi) 4	165,192	0.5161		9	**9**	9	9	9
AGGREKO (Naivasha)		0.6617		10	**10**	10	10	10
RABAI POWER	386,779	0.5939		11	**11**	11	11	11
AGGREKO (Embakasi) 3		0.6617		12	**12**	12	12	12
IBERAFRICA 2	382,836	0.6800		13	**13**	13	13	13
AGGREKO (Embakasi) 2		0.6617						
SONDU MIRIU	367,626							
AGGREKO (Eldoret)		0.6617						
AGGREKO (Embakasi) 1		0.6617						
FIAT		0.6617						
OLKARIA 2	843,448							
TSAVO	384,054	0.6313						
MUMIAS POWER	80,217							
ORPOWER4 STEAM	365,871							
GITARU	721,992							
KIPEVU DIESEL	234,390	0.6424						
IBERAFRICA 1-old	381,123	0.6831						
KIPEVU GT 2	22,115	0.6443						
KIPEVU GT 1		0.8364						
TURKWEL	502,851							
KIAMBERE	758,890							
OLKARIA 1	231,133							
MASINGA	152,025							
KAMBURU	362,503							
KIPEVU STEAM		0.7248						
KINDARUMA	144,156							
GOGO	5,982							
SOSIANI	1,280							
SAGANA	8,049							
TANA	77,525							
WANJII	42,911							
MESCO								
NDULA								
Total EG			**718,407**	**1,741,679**	**1,741,679**	**1,741,679**	**1,741,679**	**1,741,679**
20 % of Total EG								

Decision tree

Is there at least one power unit older than 10 years in the set?

If yes: | If no: no

Excluding power unit older than 10 years and including power units registered in the CDM

Does the set comprise at least 20% of generation?

If no: | If yes: yes

Include power units older than 10 years until the set comprises 20 % of generation.

SET to choose:	
SETsample	
EFgrid,BM,y	*0.6239*

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on a weighted average CM as shown in equation (11) as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (11)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The applied GEF calculator uses recommended default values by the tool as: WOM = 0.5 and WBM = 0.5.

Table 16 Dispatch Tool: Calculation of the Combined Margin ($EF_{grid,CM,y}$)

KPLC Grid Emision Factor

The Combined margin, EFgrid,CM,y

Wind and solar power generation project activities					
EFgrid,OM	wOM	EFgrid,BM	wBM	EFgrid,CM	0.6639
0.677	0.75	0.624	0.25		

All other activities					
EFgrid,OM	wOM	EFgrid,BM	wBM	EFgrid,CM	0.6505
0.677	0.50	0.624	0.50		

Table 18: Green Light for Africa ex ante Calculation of Emission Reductions

VARIABLE	YEAR										
	1	2	3	4	5	6	7	8	9	10	TOTAL
LFR	*0.0426*	*0.0852*	*0.1278*	*0.1703*	*0.2129*	*0.2555*	*0.2981*	*0.3407*	*0.3833*	*0.4258*	
ES (kW h)	*64*	*64*	*64*	*64*	*64*	*64*	*64*	*64*	*64*	*64*	**644**
NES (kW h)	*59,771,411*	*57,112,938*	*54,454,466*	*51,795,993*	*49,137,520*	*46,479,048*	*43,820,575*	*41,162,103*	*38,503,630*	*35,845,158*	**478,082,842**
ER (tCO2/MW h)	*38,881*	*37,152*	*35,423*	*33,693*	*31,964*	*30,235*	*28,505*	*26,776*	*25,047*	*23,317*	**310,993**

INPUTS					
ENTER DATA IN HIGHLIGHTED BLUE CELLS ONLY					
Energy Savings	***Unit***	***Input***	***Instruction***	**Information source**	**Location / File Name**
Average Baseline wattage	Watts (W)	68.127	*Enter forecast average baseline wattage c*	*KPLC Phase 1 Audit Data*	'Bulb Wattage' tab in ER calculations sheet
Project wattage	Watts (W)	17.703	*Enter forecast average wattage of CFLs*	*KPLC Phase 1 & Specification*	As above and *March_2012SpecCompactFluorescentLamps_ver_01.d*
Avg daily op hrs	Hours	3.5	Default value of 3.5 hours used	AMS II.J/Version 4	
Avg operating hours per ye	Hours	1277.5	Default value of 3.5 hours* 365 days	AMS II.J/Version 4	
Lamp Failure Rate					
Rated avg life	Hours	15,000	*Enter rated average life of CFLs (in hours)*	*KPLC Specifications*	*March_2012SpecCompactFluorescentLamps_ver_01.docx*
Net Energy Savings					
No. bulbs	Number	870,000	*Enter number of CFLs in SSC-CPA*	*Optimised for 60 GWh p.a. l*	
T&D losses	Percentage	14.72%	*Enter Transmission & Distrbution losses*	*Manitoba Hydro / KPLC Stud*	*Manitoba Hydro / KPLC (2006).zip*
NTG	Number	0.95	Default value of 0.95 used	AMS II.J/Version 4	
Emission Reduction					
Emission factor	tCO2/MWh	0.6505	*Enter Grid emmission factor*	*KPLC Dispatch Tool*	*Annex 3 in CPA1-DD,* 120405 Dispatch Tool Green Light.xlsm

Aggregate energy savings	**PASS**	Aggregate energy savings are below SSC threshold

Appendix 5. Further background information on monitoring plan

As per the Green Light for Africa SSC-PoA and as described in Paragraph 19 of the applied approved methodology (AMS II.J/Version4) monitoring includes (i) recording of lamp distribution data, and (ii) *ex post* monitoring surveys, these including:

(iii) During SSC-CPA implementation, the following data is to be recorded:

- Number of pieces of equipment distributed under the project activity, identified by the type of equipment and the date of supply;
- The number and power of the replaced devices;
- Data to unambiguously identify the recipient of the equipment distributed under the project activity;

(iv) The Emission Reductions are calculated *ex ante* and adjusted *ex post* following the monitoring surveys.

SSC-CPA implementation record keeping system

At the time of install/exchange of project CFLs, KPLC staff or their suitably-qualified agents will record on official hardcopy forms the following information:

- The address where the exchange was undertaken.
- Number of CFLs installed.
- Nameplate power rating of CFLs supplied.
- Date of supply.
- The number and nameplate rated power of ICLs replaced.
- Customer Account Number corresponding to the meter of the householder receiving CFLs.

- Signature of householder that they relinquish any rights over the CERs generated from the project CFLs to KPLC.

Data captured in these hardcopy forms will then be coded by KPLC or their suitably-qualified agents and stored electronically in a database, which will be managed by the CME. During this coding checks will be undertaken by KPLC or their suitably-qualified agents, with guidance from the CME, for accuracy and completeness of data collected. Hardcopy forms will be securely stored in a central locationby KPLC or their suitably-qualified agents.

Documented third party evidence will be held verifying the destruction/recycling of the ICLs replaced in the SSC-CPA.

Information from the SSC-CPA record keeping system will be consolidated and stored in the CME project database.

Ex post monitoring survey

Annex 4 of the Green Light for Africa SSC-PoA details the survey principles that shall be followed for the *ex post* monitoring survey related to determining number of CFLs placed in service and operating under the project activity, these being:

- The sampling size is determined by minimum 90% confidence interval and the 10% maximum error margin; the size of the sample shall be no less than 100;
- Sampling must be statistically robust and relevant i.e., the survey has a random distribution and is representative of target population (size, location);
- The method to select respondents for interviews is random;
- The survey is conducted by site visits;
- Only persons over age 12 are interviewed;
- The project document must contain the design details of the survey.

The PoA CME is responsible for undertaking the ex post monitoring survey.

In accordance with the Green Light for Africa SSC-PoA, the sampling plan for the *ex post* monitoring survey is presented below.

The sampling plan for the proposed CPA described below has been developed using Version 03, EB 69 Annex 4, "*Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities"*.

(c) Sampling Design:

(vi) Objectives and Reliability Requirements:

The sampling objective is to obtain a statistically robust estimate of key variables used in calculation of Emission Reductions, specifically, the Lamp Failure Rate ($LFR_{i,y}$).

The objective is to determine parameter LFRi,y for the monitoring period with a 90/10 confidence/precision. The sampling is conducted at the CPA-level. This means that each CPA under the PoA will be sampled individually in order to obtain the lamp failure rate. The data to be collected will consist of identifying and recording the number of CFLs, marked with clear unique identification as part of the PoA, that are installed and operating in households participating in the SSC-CPA. Only CFLs with original markings will be counted.

(vii) Target population

The target population is those households that have participated in the SSC-CPA(s).

(viii) Sampling Method

A "Simple Random Sample" will be taken from the sampling frame (households that have participated in the SSC-CPA). The random sample will be undertaken by the outsourced third party expert provider of market research services (refer implementation section) using an industry best practice approach. The approach to sampling will be transparently documented in their report.

(ix) Sample Size

As per the applied methodology, the desired precision is a minimum 90% confidence interval and the 10% maximum error margin.

To determine the sample size (n), the approximate equation on paragraph 54, EB 69 Annex 5, *"Guidelines for Sampling for CDM Project Activities and Programme of Activities"* is applied as below:

$$n = \frac{1.645^2(1-p)}{0.1^2 \times p}$$

Where:

n = Sample size
p = Expected proportion
1.645 = Required 90% confidence
0.1 = 10% relative precision

As per paragraph 11 (a) of the '*Standard for sampling and surveys for CDM project activities and programme of activities*' Version 3, the project proponent may usethe larger of the two proportions in the sample size calculation. Therefore in year 1 where a Lamp Failure Rate of 4.26% has been used, a proportion of 95.74% may be applied to the sample size equation.

Therefore the sample size will be given by:

$$n \quad \frac{1.645^2 \times (1 \quad 0.9574)}{0.1^2 \times 0.9574}$$

$$n \quad 13 \text{ (rounded up from 12.04)}$$

Please note that as per paragraph 20 of AMS-II.J Version 4, a minimum sample size of 100 is required to determine the number of CFLs placed in service and operating under the project activity. As the calculated sample size is less than 100,as per paragraph 20 of AMS-II.J Version 4, a minimum sample size of 100 will be surveyed for the first monitoring period. Therefore:

$$n \quad 100 \text{ (minimum)}$$

Surveys will be conducted through site visits to a random sample of households that have participated in the SSC-CPA(s). Only persons over age 12 will be interviewed as part of the survey. The first survey will be conducted within the first year after installation of project CFLs. The project activity has chosen option 1 of paragraph 17 (b) of the applied methodology i.e. subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years.

Table 7: Sample size for ex-post monitoring surveys for the first CPA[23]:

Year	1	4	7	10
Lamp Failure Rate, LFR (%)	4.26	17.03	29.81	42.58
Proportion of Operational Lamps (%)	95.74	82.97	70.19	57.42
Calculated sample size, n (households)	12.04	55.56	114.92	200.69
Required sample size, n (households)	100	100	115	201

(x) Sampling frame

A sampling frame is a list of all members of a population used as a basis for sampling. The sampling frame to be used here is all households that have participated in the SSC-CPA(s).

(d) Data to be collected

(v) Field measurements

The variables to be measured under each CPA are as follows:

- Lamp Failure Rate ($LFR_{i,y}$) for CFLs distributed under the CPA

The first survey will be conducted within the first year after installation ofproject CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years.

(vi) Quality Assurance/Quality Control

The data collection will be undertaken by an expert third party service provider (e.g. market research company). In contracting an expert third party service provider, the CME will conduct a"Request for Tender" process that will specify and assess providers experience, capacity and skills in designing and delivering similar surveys.

The CME will select and establish a contract with the preferred expert third party service provider. In broad terms they will be required to:

- Randomly select households from CME Project Database related to the SSC-CPA to be surveyed
- Visit identified households and assess:
  - Number of CFLs installed
  - Type of CFL installed (if more than one type of CFL was distributed under the SSC-CPA)
  - If installed CFLs carry the clear unique identification of the Green Light for Africa Programme of Activities
  - If installed CFLs carrying unique identification operating
- Provide robust and transparent collection and collation of data
- Provide written report(s)

(vii) Analysis

Lamp Failure Rate (LFRi,y)data will be collected, and will be used to calculate emission reductions

[23] Source: CPA 0001 ex ante emission reduction calculations

for relevant monitoring period (s). The first survey will be conducted within the first year after installation of project CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10

(viii) Implementation:
The first survey will be conducted within the first year after installation of project CFLs. Subsequent surveys will be carried out a minimum of once every 3 years. As such the first survey will be conducted in Year 1 and the subsequent surveys will take place in Years 4, Years 7 and Year 10(depending on the length of the crediting period). Subsequent surveys may be undertaken more frequently than once every 3 years. The CME will outsource the Lamp Failure Rate survey to an experienced and qualified third party firm.

Appendix 6. Summary of post registration changes

The CPA implementer (i.e. KPLC) realised that all households that will receive CFLs do not have street addresses or house number within the geographical boundary of Kenya. The CPA implementer hence decided to use GPS coordinates so that the households that will receive CFLs can be accurately recorded and located. Thus, the project participant is requesting to revise the registered monitoring plan. The proposal is to include the GPS coordinates of the households that will receive CFLs as the registered monitoring plan has only provision to capture the address of the households.

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Document information

Version	*Date*	*Description*
03.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the component project activity design document form for small-scale CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form for small-scale component project activities" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM in A.14. and Appendix 1; • Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and **Error! Reference source not found.**; • Change the reference number from *F-CDM-SSC-CPA-DD* to *CDM-SSC-CPA-DD-FORM*; • Editorial improvement.
02.0	13 March 2012	EB 66, Annex 17 Revision required to ensure consistency with the "Guidelines for completing the component project design document form for small-scale component project activities".
01.0	27 July 2007	EB33, Annex44

Version	Date	Description
		Initial adoption.

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