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

CONTENTS

Annexes

NOTE:

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

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

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

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

>> Project to replace fossil fuel based lighting with Solar LED lamps in East Africa:
Date: 15th August 2011.
Version 01

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

>> The Project to replace fossil fuel based lighting with Solar LED lamps in East Africa ("POA" or "Projects") is a voluntary initiative by Tough Stuff International ("Tough Stuff") with specific focus on the replacement of fossil fuel (kerosene) based domestic lighting systems by installation of solar charged LED lamps. The solar lamps will replace 100% of the fossil fuel traditionally used for domestic lighting.

Statistics on use of kerosene based lighting applications in Sub-Saharan Africa reveal a dire situation where approximately half a billion people in the region lack access to electricity and therefore have no choice but to use kerosene lamps for domestic lighting[1].

Small scale CPA under this proposed PoA will be implemented by Tough Stuff and other companies operating in the PoA project boundary and will access either financing or technology independently or from the PoA which will enable these companies to further disseminate solar lantern applications.

The use of fossil fuel based lighting has numerous adverse environmental, economic and social effects. In its stead the following parameters highlight the contribution to sustainable development that will be realized by implementation of the proposed PoA-DD.

Environmental:

1. Reduction of anthropogenic emissions associated with the use of fossil fuel based lighting applications, specifically kerosene lamps.
2. Reduction of indoor air pollution.

Economic:

1. Domestic savings realized from the diminished consumption of fossil fuel.
2. Domestic savings on medical bills/fees traditionally attributed to illnesses associated with indoor air pollution.

Social:

1. Improved domestic lighting with increased lumen output as compared to kerosene lamps. Providing a better environment for children to study in devoid of the low quality lighting and eye irritation previously witnessed with the traditional based kerosene lamps.

[1] IFC: http://www.ifc.org/IFCExt/africa.nsf/ContentPageDesignPreview/D8EF5023E7DCA44242257444002DBB31?OpenDocument&PreviewStyle=9D66A9622EB40AE64225776600531512

2. Increased awareness on the use environmentally friendly lighting applications and the adverse effects of traditional fossil fuel lighting applications creating social awareness on the need to conserve the environment and the health of their families.

1. General operating and implementing framework of PoA

Tough Stuff will coordinate this small-scale Programme of Activities (SSC-PoA) and will implement a CDM Programme of Activities in different parts of East Africa. The key focus of this SSC PoA is the replacement of fossil fuel lighting applications at the domestic/non-residential level.

- **Access to efficient lighting systems:**

Global lighting-related CO_2 emissions were estimated to be 1900 million tons in 2005, which was about 7% of the total global CO2 emissions from the consumption and flaring of fossil fuels[2]. In Sub-Saharan Africa these figures are amplified by poverty, poor infrastructure and subsequent poor access to electricity.

Parameter	Value
Access to Electricity	23%*
Energy Poor in Africa	500 million people**
Annual Expenditure on Fuel Based Lighting	$17 billion

Table 1: Statistics on Electricity and Lighting in Africa[3]

*Average estimate
**Projection anticipated by the year 2030

While the levels of illumination provided by flame based lamps are far lower than with modern electric lighting, the efficiency of fuel-based light production is also low. The result is a substantial amount of primary energy use with little service received in return.

For individual households, the cost of kerosene is a burden and is far more expensive than electric lighting. The cost per useful lighting energy services ($/lumen-hour of light) for kerosene lighting is 325-times higher than that for "inefficient" incandescent lighting and 1625-times higher than for compact-fluorescent lighting. To put these numbers in perspective, the total annual light consumption (about 12000 lumen-hours) in a typical un-electrified household is equivalent to that produced by a 100-watt incandescent bulb in 10 hours. While households lit with flame-based lighting spend approximate the same amount of money each year on lighting (approximately $100/year), they receive far less than one percent as much lighting services as their counterparts in electrically-lit homes in IEA countries.

There are a wide variety of fuel-based light sources, including candles, oil lamps, ordinary kerosene lamps, pressurized kerosene lamps, biogas lamps, and propane lamps. According to most studies,

[2] Lighting Laboratory Report: summary and conclusions
http://www.lightinglab.fi/IEAAnnex45/guidebook/13_summary_conclusions.pdf

[3] IFC
http://www.ifc.org/IFCExt/africa.nsf/ContentPageDesignPreview/D8EF5023E7DCA44242257444002DBB31?OpenDocument&PreviewStyle=9D66A9622EB40AE64225776600531512

ordinary wick-based kerosene lamps are the most common type of fuel-based lighting in developing countries. Ironically, more efficient kerosene lamps tend to increase both light output and fuel consumption, whereas an efficient electric compact fluorescent lamp provides an eight-fold reduction in primary energy consumption compared to standard incandescent light sources[4].

- **Reduced In-Door Air pollution**

The use of kerosene lamps for domestic lighting is widely associated with harmful indoor air pollution. As a product of the combustion reaction, gases such as sulfur dioxide, carbon monoxide and carbon dioxide are produced. Kerosene lamps are a preferred lighting option for the rural and urban poor; and with no or limited access to electricity, this demographic often live in poorly ventilated and crowded living conditions. The use of these fuels in homes with poor or no ventilation is particularly troublesome because this smoke has been associated with a variety of negative health outcomes, the most notable being lung cancer[5].

The World Health Organization (WHO) has assessed the contribution of a range of risk factors to the burden of disease and revealed indoor air pollution as the 8th most important risk factor which was responsible for 2.7% of the global burden of disease. Globally, indoor air pollution from fossil fuel use is responsible for 1.6 million deaths due to pneumonia, chronic respiratory disease and lung cancer, with the overall disease burden (in Disability-Adjusted Life Years or DALYs, a measure combining years of life lost due to disability and death) exceeding the burden from outdoor air pollution fivefold. In high-mortality developing countries, indoor smoke is responsible for an estimated 3.7% of the overall disease burden, making it the most lethal killer after malnutrition, unsafe sex and lack of safe water and sanitation[6].

- **Improved Domestic Lighting:**

The low quality lighting provided by the kerosene applications restricts household productivity as follows:

- Lighting may be restricted and provided only by the fire, candles, or simple kerosene wick lamps which can be a significant source of pollution.
- The lack of light restricts activities in the home, including children's homework, reading and opportunities for income generating activities.
- Lack of access to electricity restricts the use of a wide range of appliances that can contribute to food safety (refrigerators), communication/education, leisure (radio, TV), and economic activity[7].

[4] Evan Mills PhD. International Association for Energy-Efficient Lighting and Lawrence Berkeley National Laboratory : http://evanmills.lbl.gov/pubs/pdf/global_lighting_energy.pdf

[5] Environmental Health and Indoor Air Pollution in China: http://www.wilsoncenter.org/sites/default/files/indoor_air_may07.pdf

[6] WHO Fact Sheet on In-Door Air Pollution:

http://www.who.int/mediacentre/factsheets/fs292/en/

[7] WHO: Addressing the links between Indoor Air Pollution Household energy and Human Health http://www.who.int/mediacentre/events/HSD_Plaq_10.pdf

Figure 1: Child studying using Kerosene Hurricane Lamp

Figure 2: Children studying under an LED lantern

While there are a variety of models, arrays and types of LED lamps, it is a widely acknowledged fact that the typical LED Lantern produces greater quality useful light than the typical Kerosene lantern. This figure according to some reports is as high as 200 times better light than fuel based lighting systems[8].

2. Policy/measure or stated goal of the PoA

The principal objective of the PoA is to increase dissemination of solar charged, LED based lighting applications at the domestic level. Carbon revenues will be used to stimulate sales by reducing the Solar LED lantern price point and associated costs of marketing and promotion.

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

The coordinating/managing entity, Tough Stuff herein affirms that the proposed PoA is a voluntary action. There are no policies or statutes prompting any individuals to use Solar Lamps in households. All participation of the stakeholders to this PoA is voluntary.

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

>> Tough Stuff International is CME to the proposed PoA and will communicate directly to the Executive Board.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as a project participant (Yes/No)
Kenya	Host Party	No
Uganda	Host Party	No
Tanzania	Host Party	No

[8] Christian Science Monitor: http://www.csmonitor.com/2006/0103/p01s02-wosc.html

Rwanda	Host Party	No
Burundi	Host Party	No
Ethiopia	Host Party	No
Tough Stuff International	Coordinating/ Managing Entity	No
Viability Africa, LLC	CDM Consultant	No

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

>> The proposed PoA will disseminate solar LED lamps throughout the physical/geographical boundary as defined in Section A.4.1.2 of this PDD. These solar lamps will be distributed with the primary objective of displacing the use of kerosene lamps traditionally used for domestic lighting.

A.4.1. Location of the programme of activities:

>> The proposed PoA is will be carried out within the territorial limits of 6 East Africa Countries listed below as Host Parties.

A.4.1.1. Host Party(ies):

>> Host Parties under this PoA are: Kenya, Uganda, Tanzania, Burundi, Rwanda and Ethiopia

A.4.1.2. Physical/ Geographical boundary:

>>

Figure 3: Map of East African Countries under the PoA

The physical boundary of the PoA is the territorial limits of the 6 countries listed above and shown in the map below.

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

>> SSC-CPAs to be included in the proposed PoA will disseminate/distribute Solar LED Lamps for domestic lighting. These lamps will be used to displace fossil fuel based lighting applications, particularly Kerosene lamps, at the point of use i.e. the household in which the lamps are installed.

Each SSC- CPA will be implemented within the territorial limits of the physical/geographical boundary to which the proposed PoA is confined. To prevent double counting the SSC-CPAs will not overlap the territory identified by other SSC-CPAs included in the proposed PoA. Furthermore each CPA and the individual lamps distributed in each will be appropriately identified separately. As a small scale Programme of Activities, each CPA will be required not to exceed the 60,000 tCO_{2e} annual cap for small scale project activities. The CPAs will be required to comply with the provisions of the baseline and monitoring methodology provided for in AMS III.AR.

As CME, Tough Stuff International will coordinate the proposed PoA as well as implement an individual SSC-CPA which will be included in the SSC-PoA.

Throughout the lifetime of the PoA it is envisioned that several CPAs will continue to be included under the PoA. Monitoring for each of these CPAs will be monitored according to the monitoring plan herein described.

Key Implementation Strategies for the typical CPA under the proposed PoA:

- Awareness and Promotion:

SSC-CPAs may conduct promotion campaigns and public meetings to create awareness for the use of the Solar LED systems. These may be conducted as many times as the project implementer so wishes, as this option is left to his direction depending on the target locations in which he wishes to implement the CPA.

A proposed mechanism is these proposed promotion mechanisms is that they be conducted amongst Community Based Organizations, (CBOs), Religious groups, Women's groups and other community Welfare organizations. These organizations have been identified as pivotal to the organizational structure for fees collection and member organization.

- End-User CER Transfer Agreements

This proposed PoA and all other CPAs under it will subscribe to and receive CER revenue to subsidize the price point per Solar LED Lighting system distributed/sold as well as facilitate promotional and marketing activities.

To this end, each CPA implementer will have to secure:

1) Voluntary transfer agreements for all emission reduction to the Coordinating/Managing Entity

- Payment

The greatest impediment to the implementation of the solar LED Lighting systems is the high 'up-front' cost associated with the purchase of such systems. At the discretion of the CPA implementer, the option

of instalment based payment schemes is available. Project implementers are encouraged to take advantage of creative payment solutions such as mobile cash transfer systems that facilitate easier payments over a secure platform.

Sales receipts containing individual solar system numbers are to be issued to users upon completion of payment.

- Lighting Quality

Each CPA will need to provide independent third party testing that proves the useful life lighting quality of the solar LED lighting system. These independent tests will have to confirm with international standards as provided for in Appendix 3 of this SSC-PoA-DD.

- Monitoring

Each CPA will be accorded its individual identification number for example CPA_{01}, CPA_{02}, CPA_{n}. Subsequently, each solar LED lighting system will receive its own identification number. Each CPA will provide a total sales record to the CME who will store the data electronically up to 2 years after completion of the CPA.

- Distribution

While lamp distribution models are entirely at the discretion of the CPA Implementer, several proposed models, as defined in the following chart, are recommended as they have proven success in the Sub Saharan region.

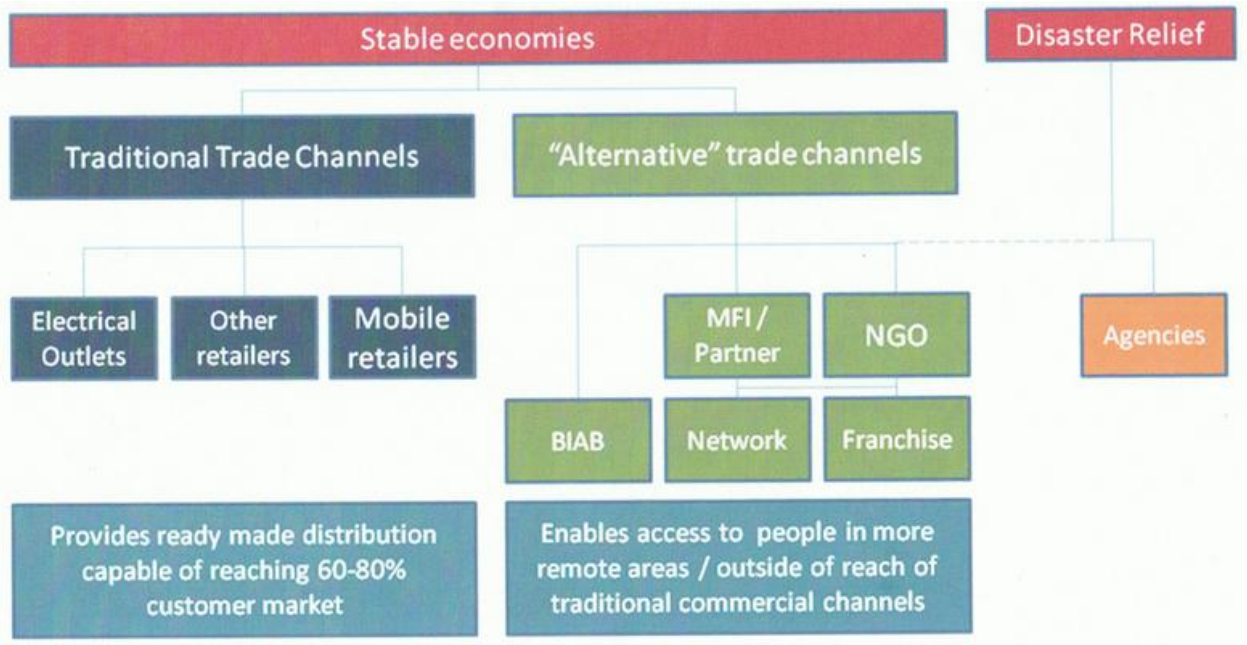

Figure 4: Proposed Distribution channels

CPA Implementers will have to approach distribution in accordance with the Monitoring methodology, where considerations of maintenance of the sales record, unique identification of the lamps distributed, and CER transfer statements/agreements are necessary and critical.

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

>> All CPAs under the proposed PoA will conform to the Indicative simplified baseline and monitoring methodologies identified below:

Sectoral Scope: 01
Type: III Other Project Activities
Category III AR: Substituting fossil fuel based lighting with LED lighting systems
Please see:
The UNFCCC CDM website at:
http://cdm.unfccc.int/UserManagement/FileStorage/OEPNS4UH9JY1VK3WRDITQ6AGBL5ZF7[9]

Solar LED Lamps:

Each CPA will provide technical description and technical details of the solar LED lantern technology at the CPA-DD level.

The solar systems to be implemented should displace the domestic lighting needs of the household so as to displace the use of kerosene lamps. An example is provided by the tough stuff Solar LED lantern system. The solar lantern has the following characteristics:

Parameter	Value
Description of the Renewable Energy System charging the LED lantern	PV module
The average rated life of the lamps	2 years (7 years with battery replacement)
The batteries' charging efficiency	≥ 50% at minimum charging voltage and maximum charging I
Duration of warranty for the lamps	1 year
Maximum charging time	8 hours sunlight or 7 hours stable power charging
Daily burn time after maximum charging	30 hours at level 1
Battery capacity (in Ampere Hours)	1800mA
Description of the lamps dust and water tightness	Meets, IEC 60529 - IP41
Duration of warranty for the Lamps	1 year
Lamp wattage	4 pcs of LEDs (3.0 - 3.2V) and < 20 mA each.
Rated Capacity of the renewable energy system charging the LED	1w solar panel x 2
Type (e.g. NiMH, Lead-Acid, Li-ion)	NiMH
Effective Useful Life of the LED lamp	10,000 hours

Table 2: Technical Description of the Tough Stuff Solar Lamps

[9] Last Accessed on 16th August 2011 at 5.09 p.m.

The solar lantern, whose technical details have been provided above, are designed to meet domestic lighting needs at a price point that is feasible without compromising the quality of useful light and lifetime of the lamps.

The Tough Stuff Solar Lighting System provides mobile phone charging components as well as radio chargeable batteries. These components are additional and will not be required from other CPAs. Furthermore only emission reductions realized from displacement of the kerosene use for lighting will be included in the proposed PoA.

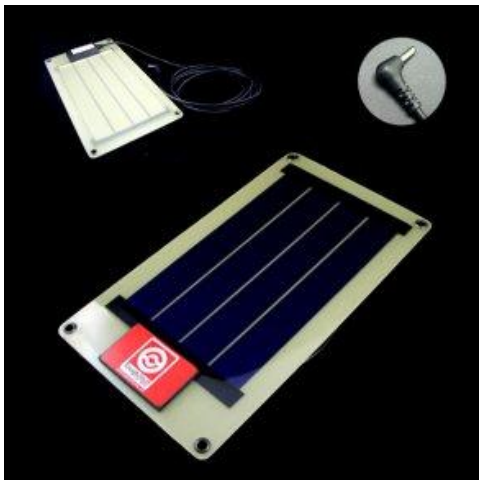

Figure 5: ToughStuff Solar Panel

Figure 6: ToughStuff Solar LED Lamps

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

>> For inclusion in the proposed PoA, each CPA must demonstrate the following:

a. The CPA will implement LED based lighting lamps in residential/non-residential settings with the objective of displacing fossil fuel based lamps.

b. The LED based lighting systems will have batteries which are charged using renewable energy systems such as photovoltaic systems.
c. The CPA project proponent must provide manufacturer certification attesting that the lamps have an average life of at least 5,000 hours as well as 50% battery charging efficiency at the time of purchase.
d. All lamps must have one year warranty.
e. Each lantern must be accorded a unique identification number at the time of completion of the CPA DD.
f. Each CPA shall meet the respective Host Parties' regulations with regard to use and disposal of batteries.
g. A maximum of 5 lamps will be distributed per household/ non-residential setting per CPA.
h. Individual SSC-CPA will not exceed 60,000 tCO_{2e} annually in its emissions reductions.
i. Proof that the households in which the LED systems have been installed traditionally relied on fossil fuel based lighting systems by way of baseline surveys or verifiable literature review.
j. Technical specifications of the lantern are provided for as described in Paragraph 6 of the indicative simplified baseline and monitoring methodologies AMS III AR.

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

>>

(i) The proposed PoA is a voluntary coordinated action;

The PoA to replace fossil fuel based lighting with Solar LED lamps in East Africa is a voluntary coordinated action of the CME, ToughStuff International. There are no mandatory requirements that force customers in East Africa to purchase solar lamps.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

The proposed PoA has not been previously announced to go ahead without the carbon financing. The following identified barriers to the project implementation and assessment of additionality has been developed in accordance with the "Tool for the demonstration and assessment of additionality".

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

Realistic and credible alternatives to the project activity are:

Alternative Scenario (a)
Installation of Solar LED Lamps without being registered as a CDM POA activity

Alternative Scenario (b)
Continued use of kerosene based lighting applications for domestic/non-residential lighting

Sub-step 1b: Consistency with mandatory laws and regulations:

Alternative Scenarios (a) and (b) are all compliant with mandatory applicable legal and regulatory requirements.

Step 2: Investment analysis

This sub-step is not used, instead the barrier analysis as described in sub-step 3 below is used.

Step 3: Barrier analysis

Under this approach we demonstrate the Project faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Three specific barriers have been identified and addressed by the project:

(a) Investment barriers
(b) Prevailing Practice
(c) Technology Costs

1. Investment Barriers

An analysis of the investment barrier extends beyond the price point analysis as subsidized by the carbon financing realized by implementation of the project activity. First the purchasing power of persons within the East African Market should be analyzed against their willingness to purchase the solar lamps. In a 2005 analysis of the Gross National Income of countries based on Purchasing Power Parity (PPP) per capita in international Dollars all 7 of the countries to be included within the PoA geographical boundary are in the bottom 50 of countries with a GNI of less than $2,000 per year[10].

This is indicative of the widespread poverty levels witnessed in the East African region. Lack of appropriate financing creates bottlenecks along the entire off-grid lighting market value chain. Most of these financing constraints are related to each other and stem from a lack of liquidity amongst both low-income consumers and the small and medium enterprises (SMEs) that comprise the majority of players in this market.

The primary financing challenges for each step of the supply chain are highlighted below:

(1) Manufacturers: Producers face two financing challenges. The first lies in initial capital for both R&D and the fixed assets for a production facility. The second challenge lies in working capital - having sufficient liquidity to purchase raw materials and produce finished goods before receiving payment.

[10] http://www.nationsonline.org/oneworld/GNI_PPP_of_countries.htm

(2) Wholesalers and large distributors: As wholesale distribution is a relatively "capital light" operation, the biggest burden comes in working capital. The wholesalers (whether they are the product owners who have outsourced its manufacturing or country-wide master distributors) are hit hard in a number of ways:

- As small businesses, they are typically offered little credit from producers;
- They typically face disproportionately high inventory levels due to a long global supply chain or poor demand predictions in early years of operations; and
- They are often required to extend credit to dealers in order to stimulate sales.

(3) Small retailers: The last-mile dealers are similarly squeezed on working capital liquidity, as they are usually small rural/peri-urban operations and face the consumer's limited ability to pay for goods or technologies.

(4) Customers: Affordability is clearly one of the leading barriers to the rapid adoption of off-grid lighting products in the developing world. Lower-income households typically cannot afford to pay a lump sum of $10 or more. It has been proven that poor consumers are willing and able to pay for off-grid lighting products under an appropriately designed credit scheme. However, we have yet to see rapid adoption of these schemes, due to the small ticket size of the product, the lack of financing for these programs, and the challenges of risk-sharing and logistics coordination between financial institutions and product companies, to name a few obstacles.

Interviews revealed additional or crosscutting themes present in the East African context:

• A limited understanding of the solar lighting industry by African banks and MFIs: A stronger emphasis must be placed on incorporating potential financial backers into industry-wide strategy going forward. Strong partnerships and relationships with lenders are an essential aspect to building trust and understanding in the market, enabling the loosening of finance markets.
• An inherent cautionary attitude to lending by banks: In part driven by a lack of market understanding among lenders, the solar lighting market must be able to demonstrate transparent market economics that demonstrate a fundamentally strong and high-potential industry.
• Available financing is often security-based, while most suppliers do not hold collateral
• High interest rates (up to 40% in certain countries): Prohibitively high interest rates negate the fundamental purpose of alternative financing plans, providing little to no incentive for their utilization.[11]

Furthermore there remains significant need for promotional and awareness campaigns given the lack of information on the use of Solar Lamps. These campaigns are often resource intensive because of the logistics, human resource and liquidity required for efficient management amongst a target group which is both diverse in cultural practice and belief and geographical location. Revenue realized from the proposed PoA will not only subsidize the price point per project lamp, it will also facilitate these campaigns and enable ToughStuff staff to operate at feasible management and corporate costs.

2. Barriers due to Prevailing Practice

[11] Solar Lighting for the Base of the Pyramid- Overview of an Emerging Market: Lighting Africa

Use of Kerosene for lighting is a widely accepted practice throughout the East African region. Despite volatile pricing based on international market prices, it remains a preferred lighting choice because of the relatively easy access points and end users familiarity with these types of lighting applications. The figure below provides a breakdown of lighting expenditure by sources and illustrates the wide variation between geographies.

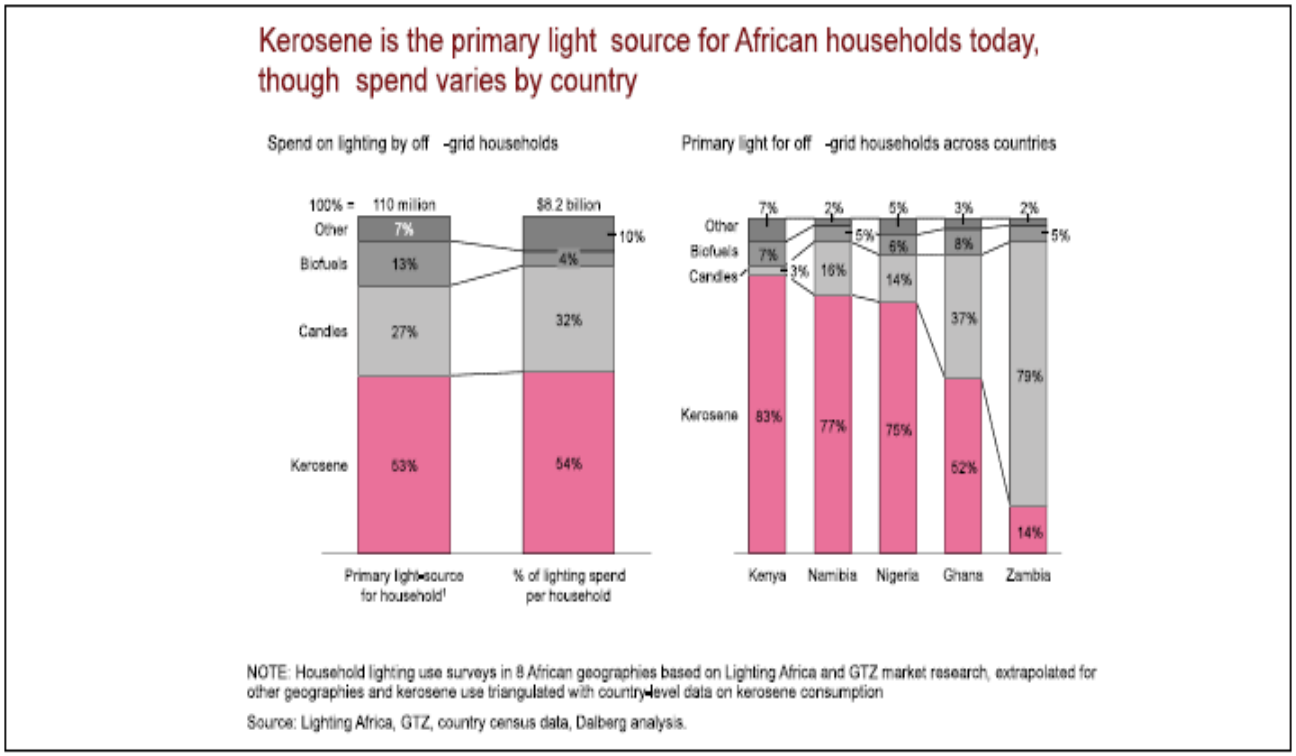

Figure 7: Kerosene consumption in African Households

Use of kerosene for domestic/residential lighting is unlikely to be phased out from being the primary light source for off-grid households in the East African region. This is due to the fact that the use of kerosene in itself is an indicator of increased economic activity in the region. Simplified, it can be stated that as households move from using biomass sources as a combined source of fuel for cooking and lighting, they move to the next most accessible and well-understood approach, i.e. combustion of Liquefied Petroleum Gas (LPG) and Kerosene[12]. Given the increased economic activity witnessed in the region in the wake of financial and political reforms, it is likely that there will be increased rather that diminished consumption of kerosene for lighting.

[12] WHO: Addressing the Links between Indoor Air Pollution, Household Energy and Human Health: http://www.who.int/mediacentre/events/HSD_Plaq_10.pdf

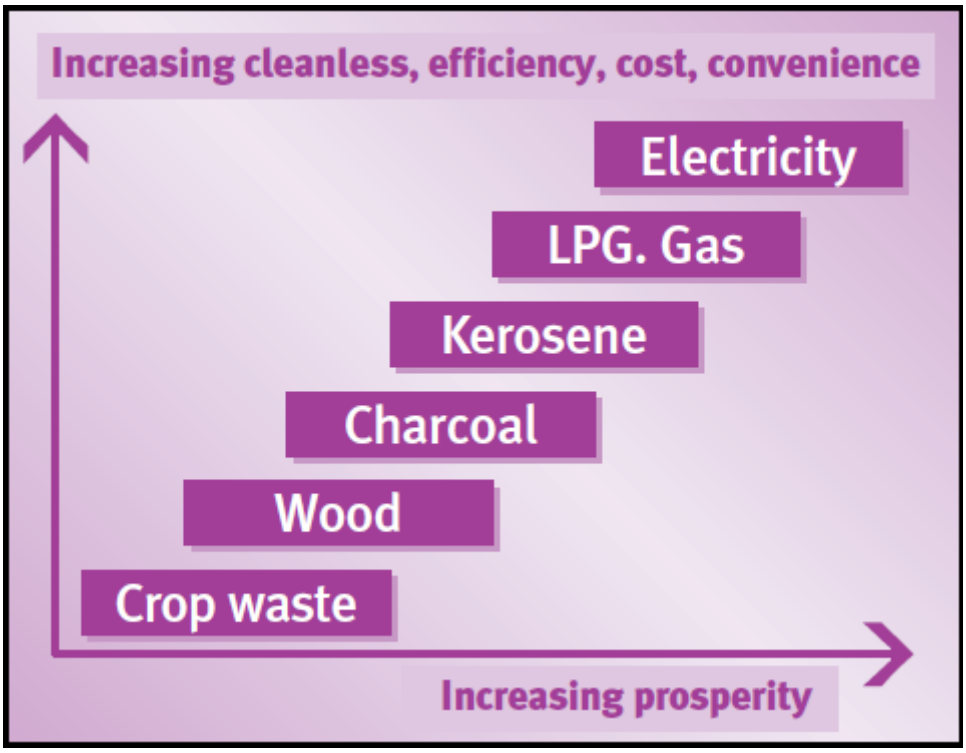

Figure 8: The energy ladder: In Practice, most households use a combination of fuels which shifts as prosperity increases.

3. Technical Barriers:

As previously mentioned there is little to no market awareness of solar lantern applications in the region. To overcome current practice, ToughStuff International and other CPA implementers will have to conduct significant marketing and awareness campaigns to educate customers to the benefits of the project activity as compared to the adverse effects of kerosene lamps.

Technical components of the solar lamp must meet international standards. This is a principle adhered to by ToughStuff International in all its solar lamp distribution projects.

The solar lamps must meet the following basic requirements:

1) Durability: The solar lamps must be tough enough to endure the weather changes typical of the East African market.
2) Simplicity: The solar lamps must meet the lighting requirements of the household setting without being difficult to operate or maintain.
3) Quality: All solar lamps must provide a lighting quality that meets internationally recognized standards.

At present many competitors in the region eye the African market as an emerging market that could have exponential growth similar to that witnessed in the telecoms industry and in particular for individual cell phone purchases. This has resulted in an influx of cheap low quality solar lamps that do not meet the requirements of the CDM methodology. By taking advantage of the lack of knowledge and poor

regulation and standardization, competitors are able to reduce price and make a quick profit without providing after sales support or at the very least warranties on each of the lamps.

Hence there remains the growing problem of market spoilage due to sales of low-quality LED lighting products (including low-quality solar lanterns) with endemic mislabelling, counterfeiting, and durability issues[13].

The main quality issues identified industry surveys were as follows:
• General construction robustness—many users and distributors reported frequent problems with the housing and the construction during transport and during day-to-day use, especially cracks and loose or faulty connections/components.
• Module cable junction—in many lanterns this seems to be a weak point in the design. Often a type of plug/socket combination is used that is not intended for frequent connection/disconnection (for example, a connector designed for audio equipment)
• The module itself—A major concern is the fact that many modules do not meet their nameplate specification and are generally poor in construction (frame, cell soldering joints, materials, and if relevant, diodes/junctions box).
• *Battery*—many batteries are of inferior quality. Several manufacturers even use batteries of different manufacturers in one lantern[14].

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

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

Alternative b: The present and continuing use of kerosene lamps across the included and identified PoA countries.

The barriers listed above do not affect Alternative b.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

There are a number of Solar PV manufacturers and distributors in the East African region. These market players are often donor dependent entities who leverage the existing poverty levels in the Sub-Saharan region to request from on-line donations and fund raising programs in the developed world[15].

Regionally there exist a number of solar lamp projects that exist solely as CDM Projects or as Donor Funded projects. Following the tool for demonstration of additionality the other CDM project activities will not be part of this analysis. However it must be understood that no other solar lamp projects of the

[13] Solar Lighting for the Base of the Pyramid: Lighting Africa

[14] World Bank: http://vle.worldbank.org/bnpp/files/TF020486ESMASolarLanterns.pdf

[15] http://www.renewableenergyworld.com/rea/news/article/2011/01/a-solar-strategy-for-africa

scale envisioned in this PoA have been achieved without carbon revenues from the CDM or other voluntary schemes.

Sub-step 4b: Discuss any similar Options that are occurring:

Projects currently occurring in the East African region for solar lamp technologies are primarily CDM/Voluntary Emissions Reductions Trading Platforms or small donor funded missions. To this date there are no solar lamp projects of this scale operating throughout the East African Region.

Having satisfied Sub-steps 4a and 4b the proposed project activity is additional.

The proposed PoA is a voluntary initiative of the CME and will not be implemented in pursuance of any mandatory requirement of the Host Countries.

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

A.4.4.1. Operational and management plan:

>> The CME for the proposed PoA shall be ToughStuff International. As CME, ToughStuff will institute the following measures for its operational, management and monitoring plan:

(i) <u>A record keeping system for each CPA under the PoA,</u>

a. The CME will keep and maintain an electronic database for each CPA included in the PoA and these records will include the following:

i. Name and unique ID number of the CPA
ii. LED Lighting System type
iii. Distribution/Implementing partners and their contact details
iv. Date of Registration of the CPA
v. Unique Serial Number sequence for lamps sold under the CPA
vi. Start date of the CPA
vii. CERs issued per verification period
viii. Total Number of lamps distributed

b. Additionally the CME will also keep a Total Sales Record derived from Sales under each CPA

i. The CPA ID
ii. Type of LED Lighting System
iii. Serial Number of the lantern sold
iv. Date the sale was made
v. Name and contact Details of the customer
vi. Name of Distributor
vii. Confirmation of the CER Transfer agreement to the CME.

(ii) **A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,**

Each CPA will be required to expressly state that it has not been registered as a single CDM project activity or as a CPA under another PoA. Furthermore each CPA will be accorded a unique serial number a series of serial numbers to identify each of the lamps sold under the particular CPA.

(iii) **The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.**

According to the "Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par.10) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.

As described in section A.4.4.1. (i) A record of the total CERs issued per CPA will be maintained to ensure that none of the individual lamps sold under the CPA does not exceed the 600 tonnes of CO2e emissions reductions per year. Default emissions reductions as defined in the indicative baseline and monitoring methodology AMS III AR are 0.08tCO2e which is far below the 1% equivalent of 600 tCO2e derived from a limit of 60,000 tCO2e.

(iv) **The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;**

As CME, Tough Stuff International will require written statements acknowledging that the CPA implementing partner subscribes to the PoA. As previously described each customer will be required to transfer all realized CERs to the CME.

A.4.4.2. Monitoring plan:

>> Each CPA under this PoA will be subject to all parameters identified in Section E.7.1. and will be monitored according to the procedures & monitoring framework established in E.7.2. The CME stores data in an electronic database and all primary data will be stored by the implementation agency according to the procedures identified in section E.7.1

The monitoring plan implemented for this PoA applies the approved small scale monitoring methodology AMS III AR "Substituting fossil fuel based lighting with LED lighting systems" (version 1).

The CME will adhere to option (ii) of section E.2 and therefore verify each CPA included in the PoA.

For monitoring and verification purposes the ToughStuff will conduct the following:

1. Confirm that each CPA's emission reductions are less than 60,000 tCO2e annually as per the approved methodology. This will be achieved by monitoring total sales, emissions per lamp and CERs per CPA.
2. Ensure that each CPA maintains a Sales Record to which data is properly entered adequately described the names and contact details of the customers as well as the unique serial number attributed to each lamp.
3. Conduct random sampling measures for households under each CPA.
4. Confirm that household/customer names are not re-entered in the same CPA or entered into other CPAs under the PoA.
5. Confirm that the unique serial numbers are not repeated in the same CPA or entered into other CPAs under the PoA.

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

>>No public funding will be used for the activity. However if a CPA does receive public funding it will be required to prove that the finance is not a diversion of official development assistance and is separate from and is not counted towards the financial obligations of the Host Party to which it operates under.

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

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

>>01/01/2012

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

>> 28 years

SECTION C. Environmental Analysis

>>

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

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

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

>> N/A

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

>> N/A

SECTION D. Stakeholders' comments

>>

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

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

The PoA covers a variety of Host Countries which encompass a variety of communities diverse in both socio-economic conditions and cultural preferences. The Local stakeholder consultation meetings will be held at SSC-CPA level to ensure that these dynamics in the target population are adequately represented in the PoA.

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

>> N/A

D.3. Summary of the comments received:

>> N/A

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

>> N/A

SECTION E. Application of a baseline and monitoring methodology

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

>> All CPAs included in the PoA will subscribe to the approved baseline and monitoring methodology described below:

AMS III AR: Substituting fossil fuel based lighting with LED lighting systems (Version 1).

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

>>

AMS.III.AR Criteria	Justification
This category comprises activities that replace portable fossil fuel based lamps (e.g. wick based kerosene lamps) with LED based lighting systems in residential and non-residential applications (e.g. ambient lights, task lights, portable lights).	All CPAs instituted under this PoA will be required to implement activities that place LED lighting systems in residential/non-residential settings. All CPAs will further be required to prove that the project lamps placed replace fossil fuel based lighting system.
This methodology is applicable only to project lamps whose batteries are charged using one of the following options: (a) Charged by renewable energy system (e. g. photovoltaic systems or mechanical systems such as wind battery chargers);	All the project lamps placed under this PoA will have rechargeable batteries charged by Solar Photo Voltaic Panels.
At a minimum project lamps shall be certified by their manufacturer to have a rated average life of at	This will be a compulsory requirement for all CPAs instituted under the PoA to provide

least 5,000 hours. The manufacturer shall certify that the project lamps' battery charging efficiency, at the time of purchase, is at least 50%.	manufacturer's certification proving minimum average life of 5,000 hours.
Project Lamps shall have a minimum of one year warranty.	All project lamps included in the CPA shall accord the user a minimum one year warranty which will cover replacement/repair of failed lamps, batteries and solar panels.
The project design document shall explain the proposed method of distribution of project lamps.	All CPA implementing parties will provide distribution details by providing the following information: 1. Proof that the project lamps displace the kerosene/fossil fuel used for lighting 2. Description of unique project lamp identification number such as a bar code or serial number 3. Compliance with Host Party laws/regulations on use and disposal of batteries.
The project design document shall include design specification of project lamps	CPA-DDs must incorporate the technical description with a detailed description highlighting the 9 parameters elaborated in paragraph 6 of the methodology.
The project activity shall restrict the number of project lamps distributed through the project activity to no more than five per household (for residential applications) or per business location (e.g. for commercial applications such as shops).	This parameter will be monitored in each sales record per CPA.

LED Lamp Effective useful life

Project implementers may choose Option 1 or option 2 for the determination of the useful life of the project lamp.

Option 1: Project Lamps are assumed to operate for two years after project lamp distribution to end-users. Therefore, emission reductions can only be claimed for two years;

Option 2: Project Lamps are assumed to operate for seven years after project lamp distribution to end-users, and thus emission reductions can be claimed for up to seven years per project lamp,

For project implementing parties who choose Option 2 the following criteria must be met:

- Manufacturer certification of a useful life of 10,000 hours with a reduction in luminous flux that does not exceed 30%. This will have to be verified by third party testing. Testing will have to meet requirements set out in the baseline and monitoring methodology AMS III AR results of which must be available for verification.
- Project lamps are replaceable using a rechargeable battery with lamp owners provided access to replacement batteries of comparable quality.

- The conditions set out in the baseline and monitoring methodology AMS III AR paragraph 11(c) items (i),(iii),(iv)and(v) are satisfied by third party testing. Such testing results will be made available for verification and upon request by the CME.

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

>>

	Source	Gas	Included?	Justification
Baseline	Traditional Fuel based lighting systems	CO_2	Yes	Main Source of emissions
		CH_4	No	Excluded to maintain conservativeness
		N_2O	No	Excluded to maintain conservativeness
Project	LED Lighting System (Project Lamp)	CO_2	No	No attributable emissions from project activity
		CH_4	No	No attributable emissions from project activity
		N_2O	No	No attributable emissions from project activity

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

>>The baseline scenario is the use of kerosene lighting applications for domestic/non-residential lighting needs. This is in accordance with the baseline and monitoring methodology AMS III AR which states "This category comprises activities that replace portable fossil fuel based lamps (e.g. wick-based kerosene lanterns) with LED based lighting systems2 in residential and non-residential applications (e.g. ambient lights, task lights, portable lights)."

The baseline scenario is analysed from three perspectives access and reliability of grid electricity, household consumption of kerosene and quality of light provided by these sources. Several comprehensive studies have been conducted in the East Africa Region that adequately demonstrates the baseline scenario.

Lighting Africa: Solar Lighting for the Base of the Pyramid[16]

1. Access and Reliability of the Grid

As of 2009, grid connection rates across Africa stood at just 35%, with more than 111 million un-electrified households, covering over 580 million individuals based on our country-level database for the continent

[16] http://www.lightingafrica.org/files/Solar%20Lighting%20for%20the%20BOP-%20overview%20of%20an%20emerging%20mkt_(2).pdf

Region	% On Grid	Millions of Household on grid	Millions of Household off- grid
Central Africa	18	4	19
East Africa	15	9	50
North Africa	76	18	6
Southern Africa	70	7	3
West Africa	39	22	34
Africa Total	35	60	111

Table 3: Grid Connection in African Households[17]

The East African region represents the lowest grid connection on the African Continent. With 50 million households not connected to the grid the most plausible scenario, as will be described below, is that these houses are dependent on fossil fuel based lighting applications such as candles, kerosene lamps or biomass combustion as combined source of cooking and lighting energy. Whereas 9 million households are connected to the grid, a separate analysis has been conducted to determine the reliability of the electrical grid for these households. It has been determined that grid reliability also presents significant problem for these households/users.

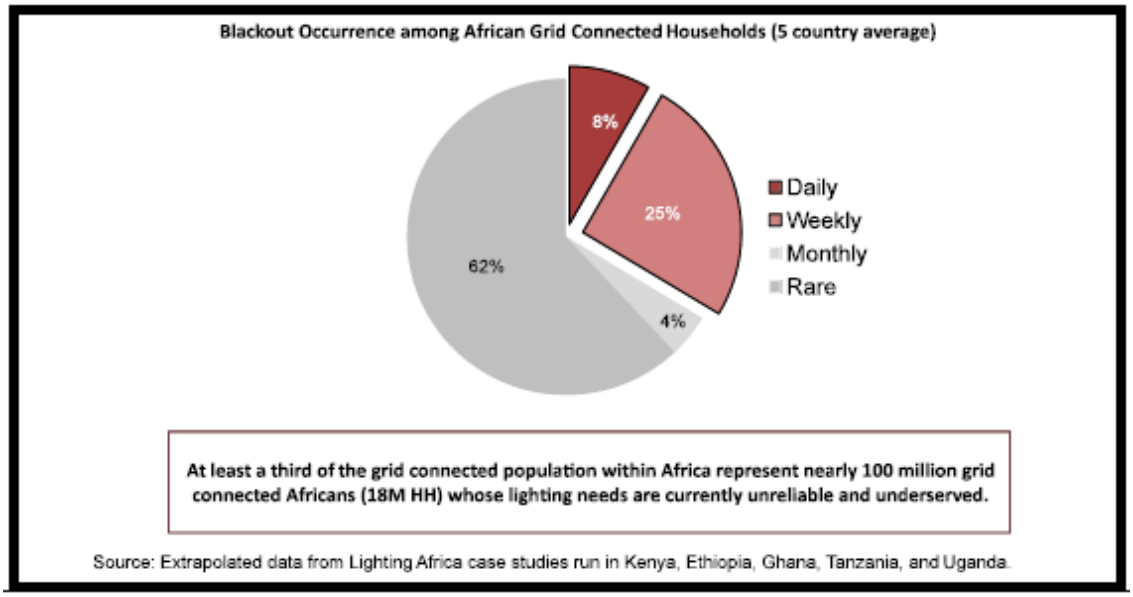

Figure 9: Reliability of grid connections in African House holds

2. Household consumption of kerosene for lighting

Estimated annual expenditure amongst domestic and non-residential applications in Africa is $10.5 billion for lighting applications, of this expenditure $8.2 billion is attributable to the 111 million off-grid households in Africa, $1.2 billion is spent by the 20 million on-grid households who rely extensively on back-up power, and, conservatively, $1.1 billion is spent by the small-business sector.

[17]Dalberg Analysis based on Country level grid penetration model (2009)

Kerosene is the dominant energy source for the off-grid lighting applications of most Africans. It is the primary light source for 53% of households and accounts for nearly half of the total expenditure on lighting. When the statistics for kerosene consumption are to be viewed against the subsequent adverse effect on the environment further analysis need be provided for the actual expenditure against the backdrop of future and current price increments for the cost of kerosene per litre.

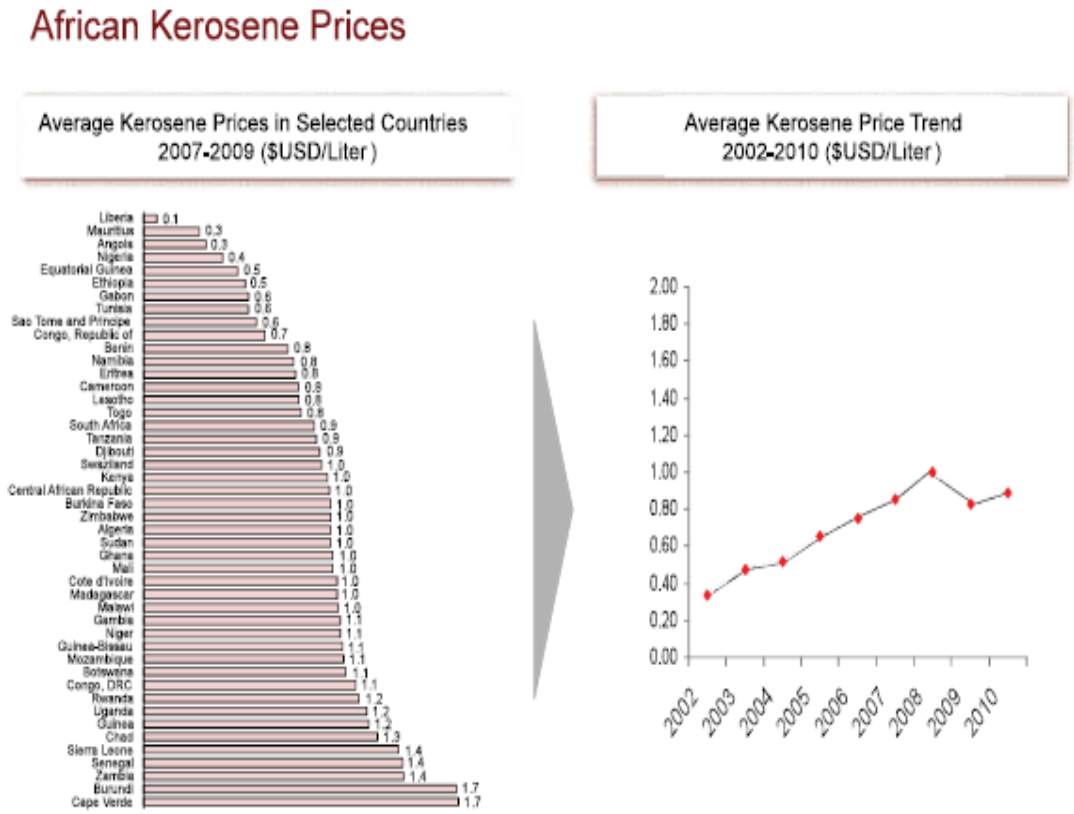

Figure 10: Indicative Trends on African Kerosene Prices

The indicative simplified baseline and monitoring methodology AMS III AR provides the following default values for calculation of baseline emissions:

Parameter	Default Value
Utilization rate (hours/day):	3.5 Hours per day
Utilization (days/year):	365 days per year
Fuel emissions factor:	2.4 kg CO_2/litre
Leakage factor:	1.0
Number of fuel-based lamps replaced per project lamp:	1.0

Table 4: Default Baseline Emission Factors

Fuel Use rate is a function of the total kerosene consumed for lighting divided by the period of time within which it is consumed, this may be weekly or monthly. Baseline surveys will establish kerosene displaced per household/non-residential setting over a specified time frame. CPA Implementers may use verifiable literature review to ascertain the Fuel Use Rate.

The Baseline Fuel Scenario has therefore been identified as the continued use of kerosene based lighting. Alternatives to the baseline scenario have been identified as follows:

1) Installation of Solar LED Lamps without being registered as a CDM POA activity

   As identified in Section A.4.3 of this PDD, implementation of the project activity will be significantly inhibited by the identified investment, technical and prevailing practice barriers that would be mitigated by its implementation under the proposed PoA. Furthermore the implementation of other solar LED lighting applications of equal or greater quality to that of the ToughStuff at a feasible price point is difficult without the revenue sourced from the CERs realized by the project activity.

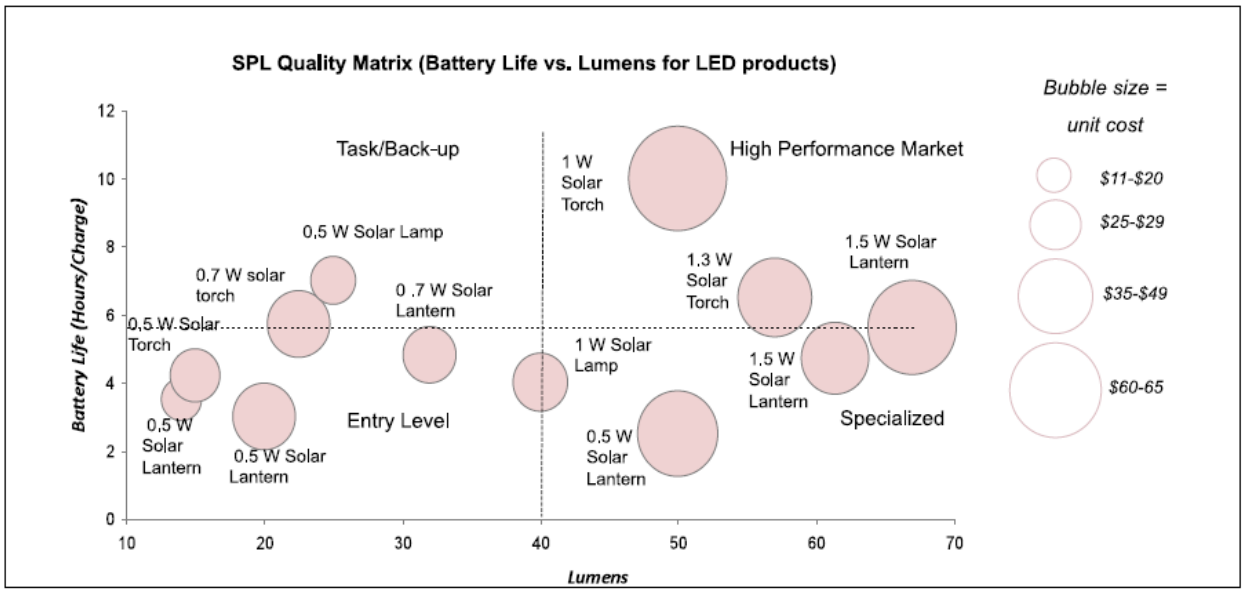

Figure 11: Indicative Price, Quality and Battery Life analysis of typical Solar LED technologies

The chart above demonstrates the fact that the highest quality lanterns fall within the $25-$49 price range.

As demonstrated above grid accessibility in the East African region represent the lowest connection rates in the entire African Continent with only 15% of households actually connected to the grid. It is therefore highly unlikely that the households targeted within the rural/urban poor demographics are likely to switch to grid connected electricity for lighting applications.

Given the barriers faced by the above identified alternatives the most plausible scenario is that the households will continue to depend on kerosene fuel for their lighting applications.

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

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

>> This PoA DD provides an assessment of additionality in Section A.4.3 that will be typical of each SSC CPA. The assessment of additionality is therefore done on a PoA level and a typical CPA included under the PoA is therefore deemed to be additional in itself upon review of its compliance with the established barriers for additionality described in this PoA-DD.

The CME will review each CPA for its eligibility based on the individual compliance with the general criteria used for assessment of additionality defined in this PoA DD.

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

>> Each CPA under this Programme of Activities will demonstrate additionality in compliance with the barriers identified in Section A.4.3 of this PoA and the latest guidance or methodological tools for the demonstration of additionality from the CDM Executive Board.

This PoA DD provides an analysis of how these barriers will affect the typical CPA and therefore implementing parties need only provide analysis in support of the argument presented herein. Each CPA will be required to prove additionality based on the following barriers:

- Investment barrier
- Technical Barrier
- Barriers due to Prevailing practice.

The CME, having conducted a comprehensive analysis, will rely on the three identified barriers as critical criteria for assessment of additionality for each CPA DD. The barriers identified above are generic to project activities of this nature (solar lamps).

NOTE: Information provided here shall be incorporated into the PoA specific CDM-SSC-CPA-DD that shall be included in documentation submitted by project participants at registration of PoA.

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

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

>> ***Baseline Emissions:***

The CPA implementing party may choose the default factors provided in the methodology AMS III AR:

(a) Fuel use rate (litres/hour): 0.025 litres/hour;
(b) Utilization rate (hours/day): 3.5 hours per day;
(c) Utilization (days/year): 365 days per year;
(d) Fuel emissions factor: 2.4 kgCO2/litre;
(e) Leakage factor: 1.0;
(f) Number of fuel-based lamps replaced per project lamp: 1.0;
(g) Net-to-Gross factor: 1.0.

Alternative values for parameters identified above (e.g. Fuel use rate, utilization rate) can only be used if adequate research/monitoring and documentation is provided by the project proponent e.g. strategic surveys and research conducted by national or local organizations, initiatives by international

organizations or non-governmental organizations or the project proponent to collect reliable and comprehensive data.

The CPA implementing party may choose either option for the effective LED Lamp Effective Useful Life but must strictly adhere to the requirements established in paragraph 11 of the methodology if Option 2 is selected.

Third Party testing of the LED Lamps, Solar Panels and batteries will be made available to the CME at any time during the project activity.

Monitoring:

Monitoring includes:
(i) Recording of project lamp distribution data;
(ii) Where Option 2, paragraph 11 is chosen ex post monitoring surveys to determine percentage of project lamps distributed to end users that are operating and in service in year y.

The C/ME will be provided with project lamp distribution data upon request from the CPA implementing partner. Furthermore this will be subject to monitoring plan as defined in Section A.4.2.

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

>> **Baseline Emissions:**

$$BE_y = DV \times GF_y \times DB_y \quad (1)$$

Parameter	Value	Unit	Description	Source
DV	0.08	tCO_{2e}	Emissions Factor per Project Lamp	Default value provided in the baseline and monitoring methodology AMS III AR or value derived from baseline surveys/literature review.
DB_y	1.0 + FFG	%	Dynamic Baseline Factor	Default value provided in baseline and monitoring methodology AMS III AR or Literature review of documented national growth rate of increased kerosene consumption[18].
GF_y	1.0	Number	Grid Factor in year y	AMS III AR

Project Emissions:

There are no project emissions ($PE_y = 0$) if the project lamp charging mechanism utilized is as defined in paragraph 2(a) of the baseline methodology AMS.III.AR which defines the charging mechanism as project lamps charged using renewable energy systems such as the photovoltaic systems as envisioned for the project activity.

$$PE_y = 0$$

Emission Reductions:

$$ER_y = \sum_{i,j} N_{i,j} \times \left(BE_{y,i} - PE_{y,i,j}\right) \times \left(OF_{y,i,j}\right) \quad (3)$$

[18] This parameter accounts for increased fuel use for lighting as it affects the baseline fuel consumption throughout the crediting period. If national statistics on documented increase in kerosene consumption are unavailable, the CPA DD may reference real GDP Growth rates and derive a correlation in increased per capita expenditure on fossil fuel with GDP growth

Where:

ER_y Emission reductions in year y (tCO_2e)

$N_{i,j}$ Number of project lamps distributed to end users of type $_i$ with charging method $_j$

$OF_{y,i,j}$ Percentage of project lamps distributed to end users that are operating and in service in year *y* for each lamp type *i* and charging method *j*.

Parameters fixed for all CPAs under this PoA include:

Data / Parameter:	**GF_y**
Data unit:	Fraction
Description:	Grid time available to target households and communities
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Solar Led lamps included in this PoA will be charged by a photovoltaic solar panel. Therefore satisfying the condition that the LED lamps are charged by a renewable energy source as described in paragraph 2a.
Any comment:	

Data / Parameter:	**UR**
Data unit:	Hours/Day
Description:	Amount of kerosene used for lighting in the domestic/non-residential setting daily
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	3.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The figure provided by the baseline and monitoring methodology is conservative and will be used by each CPA throughout the crediting period.
Any comment:	

Data / Parameter:	**$EF_{i,CO2/litre}$**
Data unit:	$kgCO_2$/litre
Description:	Fuel Emission Factor of CO2 emissions realized from the combustion of 1 litre of fuel *i* (kerosene)
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	2.4
Justification of the choice of data or description of measurement methods	Default value provided by the baseline and monitoring methodology.

and procedures actually applied :	
Any comment:	

Data / Parameter:	**U_y**
Data unit:	Days/year
Description:	Number of days in calendar year in which the baseline lamps are used
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	365
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value provided by the baseline and monitoring methodology.
Any comment:	

Data / Parameter:	**L_y**
Data unit:	Figure
Description:	Leakage Factor
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	3.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value provided by the baseline and monitoring methodology.
Any comment:	

Data / Parameter:	**N**
Data unit:	Figure
Description:	Number of Kerosene Lamps replaced per Solar LED Lamp
Source of data used:	Baseline and monitoring methodology AMS III AR
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value provided by the baseline and monitoring methodology.
Any comment:	

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

Data / Parameter:	**FUR** $_{l/hr}$

Data unit:	(litres/hour)
Description:	Quantity if kerosene fuel used per hour for domestic/non-residential setting
Source of data used:	Default value provided or Value quantified based on baseline surveys or literature review
Value applied:	Default Value of 0.025 or figure derived from baseline surveys or literature review of the respective host country.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline and monitoring methodology provides a default value for Fuel Use Rate. However the methodology AMS III AR has a provision in paragraph 14 that allows CPA implementers to use alternative values based on strategic surveys and research conducted by national or local organizations, initiatives by international organizations or non-governmental organizations or the project proponent to collect reliable and comprehensive data. All reports/ baseline survey results must be provided to the CME and DOE upon request for validation and verification purposes.
Any comment:	

Data / Parameter:	**DV**
Data unit:	tCO_{2e}
Description:	Default Emissions Factor
Source of data used:	Default value as provided in the baseline and monitoring methodology or as calculated based on Fuel Use Rate derived from baseline surveys/literature review.
Value applied:	Default value of 0.08 or value derived from baseline surveys/literature review
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values provided above are in accordance with the baseline and monitoring methodology with dual scenarios of default or alternative values.
Any comment:	

Data / Parameter:	**DB_y**
Data unit:	Dynamic Baseline Factor
Description:	Change in baseline fuel, fuel use rate, and/or utilization during crediting period) in year y.
Source of data used:	AMS III AR and literature review of documented national growth rate of kerosene fuel use in lighting from the preceding years.
Value applied:	1 + (FFG)Fraction derived from national kerosene fuel growth rate
Justification of the choice of data or description of measurement methods and procedures actually applied :	This parameter accounts for increased fuel use for lighting as it affects the baseline fuel consumption throughout the crediting period.
Any comment:	

Data / Parameter:	**$N_{i,j}$**

Data unit:	Figure
Description:	Number of project lamps distributed to end users
Source of data used:	CPA Implementer sales database
Value applied:	A figure describing the number of lamps/sold or projected to be sold within the CPA crediting period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	A sales record will be established per CPA which shall highlight the number of project lamps distributed, the lamp wattage, battery type, charging method and date of sale and unique serial number of each lamp sold for lamps that will be credited for up to 7 years.
Any comment:	

Data / Parameter:	**$OF_{y,i,j}$**
Data unit:	Percentage
Description:	Percentage of distributed lamps which are in service and operational in year **.**
Source of data used:	Monitoring surveys past year 3 of the CPA crediting period.
Value applied:	A percentage of the total sales based on the monitoring survey which will prove operational lamps within the third year from the CPA start date.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Only project lamps with an original unique marking will be counted as operating and in service. While project lamps replaced as part of a regular maintenance or warranty program will be counted as operating, project lamps cannot be replaced as part of the survey process and counted as operating.
Any comment:	

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

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

Data / Parameter:	**N**
Data unit:	Figure
Description:	Number of Project Lamps Distributed
Source of data to be used:	A figure describing the number of lamps/sold or projected to be sold within the CPA crediting period.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	CPA Sales Record
Description of measurement methods and procedures to be applied:	A sales record will be established per CPA which shall highlight 1. the number of project lamps distributed, 2. the lamp wattage, battery type, 3. charging method and 4. date of sale
QA/QC procedures to	The sales record will be developed to include all established data parameters

be applied:	identified in the methodology AMS III AR and will be maintained for 2 years after end of individual crediting period.
Any comment:	

Data / Parameter:	**USN**
Data unit:	Figure
Description:	Unique Identification of each lamp sold under the PoA for lamps to be credited for up to 7 years.
Source of data to be used:	CPA Sales Record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Each CPA will be accorded a unique number and furthermore each CPA will accord each solar lamp its own unique filter number. For example CPA_1 will have a filter number x1y2z3. The Total Sales Record maintained by the C/ME will read CPA_1x1y2z3.
Description of measurement methods and procedures to be applied:	An electronic database with maintained by both the CPA and C/ME which incorporates the unique serial number of solar lamp and CPA implementing party.
QA/QC procedures to be applied:	The unique identification of both CPA and Solar Lamp will prevent double counting and provide a verifiable data base with contact details of each customer for monitoring and verification purposes.
Any comment:	

Data / Parameter:	**$OF_{y,i,j}$**
Data unit:	Percentage
Description:	Percentage of distributed lamps which are in service and operational in year ***i*.**
Source of data to be used:	Monitoring surveys past year 3 of the CPA crediting period.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A percentage of the total sales based on the monitoring survey which will prove operational lamps within the third year from the CPA start date.
Description of measurement methods and procedures to be applied:	Monitoring surveys will be conducted from year 3 of the individual CPA crediting period using random sampling methods.
QA/QC procedures to be applied:	(a) 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; (b) Sampling must be statistically robust and relevant i.e. the survey has a random distribution and is representative of target population (size, location); (c) The method to select respondents for interviews is random; (d) The survey is conducted by site visits; (e) Only persons over age 12 are interviewed; (f) The project document must contain the design details of the survey.

Any comment:	

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

The proposed PoA will incorporate a high number of solar lamps therefore an annual survey involving of all solar lamps is not economically feasible and therefore a sample randomly identified from the sales record shall to verify the lamps in service and are operational.

An electronic database will be maintained by the CME in addition to that maintained by each CPA implementing partner.

The electronic database maintained by the CME for a period up to 2 years after completion of the CPA and will include:

1. Unique Identification number of the CPA Implementing Party
2. Unique Identification of the Solar Panel
3. Date of Sale
4. Contact details of Customer
5. Location of Sale

The information contained in this database will need to be updated continuously.

Monitoring surveys shall seek to establish the following parameters:

1. Unique Identification of the CPA
2. Unique Identification of the Solar Lamp
3. Signed transfer agreement of the CERs from the customer to the C/ME(check-list (yes/no))
4. Proper usage and maintenance of the project lamp(check-list (yes/no))
5. Date of survey
6. Number of lamps installed per household
7. Location of domestic/non-residential setting

The monitoring surveys will be conducted for project lamps with a 7 year crediting period and will be conducted from the third year from the project start date. These results will be used for operational years 4, 5, 6 and 7.

Sampling:

This sampling plan has been developed in reliance to the "General Guidelines for Sampling and Surveys for Small-Scale CDM Project Activities" Version 01 EB 50[19].

The Simple Random Sample method has been selected where:

- Each observation will be chosen randomly and entirely by chance. This will guarantee an unbiased estimate of the true population mean given the fact that each observation has equal probability of being selected for the survey.

[19] http://cdm.unfccc.int/EB/050/eb50_repan30.pdf

- The target population has relatively homogenous characteristics and therefore is better suited for the random sampling method.
- The sampling will be conducted at CPA level within closer geographical boundaries which will hence diminish the costs associated with the random selection of households.

The following steps will hence be executed for each CPA survey:

1. The sampling objectives will be clearly defined and the target population and the measurements to be taken and/or data to be collected (see section E.7.2 of this PDD defining the monitoring survey)
2. Developing the sample frame which is a list of all members of the customer database selected as the basis for sampling.
3. Randomizing cases and drawing sample. The implementer should ensure that the sample is drawn at random from the sampling frame.
4. Selecting the most effective information gathering method. CPA implementers will be required to conduct face to face interviews at each household/non-residential setting.

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

>> The application of the baseline study and monitoring methodology was completed on 1st September 2011 by Mr Kyle Denning of Viability Africa, LLC.

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Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the PoA.

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

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