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

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NOTE:

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

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

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

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

Title: "LED's save energy"
Version: 05.3
Date: 17/10/2012

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

Key Abbreviations / Terminologies

Abbreviation	Explanation
AMS	Approved small scale baseline and monitoring methodology
CER	Certified Emission Reduction
CPA	CDM Project Activity
GHG	Greenhouse gas
LED	Light Emitting Diode
PoA	Programme of Activities
SD	Supporting Document as made available to DOE (used in footnotes)

1. General operating and implementing framework of PoA

The programme aims at creating a marketing platform for supporting the usage increase of high quality LED lighting equipment (LED stands for Light Emitting Diodes). By principle, the programme is open to different LED technology producers, distributors and developers. The programme involves the installation of LED equipment in publicly, commercially, industrially or otherwise employed locations.

LED lighting equipment under this programme may include both an LED light source (lamp) as well as an LED luminaire (including lamp and corresponding power conversion electronics, thermal management, fixture etc.).

The programme will enable the participating LED lighting equipment providers, distributors and developers to use additional CER income to enable LED lighting equipment to effectively compete with low-cost/less efficient products in India. The programme will thus significantly contribute to transforming the Indian lighting market towards high quality and high efficiency lighting products.

2. Policy/measure or stated goal of the PoA

In doing so, the programme will abate greenhouse gas emissions through the avoided use of electricity and corresponding fossil fuel combustion. It will reduce national electricity demand and lower stress on the energy infrastructure. Additionally, it will reduce energy related expenses by end-users through lower electricity bills.

The programme involves the installation of LED lighting equipment in publicly, commercially, industrially or otherwise employed locations. The respective end-users can obtain the LED lighting equipment at favourable conditions due to CER benefits.

To alert all potential users to the benefits of the use of LED lighting direct marketing efforts will be undertaken. Initially the focus will be on large-scale lighting users, allowing for a faster introduction of LED lighting equipment and to realise emission reductions through volumes. The proposed PoA is a voluntary coordinated action.

The programme encompasses two types of activities:

- Brownfield; replacement of existing lighting equipment with LED lighting equipment; and
- Greenfield; the installation of LED lighting equipment on new locations where LED equipment is not the common practice.

At greenfield locations the most conservative common practice will be taken as the baseline. At brownfield locations, old lighting equipment collected during the exchange will be scrapped. This will prevent leakage and ensure correct disposal of old lamps. The scrapping will be independently verified as is required by the methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13).

Environmental Sustainability

Real and measurable reductions in GHG emissions
The programme will abate greenhouse gas emissions through the avoided use of electricity and corresponding reduced fossil fuel combustion. The programme will use an approved methodology to ensure that all measurements of greenhouse gas emission reductions are robust, conservative and verifiable. The programme will maintain high standards of monitoring to ensure that any emission reductions claimed are measurable and real.

Support to India's objectives on energy efficiency
India aims towards an increase in energy efficiency. The eleventh five year plan (2007-2012)[1] of the Indian government and the Bureau of Energy Efficiency (BEE)[2], a statutory body under the Indian ministry of power, both acknowledge the link between demand side efficiency, reliable power distribution and greenhouse gas emission reductions. Demand-side energy efficiency has been identified by the Indian government as one of the key areas to address to aim towards a more sustainable power supply. The programme is supporting these objectives.

Reducing the physical waste flow over the lifetime of the LED lighting equipment
The LED lighting equipment has a lifetime that is at least 25 times the lifetime of an incandescent light bulb and four times the lifetime of a Compact Fluorescent Lamp (CFL). This longer lifetime of an LED lighting equipment avoids the physical waste of 25 incandescent light bulbs and the (chemical) physical waste of four CFLs.[3]

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[1] SD_1 – Planning Commission Government of India, '11th Five Year Plan (2007-2012)'. Available at: http://planningcommission.nic.in/plans/planrel/fiveyr/welcome.html

[2] BEE website: http://www.beeindia.in

[3] SD_2 – U.S. Department of Energy, 'Guide to Energy-Efficient Lighting' (October 2010).

Disposal of mercury using lamps
The CPAs under the programme shall comply with government guidelines and legislation regarding the environmentally sound management of mercury from end-of-life mercury using lamps. Currently, no disposal facilities for mercury using lamps designated by the appropriate Indian authorities exist. Therefore, until such designated facilities become operational and accessible in India, CPA owners can propose their own method for environmentally save disposal, or can choose to securely store end-of-life mercury using lamps replaced under the programme until these facilities exist.

Economic Sustainability

Demand Side Management as cost effective capacity planning
The PoA will contribute to India's economic sustainability through the more efficient use of electricity. India's power demand is expected to increase strongly over the next years due to economic growth and rising electrification levels. The national ministry of power (NIC) estimates that the national electricity demand will double during the next ten years reaching a total of 1,915 TWh in 2020/2021.[4]

Demand Side Management (DSM) - as foreseen by the PoA - provides for a cost-effective way to cope with the increased electricity demand in India. It will effectively contribute to reducing the pressure on the Indian power system and liberate financial resources (scheduled for infrastructure investments) that can be used otherwise to drive economic development.

Reduced dependence on finite energy resources
India is largely dependent on fossil and nuclear energy resources for its power supply (65% of total generation capacity installed in mid 2011[5]). The programme will reduce the overall need for finite energy carriers thus reducing India's vulnerability to resource scarcity and rising fuel prices.

Social Sustainability

Improves quality of life by creating job opportunities
The programme will involve the training and employment of workforce on the ground (inside India) for technology installation, scrapping of old equipment and programme monitoring.

Education, awareness and collateral energy saving measures
The use of the lamps will create first-hand experience with LED lighting technology leading to a better understanding of the technology's benefits that will encourage behavioural change and increase general awareness of energy efficiency among end-users.

Education of the workforce will also lead to increased awareness and interest in energy saving and energy efficiency among the employees engaged under the programme.

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[4] SD_3 – Report on the 17th Electric Power Survey of India. Available at: http://www.powermin.nic.in/generation/pdf/17th%20EPS.pdf

[5] SD_4 – Central Electricity Autority (CEA): Installed Generation Capacity, Monthly Report, April 2011. Available at: http://www.cea.nic.in/reports/monthly/executive_rep/apr11/8.pdf

Technological Sustainability

The programme is designed to offer a marketing platform for LED lighting equipment with the main aim to enhance and support the introduction of LED technologies in India.

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

The PoA is a voluntary coordinated action.

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

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (YES/No)
Republic of India	Mabanaft Carbon India Pvt. Ltd. (CME)	No
Netherlands	Mabanaft Carbon B.V.	No
Netherlands	Do-inc. business B.V.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Table 1: Participants of the 'LED's save energy' PoA

Mabanaft Carbon India Pvt. Ltd. is the programme's Coordinating or Managing Entity (CME), based in Mumbai, India. It is a subsidiary of Mabanaft Carbon B.V.

Mabanaft Carbon B.V. is the carbon trading and CDM development arm of B.V. Mabanaft, which is part of Marquard & Bahls AG, a leading petroleum company; independent and privately owned. Marquard & Bahls has subsidiaries all over the world and Mabanaft has offices in (amongst others) Rotterdam, Mumbai, Hamburg, Houston and Singapore.

Do-inc. business B.V., on behalf of the CME, is responsible for the development of the documentation of the PoA.

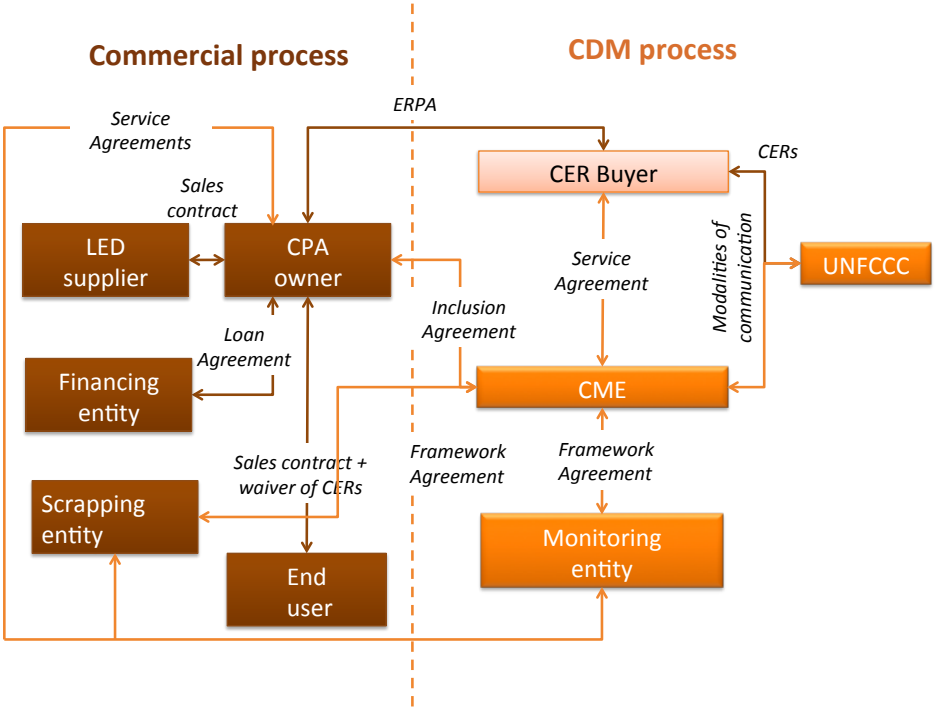

Figure 1 Overview of generic CPA structure

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

A.4.1. Location of the programme of activities:

Republic of India.

A.4.1.1. Host Party(ies):

Republic of India.

A.4.1.2. Physical/ Geographical boundary:

Republic of India.

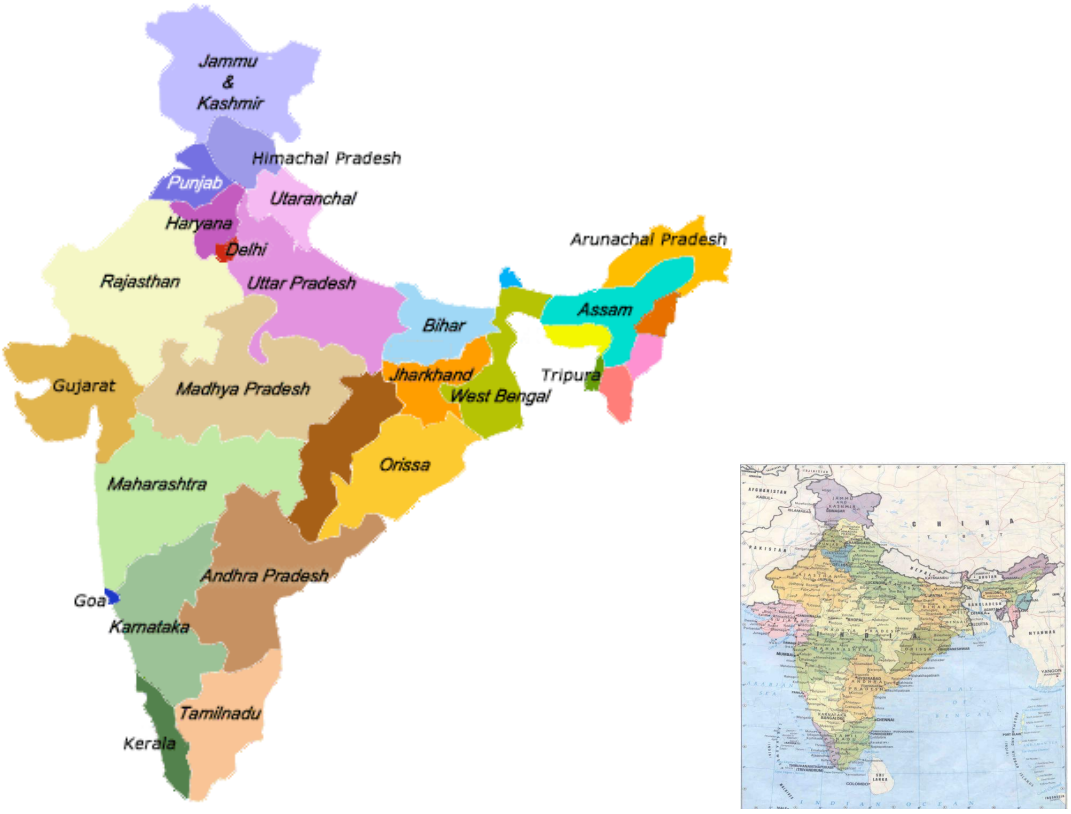

Figure 2 Republic of India

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

All CPAs under the LED's Save Energy programme comprise the distribution and installation of LED lighting equipment.

All CPAs will abate greenhouse gas emissions through the increase in energy efficiency of the targeted lighting systems and the corresponding fossil fuel combustion avoided to generate the electricity.

Under the CPAs, LED lighting equipment will be installed in publicly, commercially, industrially or otherwise employed locations. The dissemination and installation of LED lighting equipment may involve two types of activities:

- Brownfield; replacement of existing lighting equipment with LED lighting equipment ; and
- Greenfield; the installation of LED lighting equipment at new locations where LED equipment is not the common practice.

The CPA end-users can obtain the LED lighting equipment at favourable conditions due to CER benefits. Favourable conditions have been defined as a list of options under which the CPA end-user can obtain the LED lighting conditions. These are included under section B. 3 of the CPA-DD.

Participants in the CPA will join on a voluntary basis; no one will be forced to join in any way.

CPAs under the PoA will adhere to the relevant existing technology specific legislation in the host country.

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

The PoA uses solid state lighting technology. It focuses on Light Emitting Diodes (from here on LED) technology. Organic Light Emitting Diodes (OLED) and any other future refined solid state lighting options are also eligible to be included under the programme.

LED lighting equipment under this programme may include both a LED light source (lamp) as well as an LED luminaire (including lamp and corresponding power conversion electronics, thermal management, fixture etc.).

LED lighting equipment has several characteristics that makes it an attractive replacement option for existing lighting equipment. Compared to conventional lighting equipment, LED lighting equipment :

- Consumes less energy;
- Has a longer lifetime that is not affected by frequent switching;
- Does not emit ultraviolet light;
- Does not contain mercury.

LED lighting equipment uses at least 75% less energy than incandescent bulbs, emits virtually no heat, and lasts 25 times longer than incandescent lamps. LED lighting equipment can last up to four times longer than a CFL.[6]

LED lighting equipment is available for various lighting applications including indoor and outdoor lighting, spot and flood lighting. It can thus replace a multitude of less-efficient technologies such as incandescent, halogen, CFLs and other gas discharge lamps.

The specific applied LED lighting equipment will be further described in the specific CPA-DDs.

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

The CPAs must fulfil defined eligibility criteria to be registered under the PoA. These criteria are presented in table 2. The CME shall check the Eligibility Criteria for Inclusion and summarise its findings in the Eligibility Check Report of the proposed CPA. This Report shall be signed by both the CME and the CPA-owner.

[6] SD_2 – U.S. Department of Energy, Guide to Energy-Efficient Lighting (October 2010).

No	Eligibility Criteria 'information to be checked'	Information to be reported	Verifiable data source
1	Does the CPA regard solely distribution within the programme's geographic boundary as defined in the SSC-PoA-DD? 'geographical boundary'	GPS coordinates provided in A.4.1.2 of the CPA-DD.	GPS coordinates in Google-Earth/Google-Maps format.
2	Shall the end user locations be uniquely identifiable by address and/or unique location description to avoid double counting of emission reductions? 'avoid double counting'	A record keeping system for each CPA under the PoA shall be in place that identifies each end-user site under a serial numbering system to uniquely identify each location.	Procedure and record keeping system for the specific CPA based on the monitoring templates as provided under Annex 4.
3	Do the end users of the LED lighting equipment waive all their rights to CERs generated under the CPA to the respective CPA owner(s)? 'CER waiver'	Signed CER waiver by end-user and CPA owner.	Signed CER waiver by end-user(s) included under the CPA and the CPA owner.
4	Does the CPA regard the installation of LED lighting equipment? Which may or may not include an LED luminaire (including lamp and corresponding power conversion electronics, thermal management, fixture etc.)? 'LED lighting equipment'	A description of the LED lighting equipment to be installed is to be included under CPA-DD section A.2.	Specsheet(s) of the proposed LED lighting equipment to be installed under the CPA.
5	Will the CPA owner ensure that for each installed LED lighting equipment the rated capacity or output or level of service (e.g., lumen output) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%) than the baseline? 'level of service'	Filled in 'template identified LED equipment data' (see Annex 4). This include records on the baseline lamp and its identified LED replacement.	Specsheet(s) of the identified LED equipment data. Including a statement that the level of service (e.g., lumen output) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%) than the lighting equipment to be replaced.
6	Has the CPA provided a forecast concerning the CPA start date supported through documentary evidence? 'start date'	The start date as stated in the CPA-DD shall be after the date of web-hosting of the PoA (19/12/2011).	The CPA owner shall provide the purchase order for the first LED lighting equipment to be installed for the first end-user under the applicable CPA (or similar e.g. purchase quotation or draft PO if the installations have not started)

7	Has the CPA Owner confirmed that the CPA under the PoA is a voluntary action and is neither registered as an individual CDM project activity nor included in another registered CDM PoA? 'voluntary action, double counting'	Check of UNFCCC website and a signed statement by the CPA owner regarding voluntary action.	The UNFCCC website shall be used to check whether a prospective CPA is already a registered CDM project or if the prospective CPA is already included in another registered CDM PoA. Signed statement by the CPA owner confirming the CPA under the PoA is a voluntary action.
8	Does the CPA comply with the applicability criteria of methodology AMS-II.C "Demand-side energy efficiency activities for specific technologies" (version 13) used in the PoA? 'applicability criteria'	a) The programme entails activities that promote the adoption of energy efficient equipment through the distribution and installation of LED lighting equipment (see eligibility criterion 4) b) The aggregate energy savings by a single programme activity may not exceed the equivalent of 60 GWh per year (see eligibility criterion 15). c) The light output of every replaced lighting equipment will not be significantly smaller (maximum -10%) or larger (maximum +50%) than the baseline (see eligibility criterion 5). d) Leakage associated with SSC-CPAs will be accounted for through the independent verification of scrapping of the old equipment. a. CPA owner must enter into a contract with monitoring and scrapping actors appointed by the CME, and b. The record keeping system for scrapping must be based on the template defined under Annex 4.	a-c: See eligibility criteria 4, 15 and 5. d: For the verfication of scrapping of old equipment: (a) a signed (or if installation has not started, a negotiated) contract between the CPA owner and the by the CME appointed scrapping actor, and (b) the procedure for scrapping of old lighting equipment includes data capture based on the template for scrapping as provided under Annex 4.

9	Will the CPA meet the requirements pertaining to the demonstration of additionality as specified in EB 68 Annex 27: *Guidelines on the demonstration of additionality of small-scale project activities (version 09)*? 'additionality'	What favourable conditions has been chosen by the CPA owner to enhance the market entry of high quality LED lighting equipment products? A selection from the following options is to be made. (see CPA-DD section B.3) ☐ Promotion:awareness raising, information dissemination ☐ Energy audit ☐ Energy Performance Contract (ESCO Service) ☐ Matchmaking with appropriate technology provider ☐ Capacity building at the end-user ☐ Payment by the end-user in installments over time ☐ Discount on purchase price ☐ Support with identification of financing options ☐ Other, please describe:	The CPA owner is to provide the following: 1) Justification of the option(s) selected from the list of favourable conditions as described under the CPA-DD section B.3, 2) Signed (or if installation has not started, a negotiated) ERPA between the CPA owner and the CER buyer, 3) Signed (or if installation has not started, a negotiated) inclusion agreement between the CPA owner and the CME.
10	Does the CPA rule out including facilities that are covered by an enforced government policy that includes mandatory adoption of LED lighting equipment? 'enforced government policy'	Status of enforced government policy considering the mandatory adoption of LED lighting equipment for the identified facility.	The CME is to provide a statement based on annual monitoring of the enforced government policy considering the mandatory adoption of LED lighting equipment. The CPA owner is to provide a description of the status of enforced government policy considering the mandatory adoption of LED lighting equipment for the identified facility/(ies).
11	Is the market penetration of LED lighting in India below 33% at the time of inclusion of the CPA? 'market penetration'	Figure of the market penetration of LED lighting in India. To be supported by publicly available regional or national statistics or the opinion/statement from at least one independent expert.	Publicly available statistics or expert statement. If an expert statement is selected, the CPA owner shall provide information on the expert to allow verification on expertise, relevance and independence.

12	Has the owner of the CPA provided an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance? 'ODA diversion'	Signed statement by prospective CPA owner affirming that funding from Annex I parties, if any, does not result in a diversion of official development assistance.	Signed statement by prospective CPA owner affirming that funding from Annex I parties, if any, does not result in a diversion of official development assistance.
13	Does the CPA involve the installation of LED lighting equipment for grid-connected use in publicly, commercially, industrially or otherwise employed locations? 'grid connected use'	Conformation that the LED lighting equipment to be installed is for grid connected use in publicly, commercially, industrially or otherwise employed locations.	The record keeping system includes a template considering 'lamp replacement data'. In this template the LED lighting equipment shall be assigned to one of the two interconnected Indian electricity grids (NEWNE or the Southern grid). Only lighting equipment that is assigned to one of these two electricity grids can be included under the CPA.
14	Does the CPA comply with the sampling requirements as per the sampling plan of the PoA, in accordance with the 'Standard for sampling and surveys for CDM project activities and programme of activities' (Version 03.0), EB69 Annex 4? 'sampling'	In the PoA-DD has been described that in order to meet the sampling requirements a minimum of 70 meters must be installed for each respective stratum of LEDs installed (High Power Indoor, High Power Outdoor, Low Power Indoor, Low Power Outdoor). The CPA owner must enter into a contract with a monitoring actor appointed by the CME, to assure compliance with the the sampling requirements as per the sampling plan of the PoA.	The monitoring plan of the CPA-DD shall include at least 70 meters per respective stratum of LED lighting equipment. Signed (or if installation has not started, a negotiated) contract between the prospective CPA owner and the by the CME approved monitoring actor.
15	Will the energy savings be capped at 60 GWh/per year? 'small scale limit'	A record keeping system for each CPA under the PoA shall be in place. From this system the total electricity savings can be calculated.	Procedure and record keeping system for the specific CPA based on the monitoring templates as provided under Annex 4.
16	Is the SSC-CPA approved by the CME and the DOE prior to its incorporation into the PoA? 'approval'	Approval by both the CME and the DOE.	By the CME approved Eligibility Check Report and a positive validation (inclusion) opinion of the DOE regarding the prospective CPA.

17	Does the SSC-CPA satisfy de-bundling rules for PoA through the fact that each installation accounts for less than 1% of the total energy savings of the SSC-CPA? (These rules are elaborated on in chapter A.4.4.1.) 'debundling'	Justify that savings per LED lighting equipment installed are less than 1% of the total CPA savings.	Records of the rated wattage of the baseline lamp and the identified LED lighting equipment, based on the templates provided under Annex 4.

Table 2 CPA eligibility criteria, information to be reported and verifiable data source.

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

According to EB 47, paragraph 73, "additionality is to be demonstrated either at the PoA level or at CPA level". The project participants have chosen to demonstrate Additionality at PoA level.

The following is demonstrated in this section:

a. The proposed PoA is a voluntary coordinated action
b. It would not be implemented in the absence of the PoA

1. The proposed PoA is a voluntary coordinated action

The LED's save energy' PoA, is designed to offer a marketing platform for LED lighting equipment. As such it is a voluntary coordinated action initiated by the CME. The LED's save energy programme is a commercial initiative solely based on expected CER revenue[7]. The programme will be operated from revenues resulting from the sale of carbon credits and contributions from CPA developers and owners seeking access to CER revenues to enhance their market position. There are no mandatory policies and/or regulations in India that mandates the installation of LED lighting equipment. Furthermore end-users and other stakeholders participating in SSC-CPAs under the PoA will do so through a voluntary collaboration with the CME.

2. It would not be implemented in the absence of the PoA

Additionality is demonstrated using the criteria outlined in Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. To ensure a well-developed discussion of additionality and substantiate that the technological barrier & institutional, managerial resources and capacity to absorb new technologies barriers are preventing implementation of the project without CDM revenues, elements from the 'Tool for the demonstration and assessment of additionality" are borrowed. Note, as the project is small-scale and as the pertaining methodology AMS-II.C (version 13) does not require the use of the tool; its usage is not obligatory.

As per the General Guidelines to SSC CDM methodologies (version17) the following documents provided additional guidance or guidelines:

[7] SD_5 – Do-inc., 'QuickScan LED lighting' (2010). And SD 6 – Do-inc., 'Business Development Strategy' (2010).

a) EB35, Annex 34: Non-binding best practice examples to demonstrate additionality for SSC project activities[8];
b) EB50, Annex 13: Guidelines for objective demonstration and assessment of barriers[9].

Given that the LED's save Energy PoA implements a small-scale technology, i.e. efficient lighting equipment, EB63 Annex 12: Guidelines on Common Practice (Version 01.0) is not used, since it is considered not applicable to the type of project activity implemented under this programme.

To demonstrate additionality the following steps are used:

Step 1. Identification of alternative scenarios;
Step 3. Barrier analysis; and
Step 4. Common practice analysis.

Note that the project participants are choosing not to undertake an investment analysis (Step 2) as allowed for under the Tool. This as the parameters (type of lamps, operating hours, costs of lamps) to build a financial model are either not known yet, or they vary too much to develop one financial model that would be suitable for all situations under the CPA.

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

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

Three alternatives to the PoA have been identified:

No	Name of scenario	Description of scenario
1	Business as usual	The introduction of energy saving lighting technology and corresponding electricity savings are left to the market without further incentives.
2	Same programme without use of the CDM	Project implementation as described in this PoA but not undertaken as a CDM project activity.
3	Programme achieving the same results with a different incentive mechanism	Project implementation of LED lighting equipment through the support of a different mechanism, for instance a government subsidy policy.

Sub-step 1b: Consistency with mandatory laws and regulations:
Under this step it is checked if the identified alternative(s) are in compliance with all mandatory applicable legal and regulatory requirements.The most relevant authority for regulations considering energy savings is the Bureau of Energy Efficiency (BEE). This as set up under the Energy Conservation Act, 2001 to promote energy efficiency. There are various mandatory and voluntary provisions of the Act that have been implemented by BEE in the form of projects and schemes. Such as the Announcement of National Mission on Enhanced Energy Efficiency (NMEEE) in 2009. However there is currently no mandatory legislation stipulating the introduction or usage of LED lighting technology.

As there is no mandatory legislation stipulating the introduction or usage of LED lighting technology, all scenario's number 1 to 3 comply with mandatory laws and regulations.

[8] http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

[9] http://cdm.unfccc.int/EB/050/eb50_repan13.pdf

Step 2: Investment analysis
This step is not applied

Step 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:
The objective of LED's save energy is to provide a platform, aimed at enhancing market entry of high quality LED lighting equipment products. The programme will enable different manufactures, distributors and developers to use additional CER income for a faster roll out of LED lighting technology and to compete with less energy efficient products. There is no such platform aimed at enhancing market entry of high quality LED lighting equipment products in India. The LED's save energy programme is a commercial initiative solely based on expected CER revenues. These revenues make it possible for the CPAs under the platform to use several options to realise a faster roll out of LED lighting technology

The following barriers have been idenfied based on the classification as described under EB35, Annex 34: *Non-binding best practice examples to demonstrate additionality for SSC project activities*;

- Technological
- Other
    - Institutional
    - Managerial resources
    - Capacity to absorb new technologies

Technological barrier
The penetration of energy efficient lighting in India is low. More specifically LED lighting equipment has hardly penetrated the Indian lighting market. Currently the LED lighting equipment penetration rate is assessed to be well below 2% of the total lighting market.[10] This can be deemed a marginal proportion of the total market and poses a technological barrier for the introduction of LED lighting equipment.

LED lighting equipment is a relatively new technology that has changed design practices in the lighting industry, it requires new expertise not previously used in fixture design. Fixture design consisted mostly of mechanical design, and the electronic components (e.g. ballasts) were integrated at a later stage. LED luminaire design needs an integrated approach. The luminaire has to be designed for a particular light source, unlike in the design of traditional fixtures using replaceable or interchangeable light sources. Since there are new technologies that are difficult to develop in-house, LED luminaire design needs collaboration with outside experts/consultants (with an understanding of the design of drivers and thermal management). The technology and knowledge to correctly implement LED lighting equipment is only limited available in India.

For fully functional LED lighting equipment, including drivers, heat sinks, etc., the cost can easily be more than 30 times higher than conventional sources. In established lighting technologies the lighting fixture is permanent and the lamp is replaced. The perceived marginal cost of a solid-state luminaire is more than the replacement cost of a lamp. As the technology is not widely known by the end-users India, this is an important barrier to solid-state lighting. At the current prices of LED luminaires, it is difficult to

[10] Statement by ELCOMA, the Electric Lamp and Component Manufacturers' Association of India (email correspondence 5th May 2011).

convince customers of energy and cost savings compared with cheaper conventional lighting technologies, particularly linear or compact fluorescent lamps.[11]

The aforementioned factors constitute a technological barrier, for the uptake of LED lighting equipment

Other Barriers

Institutional
The innovative nature of LED lighting equipment, combined with their higher cost, low public awareness[12], lack of support for the introduction create a strong preferences for continued utilisation of existing lighting equipment. LED's Save Energy delivers a solution to overcome this institutional barrier..

Energy efficiency has been recognized as one of the most important tools for delivering both climate and energy security whilst supporting sustainable economic growth both within OECD countries and in emerging economies. However, despite these benefits, investments in energy efficiency have lagged far behind the vast potential. The reluctance of firms to invest in energy efficient technologies has been recognized since the late 1970s and has been dubbed the "efficiency paradox".[13] A substantial body of literature has developed in the past quarter century on its causes. The main challenges identified are finance, communications, and changing traditional behaviour.[14]

Project opportunities tend to be relatively small scale and dispersed, transaction costs can prove daunting if no mechanisms are put in place to take advantage of similarities among projects and bundle them. Some form of financial intermediation is usually required, unless enterprises use their own funds. Typically, therefore, implementation of energy efficiency projects involves interaction of both financing entities and technical experts with end-users. Project delivery requires very efficient contracting to achieve this without driving up transactions costs—a challenge in any country, but especially where market institutions may be relatively weak, causing greater insecurities in contracting, as in India.[15]

The local distribution companies (DISCOMs) add to the instituional barrier. Over 90% of the distribution business is owned by public utilities which are often found not responding to incentive structures.[16] Some of the barriers to implementation of DSM programs in India, can be listed below as:

- The distribution utilities often lack necessary institutional capacity and funds to develop practical approach for undertaking energy efficiency and demand side management programmes;[17]
- There are barriers relating to untested outcomes;

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[11] Based on the Strategies Unlimited report *LED Luminaires, Market Analysis and Forecast* (2nd edition, February 2011). Inspection of the document granted to the DOE.

[12] SD_7 – McKinsey, 'LED lighting at the crossroads: country road or expressway?' in: LEDsmagazine.com (november/december 2010) p. 31-34.

[13] SD_8 – Jackson, J., Promoting energy efficiency investments with risk management decision tools, in: *Energy policy*, Volume: 38 (2010) p. 3865-3873.

[14] SD 9 – REEEP Energy Efficiency Coalition. available at: http://www.reeep.org/file_upload/9_tmpphpGDrLOz.pdf

[15] Taylor et al, Financing energy efficiency (2008).

[16] http://220.156.189.26/Finance_3.aspx

[17] Vashishtha , S. and Ramachandran, M., Multicriteria evaluation of demand side management (DSM) implementation strategies in the Indian power sector, in: *Energy*, Volume 31 (2006) p.2210-2225.

- Lack of clarity about baseline data and Monitoring & Verification protocol;
- Clear lack of energy efficiency awareness.

Managerial Resources
An energy service company (ESCO) is a private business that engages in a performance-based contract with a client to identify and implement energy- efficiency measures to reduce the client's energy consumption at the client's premises. ESCO's can provide their customer's energy equipment on lease or benefit-sharing terms. ESCO's are considered as an effective mechanism for the introduction of energy efficient equipment, such as LED lighting equipment.

In India the ESCO approach is piloted, but not well established. Currently the barriers for operation of ESCOs in India include:

- Lack of experience as few ESCOs exist[18];
- ESCOs have insufficient financial means available[19];
- Due to lack of credit history, ESCOs are treated as a high credit risk. This leads to high collateral requirements, which many ESCOs are unable to provide.[20]

If an ESCO is able to overcome the above barriers, there is still difficult to offer lease or benefit-sharing terms to the end-user. In India, asset based lending is the dominant form of lending, whereas LEDs are not considered to be collateral by financing institutions. Reason for this is the fact that the cost of collection of equipment exceeds the value. This lack of collateral will be translated into an interest rate that makes a financial lease unviable or not possible at all.[21]

Capacity to absorb new technologies
Project site (business) owners are unwilling to make large up-front investments for the installation of energy efficient technology despite the forecasted electricity shortage, increased electricity prices and cost of maintenance. The potential for energy savings and attractive payback period is also not a sufficient catalyst for stimulating the required level of implementation. The LED's save energy PoA offers several options to realise a faster roll out of LED lighting technology (for a detailed list op options, see the section under 'Conclusion on the assessment and demonstration of additionality' below.

Practice shows commercial end-users are not investing in energy efficient LED lighting equipment for three main reasons:

a) Their capital investment requirements are too high compared to other investment options. The payback period, IRR and NPV are not attractive enough for commercial users to make such an investment.[22] A recent article by McKinsey & Company[23] refers to a survey conducted by McKinsey & Company in 2010, which showed that industry leaders agreed that the top roadblock

[18] Okay, N. and Akman, U., Analysis of ESCO activities using country indicators, in: *Renewable and Sustainable Energy Reviews*, Volume 14 (2010) p.2760-2771.

[19] Okay and Akman, Analysis of ESCO activities (2010).

[20] Painuly, J.P. et al, Promoting energy efficiency financing and ESCOs in developing countries: mechanisms and barriers, in: *Journal of Cleaner Production*, Volume 11 (2003) p.659-665.

[21] Reference to statement by financial institution made available to the DOE.

[22] Jackson, Promoting energy efficiency investments (2010).

[23] Wunderlich, F. et al, LED lighting at the crossroads: country road or expressway?, in: *LEDs Magazine* (November/December 2010) p.31 – 34.

for the uptake of LED lighting equipment is that LED lighting equipment unit costs are too high. The article notes that LED lamps are four times the price of an equivalent CFL in the 40-watt equivalent product range.

b) If an efficiency project does have an attractive financing period, IRR, NPV etc. the project will still have low priority. Management will prefer projects that increase revenue rather than reduce costs. Increasing revenue is seen as a more important performance indicator[24].

c) Scientific studies have consistently found that the average implicit discount rates firms use for investing in energy saving technologies are much higher than seems plausible, even when adjustments are made for risk.[25]

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

The presented barriers are serious and real obstacles for LED lighting equipment to be implemented. The conclusion on the elimination of alternative scenarios is presented in Table 3.

Table 3: Elimination of alternative scenarios prevented by barriers

No	Name of scenario	Scenario prevented by barriers?	Explanation
1	Business as usual	No	The identified barriers do not prevent this scenario as it describes the continuation of the current situation.
2	Same programme without use of the CDM	Yes	This scenario faces all the identified barriers: technological barrier & institutional, managerial resources and capacity to absorb new technologies barriers
3	Programme achieving the same results with a different incentive mechanism	Yes	This scenario in principle faces technological, managerial resources and capacity to absorb new technologies barriers,

The introduction of energy saving lighting technology and corresponding electricity savings are left to the market without further incentives (Alternative 1) is not hindered by the identified barriers

Step 4: Common practice analysis

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

The applicable geographical area is the republic of India, the delivered service is lighting (lux). The penetration of energy efficient lighting in India is low. More specifically LED lighting equipment has hardly penetrated the Indian lighting market. Currently the LED lighting equipment penetration rate is assessed to be well below 2% of the total lighting market[26]. This can be deemed a marginal proportion of the total market and is not the common practice. Furthermore the project proponents are not aware of any other activities similar to the LED's save energy platform.

[24] Taylor et al., Financing energy efficiency (2008).

[25] Ansar, J. and Sparks, R., The experience curve, option value, and the energy paradox, in: *Energy Policy* Volume 37 (2009) p.1012-1020.

[26] Statement by ELCOMA, the Electric Lamp and Component Manufacturers' Association of India (email correspondence 5th May 2011).

At inclusion of a CPA a Common Practice check needs to be performed. The CPA can only be included if the market penetration is below a set benchmark for market penetration (see also A.4.2.2 Eligibility criteria for inclusion of a SSC-CPA in the PoA, number 11).

For the LED's save energy PoA, a threshold for market penetration was set at 33%. Meaning that as long as the market penetration of LED lighting equipment does not reach 33%, LEDs are not regarded common practise.

The threshold of 33% market penetration is based on Rogers' (1995) Innovation-Decision Process Model and technology diffusion curve, where the innovators represent 2.5% of the market, the early adopters another 13.5% and the early majority 34%. The 33% includes half of the early majority since this category represents all sections of an economy whilst the innovators and early adopters are typically only the younger, higher educated, or better-informed part of the market. See Figure 3 for the distribution of adopter categories within a typical population.

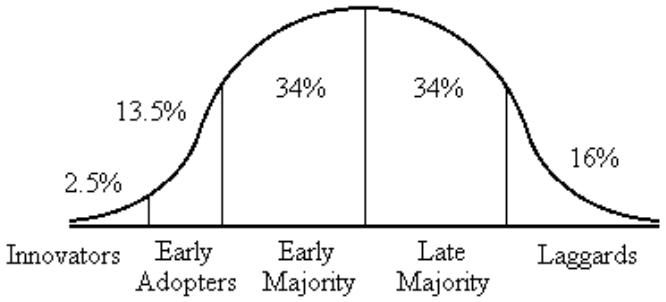


Figure 3: Distribution of adopter categories within a typical population[27]

The threshold of market penetration is included in the eligibility criteria for CPA inclusion, meaning that for each CPA it has to be proven that market penetration is below 33% in order to be included. For each CPA this is to be demonstrated by:

a) Publicly available regional or national statistics or
b) Alternatively (if a) is not available) the opinion/statement from at least one independent expert[28]

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

No similar options are occurring; hence this step is not applicable.

Conclusion on the assessment and demonstration of additionality

The implementation of LED lighting equipment in India faces a technological barrier & institutional, managerial resources and capacity to absorb new technologies barriers. The CME plays a crucial role by facilitating access to CER revenues for different manufactures, distributors and project developers to overcome these barriers. This consists of providing the following services:

[27] Source: Surry, D. W. and Ely, D. P.: Adoption, Diffusion, Implementation, and Institutionalization of Educational Technology. Available at: http://www.usouthal.edu/coe/bset/surry/papers/adoption/chap.htm

[28] Initially it is anticipated that national statistics are not available and expert opinions need to be sought.

Figure 4: services possibly provided by LED's save energy

In more detail the services presented are:

1. Professional Monitoring & Verification support
2. Financing structure (including access to CER revenue via an ERPA with CER buyer(s)
3. Professional scrapping services of old lighting equipment
4. Awareness raising
5. Energy audit
6. Match Making
7. Capacity Building

The registration of LED's Save Energy PoA under the CDM will overcome the identified barriers and enable the establishment and operation of a platform, aimed at enhancing market entry of high quality LED lighting equipment products. Based on the above analysis of alternative scenarios, barriers and common practice the PoA is considered to be additional.

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

A.4.4.1. Operational and management plan:

The following section describes the operational and management arrangements established by the CME for the implementation of the PoA, including:

1. A record keeping system for each CPA under the PoA,
2. 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,
3. The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.
4. The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

The 'LED's save energy' programme involves a range of operational activities in order to effectively implement and manage both the overall PoA as well as each individual CPA. The operational structure of the programme is depicted in Figure 5. An overview of the different parties involved in the programme and their respective responsibilities is given in Table 4.

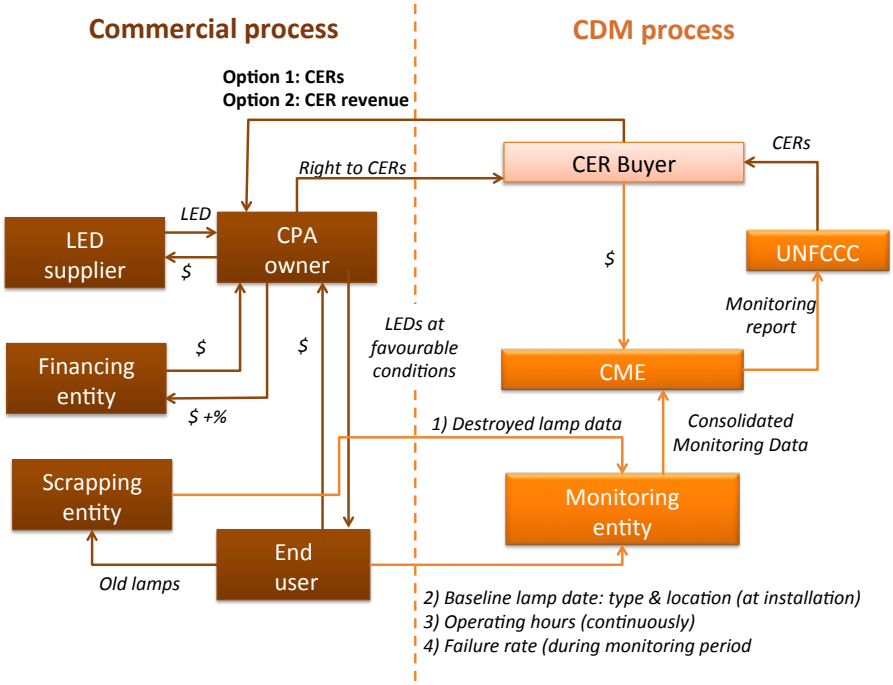


Figure 5: Operational flow within the programme

Roles under the programme	Responsibilities
Coordinating and Managing Entity	• Overall management and coordination of the PoA, communication with the EB • Approves inclusion of a CPA under the PoA based on the Eligibility Criteria • Operates and supervises central monitoring database • Checks aggregated CPA monitoring datasets to prevent double counting • Compiles monitoring reports per CPA and sends these to DOE for verification • Selects and proposes eligible actors to fulfil the monitoring and scrapping roles under the PoA
CPA Owner	• Enter into sales agreements for LED lighting equipment with end-users • Install or supervise instalment of LED lighting equipment (CPA owner has final responsibility for installation) • Deliver installation data to the actor fulfilling the monitoring actor • Ensure eligibility criteria are fulfilled • Must enter into a contract with monitoring and scrapping actors appointed by the CME to

Roles under the programme	Responsibilities
	monitor according to the PoA monitoring plan
End User (s)	• Purchase or receive LED lighting equipment from the CPA Owner • Waive all their rights to CERs generated under the CPA to the respective CPA owner • Use the LED lighting equipment with due care
CER buyer	• Purchase CERs from CPA Owner • Payment of PoA management expenses to CME
Monitoring Role	• Implement metered sampling to measure the mean operation time of installed LED lighting equipment • Implement non-metered sampling survey to determine the mean failure rate of installed LED lighting equipment • Collect all monitoring data: sampling data, installation data and scrapping data. Deliver the aggregated monitoring data to the CME
Scrapping Role	• Scrapping of replaced lighting equipment according to CDM rules • Deliver scrapping data to monitoring actor fulfilling this role
Financing Role	• If applicable provide financial support to the CPA Owner to implement the CPA.

Table 4: Description of roles and responsibilities of parties involved in the 'LED's save energy' programme

1. CPA Record Keeping

Each CPA Owner is responsible for monitoring the CPA according to the requirements stipulated in methodology ASM II-C. and the 'LED's Save Energy' monitoring plan described in section A.4.4.2 of this SSC-PoA-DD. The monitoring services are to be obtained from a CME approved party. Each CPA will have a unique CPA identification number in the database that is mutually exclusive with the other CPAs. Monitoring is performed at CPA level so that every CPA has its unique and individual set of data (see Table 6) in the central database.

2. Procedures to Avoid Double Counting

When LED lighting equipment is installed under the CPA, this will be recorded in the CPA data set by the parameter 'exact installation location'. This parameter is a unique address and/or description of the location where LED lighting equipment is installed.

All CPA data sets will be aggregated at PoA level in a central database. At verification, the CME will review the CPA data sets and check whether the parameter 'exact installation location' is unique. This procedure ensures that no double counting occurs within the overall PoA. In case of multiple entries of exact location, a detailed check will be made of that entry, including determination of precise lamp type installed. In case of double entries, the latest entry will be removed from the database.

3. De-bundling

According to 'Guidelines on assessment of de-bundling for SSC project activities' (Version 03), a CPA is exempted from performing a de-bundling check if each of the independent subsystems/measures included in the CPA of a PoA is no greater than 1% of the small-scale thresholds defined by the methodology applied. In this programme a single LED lighting equipment unit is the subsystem/measure. An LED lighting equipment unit will not entail more than 1% of the total energy savings of any CPA. Therefore the use of many LED lighting equipment units under one CPA is allowed regardless of the geographical location of the LED equipment units and is not regarded as de-bundling. However, the maximum savings of 60 GWh per year as upper limit of a small-scale CPA means that only a limited number of LED equipment units (hereafter LED lighting equipment) can be included within one CPA.

4. Subscription of CPA activity under the PoA

The PoA platform design allows for multiple CPA owners. Each CPA owner will enter into a contractual agreement with the CME in order to subscribe their activity to the 'LED's save energy' PoA.

A.4.4.2. Monitoring plan:

The following paragraphs will describe the proposed monitoring and sampling method/procedure to be used for verification of the amount of emission reductions achieved under the programme.

The project participants shall adhere to the General Guidelines for Small Scale Methodologies[29] (version 16) while monitoring the emission reductions from the project activity.

Para 17	General Guidelines for SSC-CDM methodologies	LED's save energy
a	Electronically archive all data [….] for a period of two years from the end of the crediting period;	Aggregated data will be stored in the central database for at least two years after the crediting period or the last issuance of CERs to the programme, whichever occurs first.
b	Data variables that are most directly related to the emission reductions […] should be measured or calculated at least once a year;	The most crucial data variable for the establishment of the emission reductions is operating hours. This variable is metered continuously for the applicable strata
c	Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years;	The used measurement equipment determines if a lamp is turned on or off. This is a) transmitted via a digital signal to the monitoring actor, or b) read out manually. This binary measurement is calibrated according to manufactured specifications, and recalibrated at least once in three years.
d	The measured data with high levels of uncertainty or without adequate calibration should be compared with location/national data and commercial data to ensure consistency;	The variable operating hours has no high level of uncertainty
e	Wherever a statistical sample is proposed for monitoring, the. General guidelines for sampling and surveys for small-scale CDM project activities. <http://cdm.unfccc.int/Reference/Guidclarif/ssc/index_guid.html> shall be referred.	The project activity applies the stratified random sampling method and refers to the General guidelines for sampling and surveys for small-scale CDM project activities.

Table 5 Monitoring requirements overview

[29] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

Monitoring Procedures

A central verification system will be implemented at PoA level to determine the amount of emission reductions achieved under the programme. The verification system consists of a central database that aggregates and stores all monitoring data collected throughout the programme. It is operated and supervised by the CME or an entity assigned by the CME.

Monitoring itself is performed at CPA level. That means that a separate data set and a respective monitoring report will be compiled per CPA. The data sets of all CPAs will be aggregated and stored within the central database at PoA level. Monitoring at CPA level is deemed advantageous in case of the 'LED's save energy' PoA, since the programme is designed to offer a marketing platform for LED lighting equipment. This implies that various different LED lighting equipment producers/retailers and different LED equipment types can be included under the overall PoA. In case of monitoring at CPA level, CERs issued are exclusively influenced by the nature of the specific CPA. Thus, monitoring at CPA level increases robustness of the dataset, lowers the margin for errors (this is a conservative approach and strengthens data reliability).

Four data streams can be distinguished with respect to the data collected during implementation and execution of the individual CPAs. These are:

a. Installation data including the details of lamp installation in particular the number and wattage of replaced (brownfield) or avoided (greenfield) equipment and the number and wattage of newly installed LED lighting equipment.
b. Scrapping data including the record on replaced and subsequently scrapped old lamp equipment
c. Sampling data including the mean operating hours (metered samples) of the newly installed lamps and their failure rate (non-metered survey).
d. If the devices installed replace existing devices (brownfield locations), the number and "power" of a representative sample of the replaced devices shall be recorded in a way to allow for a physical verification by DOE.

An overview of the recorded data is presented in Table 6, showing the relevant monitoring parameters to be included in the database and the respective CPA monitoring reports.

Parameter	Explanation	Symbol
End-user	Exact name(s) of end-user participating in the CPA	
Contact details	Address of end-user participating in the CPA	
Exact replacement location	Unique address and/or description of location where lamp installation takes place. Optional use of GPS data.	
Date of replacement	CERs will be earned starting the day after the installation of the LED lighting equipment. Under the condition that the day of installation is after start of the crediting period.	
Quantity of old equipment or avoided equipment	Counted number of replaced old equipment (brownfield) and avoided equipment (greenfield). Data is used to determine the baseline scenario.	n_i
Wattage of old equipment or avoided equipment	Nameplate data of replaced equipment. In case of avoided equipment (greenfield) the most conservative current practice is taken into account. Data is used to determine the baseline scenario.	p_i
Quantity of installed LED lighting equipment	Counted number of installed LED lighting equipment. Data is used to determine the project scenario.	n_k
Wattage of installed LED lighting equipment	Nameplate data. Data is used to determine the project scenario.	p_k

Parameter	Explanation	Symbol
Lamp Classification of installed LED lighting equipment	The Lamp Classification defines the strata for the sampling.	
Sample size of metered sample	Number of LED lighting equipment that is equipped with a monitoring meter in order to monitor the mean operating hours of the installed LED lighting equipment. Meter can be installed at the last point of control. Data is used to determine whether the sample size is statistically robust.	$S_{metered}$
Sample size of non-metered sample	Number of LED lighting equipment that are considered in the non-metered sampling survey in order to monitor the mean lamp failure rate and the outage factor. Data is used to determine whether the sample size is statistically robust.	$S_{non\text{-}metered}$
Location monitoring samples	Unique address or unique description of location of the LED lighting equipment equipped with a monitoring meter (meter can be installed at the last point of control). Optional use of GPS data.	
Operating hours of installed LED lighting equipment	Measured operation time of the LED lighting equipment in the metered sample. For each monitoring period a mean value is calculated; this value is used for the operating hours of all LED lighting equipment within the respective stratum.	o_k
Failure rate of installed LED lighting equipment (in %)	Measured failure rate of the LED lighting equipment in the metered sample. Failure rate is measured annually by means of a non-metered survey. The resulting value is used as the average failure rate of all LED lighting equipment within the respective stratum.	$r_{failure}$
Outage factor	Maintenance turn-around time from LED failure to replacement	of_y
Scrapping data	Number and wattage of scrapped lighting equipment. Scrapping data is used to double-check the installation data (replaced equipment).	
Sample for verification by DOE	If the devices installed replace existing devices, the number and "power" of a representative sample of the replaced devices shall be recorded in a way to allow for a physical verification by DOE. DOE (paragraph 12 of AMS II.C. Demand-side energy efficiency activities for specific technologies, v13). The number and "power" of the replaced equipment to be recorded for physical verification is based on the identified samples within the metered sampling survey ($\mathbf{S_{metered,k}}$). That means, if a meter is installed the replaced lamp is collected and stored for verification.	

Table 6: Monitoring data recording and parameters

As is required by methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13), the number of LED lighting equipment installed must correspond with the number of old equipment units collected and with the number of old equipment units scrapped plus the number of avoided lighting equipment units. In the event that there is a discrepancy between the total of replaced and avoided lamps and the number of newly installed LED lighting equipment, there are deemed to be leakage emissions. In this case, the lower of the two numbers is used to calculate the emission reduction for that CPA. The same applies to the total number of old equipment replaced (brownfield) and the number of old equipment collected and scrapped. Again, in case of a discrepancy between the numbers, the lower of the two numbers is used to calculate the emission reduction calculations for that specific CPA.

Both installation data and scrapping data are point measurements that are recorded once during the installation of new LED lighting equipment and the scrapping of replaced equipment, respectively. Installation data is provided by the CPA owner who is responsible for the installation of LED equipment

under his CPA. Scrapping data is provided by the actor responsible for handling the replaced lamps. Sampling data is a continuous measurement. Individual CPA owners purchase monitoring sampling services from a dedicated actor responsible for monitoring appointed by the CME. The monitoring actor is responsible for collecting the installation data from the CPA owner, the scrapping data from the scrapping actor and for sampling both operating hours and failure rate of the installed LED equipment. The monitoring actor subsequently sends the aggregated monitoring data (installation, scrapping and sampling data) to the CME who compiles a monitoring report per CPA, which is then stored in the central database.

During installation of LED Lighting Equipment, it is the responsibility of the CPA owner to store (keep safe) the number and power of a representative sample of the baseline lighting equipment, to allow for a physical verification by DOE.

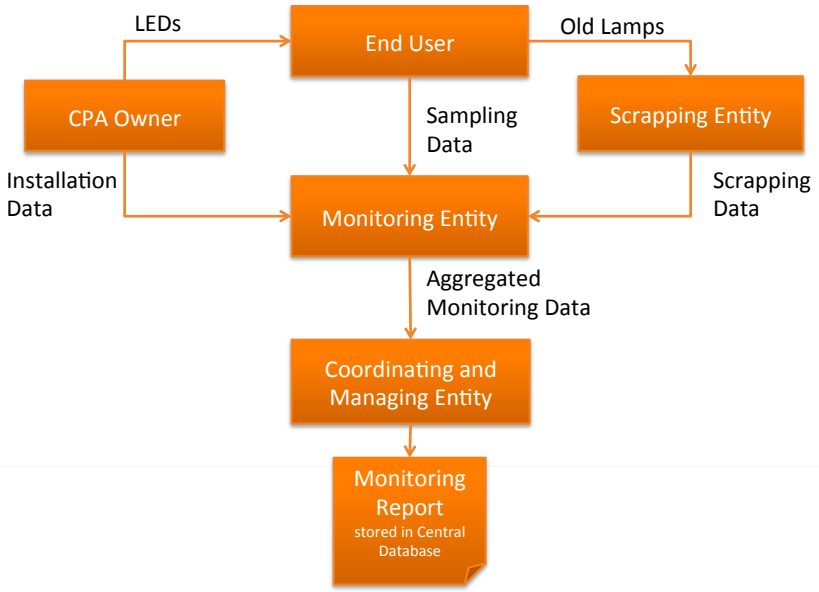


Figure 6: Monitoring Process

The central database shows the emission reductions realised by the entire PoA and the individual data sets attributed to each CPA. Verification of the data compiled will occur at the end of each monitoring period. The programme database will record the start and end dates of each monitoring period, and record the emission reductions attributable to each monitoring period per CPA.

Sampling Plan

The purpose of sampling is to obtain unbiased and reliable estimates of the mean value of parameters used in the calculations of greenhouse gas emission reductions. 'Unbiased' in this case indicates that the sampling will not systematically underestimate or overestimate the mean value determined. In the design of the sampling plan the, *The standard for sampling and surveys for CDM project activies and PoAs (Version 3.0), and the Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 2.0)*, were used.

The sampling plan below contains the required information relating to: (A) sampling design; (B) data to be collected; and (C) implementation plan.

Sampling will occur on a CPA level. For each CPA the sample sizes need to be determined in line with the guidance as laid down in the PoA-DD. Detailed guidance can be found under Annex 4.

A: Sampling design

(i) Objectives and Reliability Requirements

The reduction in energy use is the product of the following variables:

a) difference in wattage between the replaced equipment/avoided equipment and the newly installed LED lighting equipment (based on the name plate data). This is a point measurement, as it will be recorded once at the actual physical replacement
b) operating hours of the installed LED lighting equipment. This is a continuous measurement undertaken at the sample group LED lighting equipment.
c) failure rate of the installed LED lighting equipment. This is a survey conducted on the non-metered sample group LED lighting equipment.
d) grid emission factor of the country the programme is implemented in. This is a ex-ante calculation based on the installed power base. It is not a project-specific variable.

Sampling is necessary to establish variables b and c in the calculation of the reduction in energy use (see bullets above). Hence it will result in mean annual values over the crediting period per sampling stratum for:

- Lamp operating hours (h); and
- Lamp failure rate (%)

The minimum desired precision of the sample group is a sampling error of 10% and a confidence level of 90%[30].

(ii) Target Population

Under the PoA LED lighting equipment is broadly divided into two categories: indoor and outdoor. Further these can be divided - as per the power mentioned on the nameplate data of the LED lighting equipment - into high power and low power.

Table 7: Lamp classification

Indoor		Outdoor	
Low power	High power	Low power	High power
<40 Watt	≥ 40 Watt	<20 Watt	≥ 20 Watt
IL (Indoor Low)	IH (Indoor High)	OL (Outdoor Low)	OH (Outdoor High)

Hence, all LED lighting equipment under the CPAs that are included PoA will fall into one of the four strata: IL, IH, OL, OH identified above. These strata (classifications) are to be applied for the metered and non-metered sample groups.

[30] per EB 69 – Annex 4 Standard for Sampling and Surveys for CDM project activities and programme of activities. (para 10).

The different strata as described above represent the target populations for sampling under the programme. The number and nature of strata is defined individually per CPA since both are ultimately defined by the content and participants of each individual CPA.

(iii) Sampling Method
The selected sampling method is stratified random sampling (as per standard for sampling and surveys for CDM project activies and PoAs, Appendix 2 para 5). When sub-populations vary considerably, it is advantageous to group elements into relatively homogeneous sub-populations and sample each sub-population independently. The sub-populations are collectively exhaustive and mutually exclusive, i.e. no population element is excluded but every element in the population is assigned to only one sub-population (General Guidelines for SSC Sampling, Version 01).

(iv) Sample Size
See Annex for detailed guidance on the determination of the sampling size.

(v) Sampling Frame
See Annex for detailed guidance on the determination of the.

B: Data
(i) Field measurements
Lamp operating hours will be determined by means of a metered sampling survey. The LED lighting equipment in the sampling group is equipped with run time meters that measure the exact number of operating hours. The data from these run time meters is digitalized by the monitoring actor and sent to the CME. The sampling data is extrapolated for the respective sub-population that the sample group represents.

Lamp failure rate is determined by means of the same non-metered sampling survey on an annual basis. The sample group will be identified by the monitoring actor on the basis of random sampling. The operating hours are corrected by the percentage of LEDs replaced ($r_{failure,k,y}$) times the down time (per stratum) for each type of LED lighting equipment ($of_{k,y}$).

Table 8: parameters to be sampled

Parameter to be sampled	How sampled?	Confidence level	Monitoring ID
Operating hours (h)	Metered	90/10	o_k
Lamp Failure Rate (%)	Survey on non-metered sample	90/10	$r_{failure,k,y}$

(ii) Quality Assurance/Quality Control:

The programme has the following Quality Assurance/Quality Control procedures in place.

Table 9: QA/QC

Parameter to be sampled	How sampled?	Quality Assurance/Quality Control
Operating hours (h)	Metered	All data entries will be checked on validity and correctness using dedicated software. A procedure has been developed to correct for non-valid data entries
Lamp Failure Rate (%)	Survey on non-metered	The survey will consist of identifying LED lighting equipment,

	sample	based on their 'exact installation location' that are installed and operating. The exact installation location is the entry in the database that allows for a unique identification. While LED lighting equipment replaced as part of a regular maintenance or warranty program can be counted as operating, LED lighting equipment cannot be replaced as part of the survey process and counted as operating.

The CPA owner is responsible for the LED lighting equipment installation. The monitoring actor is responsible for the correct installation of the sample Meters, the execution of the sampling survey and the gathering and digitalization of the respective sampling data.

C: Implementation

The CME will select one (or more) specialised and experienced monitoring actor(s) who will provide the monitoring service to the CPA owners. In this way potential mistakes during the sampling process can be minimised. The monitoring actor, contracted by the individual CPA owners who purchase its services, will be responsible for all sampling activities (installation of meters, survey execution, reading and processing of sampling data). Dedicated meters that will be installed at the sample lamp base measure the exact operation time of the respective sample. The data is a) relayed to Central Server digitally or b) obtained by manual read out to the monitoring actor who processes the data by means of a dedicated monitoring software to produce daily usage data. This digitalised sampling data is then sent to the CME who collects and stores the data over time (central database) and issues the overall monitoring report (see Figure 5). Each CPA will be sampled individually to prevent statistical bias.

It is important to guarantee a uniform distribution of the monitoring samples throughout the defined strata (sub-populations). The monitoring actor in charge shall ensure that the sample selection will not display any pattern which would potentially threaten randomness.

Verification

Based on the data gathered in the central database, a written monitoring report per CPA will be provided by the CME to the verifying DOE to demonstrate compliance with the monitoring requirements corresponding to the preceding monitoring period. Apart from the aggregated data, the monitoring report includes the outcome of the following internal checks of procedures:

1) The single basic check; to ensure that replacement procedures are being followed, at least one spot check at a replacement location will be done;
2) The number check; to ensure that the number of LED equipment installed corresponds with the number of old equipment collected and avoided equipment;
3) The single visual check; in order to establish that collection of old equipment has been undertaken correctly, one physical spot check will be conducted of the replaced equipment prior to their destruction;
4) The double check; to ensure that no leakage occurs, either a certificate of scrapping is presented and checked or an independent party will be present at scrapping and testify the old equipment is indeed scrapped;

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

No public funding will be used for this programme.

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

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

01/12/2012

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:

This PoA involves the distribution and installation of LED lighting equipment. The use of LED lighting equipment does not entail significant environmental impacts. The host country does not require that environmental impact assessments should be undertaken for the PoA.

There are no statutory environmental requirements on LED disposal, so there is no need for analysis of the environmental impacts, including trans-boundary impacts as a result of this PoA. The primary environmental impact of the PoA is the physical waste created by the replaced lighting equipment. The methodology requires that this is collected and scrapped to prevent leakage.

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),:

The Indian Government does not require an environmental impact assessment for a typical SSC-CPA.

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 choice for PoA level is informed by the fact that all potential installations of LEDs have similar features at national and subnational level. As the roll out scope of the programme is throughout India, so

the stakeholders are also based across India. Therefore the Local Stakeholder Consultation organised at PoA level has captured all relevant stakeholders.

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

With respect to the proposed Programme of Activities 'LED's Save Energy', a local stakeholder consultation was organised on 22 July 2011 at the hotel *Meluha The Fern* in Mumbai, India.

Key stakeholders were identified by the project proponents and received personal invitations to the meeting. The project proponents contacted all invited stakeholders by telephone to confirm their proper receipt of invitations sent. All invited stakeholders were requested to send an alternate representative in case they themselves would not be able to attend the meeting. In addition the meeting was advertised in two newspapers: The Economic Times of India and The Times of India.

Personal invitations were sent to:

- The designated national authority of India;
- Other relevant Indian Government representatives;
- LED lighting equipment suppliers;
- Financing institutions;
- Energy Service Companies;
- Local government representatives;
- End-users of LED lighting equipment;
- Energy distribution companies;

The local stakeholder consultation was attended by approximately 25 people. Participants were requested to leave their contact details and sign an attendance list. During the meeting a professional photographer was present to document the meeting.

D.3. Summary of the comments received:

#	Question	Answers
1	In your presentation on the programme, you presented an example with indicative savings of INR 3,300. Is that INR 3,300 per year?	No, this is over a ten year period.
2	Does the indicative number of INR 3,300 represent the value of the carbon credit only, or have the energy savings also been incorporated in the calculation?	This only considers carbon credit value and does not consider energy savings.
3	How are the units of energy saving converted to CER units?	The UNFCCC has provided a calculation methodology to determine the average CO2 emissions per average kWh generated in the national grid. This is called the tool to calculate the emission factor for an electricity system.
4	Who will collect the data of energy saving by the consumers and how will these saving be transferred to the end-user?	The collection of data is done by the CPA owner (project implementer). The energy savings are fully to the benefit of the end-user.
5	How do you calculate the baseline emissions?	Step-wise: 1) determine the currently installed lamp

#	Question	Answers
		capacity; 2) determine annual operating hours; 3) multiply by the grid emission factor for India.
6	Is the revenue from the carbon credits given upfront? How much time before this revenue becomes available for LED suppliers under the programme?	No, these revenues are generated after usage of the lamps. They will become available after certification of the usage. Typically this takes six to twelve months.
7	How are the energy savings measured?	This is done through the following steps: 1) determine the difference in capacity between the currently installed lamps and the project lamps; 2) sample the operating hours; 3) multiply by the grid emission factor for India.
8	For how much time can you receive upfront subsidy?	It is not possible for the CDM Executive Board under the UNFCCC to issue credits in advance for a ten year period. Credits will only be issued periodically after certification of the emission reductions resulting from the project.
9	What will be the benefit in participating in the LED's Save Energy programme to LED lighting equipment manufacturers? How is the benefit transferred to LED Manufacturers?	The programme will provide an opportunity to participating LED lighting equipment manufacturers to sell more LED lighting as well as increase their market share.
10	When the programme is registered can carbon credits from the programme still be sold under the European Emissions Trading System (ETS) after the Kyoto protocol's first commitment period runs out on 31 December 2012?	Yes, the EU has made legislation for CO2 emissions by companies. This is valid and will be enforced until 2020. Credits from projects registered before 31 December 2012 will be eligible for sale under the European ETS. One of the advantages of a Programme of Activities (PoA) is that new CDM Programme Activities (CPA's) can be added under the PoA after 2012 and credits from these newly added CPA's will be eligible for sale under the European ETS up to 2020. The European Commission has explicitly confirmed this.
11	Could revenue from carbon credits issued under the programme (once registered) be awarded to manufacturers to subsidise costs of marketing LED lighting equipment or to subsidise the costs of setting up a factory for producing Light Emitting Diodes?	Considering marketing: there should be a clear relation between the product and the greenhouse gas reduction. With respect to setting up a factory: this is not possible under this programme.
12	Is the programme incorporating learnings from the PoA "Bachat Lamp Yojana" (BLY)?	Yes, the project proponents have had meetings with the Bureau of Energy Efficiency (BEE, developers and owners of the BLY PoA) and they have shared their experiences and learnings.
13	Has the Indian government shown interest in the LED´s save energy programme?	On a national level we have discussed the programme with the BEE. The fact that the Municipal Corporation of Greater Mumbai is present, is an indication that local government is interested in the programme.
14	Because of frequent voltage fluctuations on the electricity grid, our currently installed lamps have to be replaced at least once per year. How does LED lighting equipment cope under frequent voltage	This question was answered by an LED lighting equipment supplier in the audience as follows: this is related to the electronics used in the LED lamp. Typically, the more expensive the electronics that are

#	Question	Answers
	fluctuations?	used, the better an LED lamp can withstand the voltage fluctuations.
15	When is the programme expected to be registered with UNFCCC?	We aim for a registration of the programme in the first quarter of 2012.
16	Which authority will determine the number of CERs generated due to savings in Energy?	The number of CERs is based on the monitoring data. CERs are issued by the CDM Executive Board.
17	Does LED lighting equipment need to have certification that it will function for a period of ten years to be eligible to be used under the programme?	No, this is not required.

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

No comments or concerns were raised during the consultation with local stakeholders that necessitated changes to the project design. Valuable comments were made on the importance of using high quality LED lighting equipment in the programme. The project proponents will take these comments into consideration for the further roll-out of the programme.

SECTION E. Application of a baseline and monitoring methodology

This section will demonstrate the application of the baseline and monitoring methodology to a typical SSC-CPA. It defines the PoA specific elements that will be included in preparing the PoA specific form used to define and include a SSC-CPA in this PoA (PoA specific CDM-SSC-CPA-DD).

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

The programme classifies as:

- Scope 3: Energy Demand / TA 3.1 Energy Demand

The programme uses the following approved small-scale baseline and monitoring methodology:

- AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13).31

The programme will use the following tools:

- Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities[32]
- Tool to calculate the emission factor for an electricity system (Version 02.2.1)[33]

The programme will use the following guidelines:

- Standard for sampling and surveys for CDM project activities and programme of activities (Version 03.0)[34]

[31] http://cdm.unfccc.int/methodologies/DB/UA3QLMFDUFFQ1P210L6EIK44O8U7XM/view.html

[32] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf

[33] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[34] http://cdm.unfccc.int/Reference/Standards/meth/meth_stan05.pdf

- General guidelines for SSC CDM methodologies (Version 17.0)[35]
- Non-binding best practice examples to demonstrate additionality for SSC project activities, EB35, Annex 34[36]
- Guidelines for objective demonstration and assessment of barriers, EB50, Annex 13[37]
- Guidelines on assessment of de-bundling for SSC project activities (Version 03)[38]
- Guidelines on the demonstration of additionality of small scale project activities (Version 9.0)[39]
- Guidelines for sampling and surveys for CDM project activities and programme of activities (Version 2.0)[40]

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

The methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13) is applicable since the project activities fulfil the following criteria:

e) The programme entails activities that promote the adoption of energy efficient equipment through the distribution and installation of LED lighting equipment, creating demand-side energy savings and reductions in greenhouse gas emissions - at many sites. LED lighting equipment may replace existing equipment (Brownfield) or be installed at new sites (Greenfield);

f) The aggregate energy savings by a single programme activity may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies.

g) The light output of every replaced lighting equipment will not be significantly smaller (maximum -10%) or larger (maximum +50%) than the baseline.

h) Leakage associated with SSC-CPAs will be accounted for through the independent verification of scrapping of the old equipment.

[35] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

[36] http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

[37] http://cdm.unfccc.int/EB/050/eb50_repan13.pdf

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

[39] http://cdm.unfccc.int/EB/068/eb68_repan27.pdf

[40] http://cdm.unfccc.int/EB/069/eb69_repan5.pdf

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

Source		Gas	Included?	Justification / Explanation
Baseline	Power plants servicing the electricity grid	CO_2	Yes	Main source of emission.
		CH_4	No	Excluded for simplification. Minor source of emission. Conservative.
		N_2O	No	Excluded for simplification. Minor source of emission. Conservative.
Project Activity	Power plants servicing the electricity grid	CO_2	Yes	Main source of emission.
		CH_4	No	Excluded for simplification. Minor source of emission. Consistent with baseline.
		N_2O	No	Excluded for simplification. Minor Source of emission. Consistent with baseline.

Table 10: GHG sources included in the CPA boundary

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

The energy efficiency measure of the installation of LED lighting equipment saves electricity; therefore the emission baseline is determined as the product of the electricity consumption of the old equipment replaced (in case of brownfield) or the electricity consumption of the equipment avoided (in case of greenfield) and the emission factor for the electricity displaced.

Type II and III Greenfield projects (new facilities): may use a Type II and Type III small- scale methodology provided that they can demonstrate that the most plausible baseline scenario for this project activity is the baseline provided in the respective Type II and Type III small-scale methodology.

The baseline scenario for Greenfield actvities is determined in the following steps.

Step 1:
In this step the various alternatives available to the project proponent that deliver comparable level of service including the proposed project activity undertaken without being registered as a CDM project activity are identified

Alternative	Name of alternative
1	Business as usual
2	Same programme without use of the CDM
3	Programme achieving the same results with a different incentive mechanism

Step 2:
All identified Alternatives are in line with host Country's legislation

Step 3:
Under this step the Alternatives are ranked taking into account barrier tests specified in attachment A to Appendix B of the simplified modalities and procedures of SSC CDM.

Alternative	Barrier
1	No barrier
2	Technological and other barrier (see section A.4.3)
3	Technological and other barrier (see section A.4.3)

Step 4:
As only one Alternative remains, namely business as usual, and that is not the proposed project activity undertaken without being registered as a CDM project activity. And furthermore this corresponds to one of the baseline scenarios provided in the methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13); then the project activity is eligible under the methodology.

Hence the baseline scenario for Greenfield activities is business as usual use of lighting equipment. In order to be conservative the most conservative common practice will be taken as the baseline scenario, to determine the installed lighting equipment that otherwise would have been installed (avoided equipment). The most conservative common practice is defined here as the least electricity consuming available non-LED lighting equipment producing light output service levels, in the amount of Lux, as required for the application in question by national standards and/or codes. This is to be supported for each site by documentation of representative locations, where baseline lighting equipment is already installed in the same region as the project.

The baseline energy consumption is the product of the power consumption, the operating hours and the quantity of equipment replaced (brownfield) and avoided equipment installed (greenfield). Quantity and wattage of replaced or avoided equipment is a one-point measurement that is delivered by the CPA owner who is responsible for LED lighting equipment installation. Each LED lighting equipment installation will be recorded in a respective data sheet, containing location, quantity and wattage of both newly installed LED as well as replaced or avoided non-LED lamp.
The operating hours are measured by monitoring the sample LED lighting equipment after installation. It is assumed that the replaced equipment had an equal amount of operating hours as the LED lighting equipment that replaces this equipment.

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:

Additionality is demonstrated at PoA level.

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

Additionality is demonstrated at PoA level.

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

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

The methodological choices that will be applied in relation to each of the CPAs to be developed under this PoA are as follows:

Determination of Baseline Emissions
The energy displaced in the baseline is electricity. The baseline electricity consumption of each CPA is the product of two variables, the wattage of the replaced equipment or avoided equipment, and the operating hours. For Brownfield, the number and nameplate wattage of each replaced lamp is registered during installation of the new LED lighting equipment. For Greenfield, the most conservative common practice will act as the baseline wattage. The operating hours are measured by monitoring the distributed LED lighting equipment ex-post with meters installed in the project sample group.

The baseline emissions are calculated by multiplying the baseline electricity consumption of the baseline lighting systems with the grid emission factor for electricity in India. The grid emission factor for the electricity displaced is calculated in accordance with "Tool to calculate the emission factor for an electricity system". The baseline emissions are adjusted for average annual technical grid losses (transmission and distribution) for the grid serving the location where the devices are installed, expressed as a fraction.

Determination of Project Emissions
The energy consumed in the project is electricity. The project electricity consumption of each CPA is the product of two variables, the wattage of the installed LED equipment and the operating hours. The number and nameplate wattage of each newly installed LED lighting equipment is registered during installation. The operating hours are measured by monitoring the distributed LED lighting equipment ex-post with meters installed in the project sample group.

The project emissions are calculated by multiplying the project electricity consumption of the project lighting systems with the grid emission factor for electricity in India. The grid emission factor for the electricity displaced is calculated in accordance with "Tool to calculate the emission factor for an electricity system". The project emissions are adjusted for average annual technical grid losses (transmission and distribution) for the grid serving the location where the devices are installed, expressed as a fraction.

Leakages
Leakages will be avoided because the replaced equipment will be scrapped. Independent monitoring of the scrapping of replaced equipment will be implemented in compliance with the requirements of the applied baseline and monitoring methodology.

According to requirements of methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13), the monitoring will include a whether check if the number of project activity equipment distributed by the project and the number of scrapped equipment are equal and no leakage occurs. For this purpose scrapped equipment will be stored until such correspondence has been checked. The scrapping of replaced equipment will be documented and independently verified.

Calculation of Emission Reductions
Emission Reductions are calculated by subtracting project emissions from baseline emissions.

Metered Sample Group
The values for operating hours used for calculating baseline- and project emissions are determined through a metered sampling process per stratum at CPA level. The size of the project sample group used for arriving at these values is determined taking into consideration the guidance as per this PoA-DD. The CME will work to ensure that, to the extent feasible, the LEDs included will be randomly selected from

the database of participating LEDs. The results obtained from the sampling process will be directly extrapolated across the entire population of LEDs installed in that stratum in the respective CPAs.

Non-metered Sample Group
A group of non-metered LED lighting equipment will be randomly identified on basis of the project database and will be subject to annual check to determine the mean failure rate of the installed equipment.

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

Baseline
Because the energy displaced is electricity, the emission baseline is determined as the product of the baseline energy consumption and the emission factor for the electricity displaced (as per option 1 of methodology AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13).

$$BE_y = E_{BL,y} * EF_{CO_2,ELEC,y}$$

Equation 1

$$E_{BL,y} = \frac{\sum_i (n_i * p_i * o_i)}{(1 - l_y)}$$

Equation 2

Where;

BE_y	Baseline emissions in monitoring period *y* (tCO_2e)
$E_{BL,y}$	Energy consumption in the baseline in monitoring period *y* (kWh)
$EF_{CO2,ELEC,y}$	Emission factor in monitoring period *y* calculated in accordance with "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh). Under the PoA, the Grid Emission Factor (GEF) is calculated as per the "Tool to calculate the emission factor for an electricity system" using a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM). Data is sourced from the latest publicly available CO_2 emission database by the Central Electricity Authority (CEA) of India. Refer to Annex 3 of the generic CPA-DD for how to calculate the GEF. The calculated GEF value is fixed ex-ante in the SSC-CPA at the time of CPA inclusion.
Σi	The sum over the group of "i" devices replaced (brownfield) and "i" devices avoided installation (greenfield), for which the substituted energy efficient equipment is operating during the monitoring period of the project
n_i	The number of devices of the group of "i" devices replaced (brownfield) and "i" devices avoided installation (greenfield), for which the substituted energy efficient equipment is operating during the monitoring period
p_i	The power of the devices of the group of "i" devices replaced (brownfield) and "i" devices avoided installation (greenfield)
o_i	The average operating hours during the monitoring period of the devices of the group of "i" devices replaced (brownfield) and "i" devices avoided installation (greenfield). This is equal to parameter $o_{k,net,y}$ that is monitored throughout the crediting period.
l_y	Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the devices are installed, expressed as a fraction. A AMS-II.C. Demand-side energy efficiency activities for specific technologies (version

13), of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable

Project Emissions

Because the energy used is electricity, the project emissions are determined as the product of the energy consumption of the project and the emission factor for the electricity displaced.

$$PE_y = E_{p,y} * EF_{CO_2,ELEC,y}$$

Equation 3

$$E_{p,y} = \sum_k (n_k * p_k * o_k)/(1 - l_y)$$

Equation 4

Where;

PE_y	Project emissions in monitoring period *y* (tCO_2e)
$E_{P,y}$	Energy consumption due to the project in monitoring period y (kWh)
$EF_{CO2,ELEC,y}$	Emission factor in monitoring period *y* calculated in accordance with "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)
Σk	The sum over the group of "k" LED lighting equipment equipment that is operating during the monitoring period of the project
n_k	The number of devices of the stratum of "k" LED lighting equipment equipment that is operating during the monitoring period. This parameter will be corrected with the monitoring data on failure of devices throughout the monitoring period
p_k	The power of the devices of the stratum of "k" LED lighting equipment equipment that is operating during the monitoring period
$o_{k,net,y}$	The average operating hours during the monitoring period of the devices of the stratum of "k" LED lighting equipment equipment This parameter will be corrected with the monitoring data on replacement by maintenance of devices throughout the monitoring period (see below)
l_y	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction. A AMS-II.C. Demand-side energy efficiency activities for specific technologies (version 13), of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable

The measured operating hours are corrected by the percentage of LEDs replaced ($r_{failure,k,y}$) times the down time (per stratum) for each type of LED lighting equipment ($of_{k,y}$).

The operating hours are to be corrected by the failure rate and the outage factor as follows:

$$o_{k,net,y} = o_{k,y} * (1 - (r_{failure,k,y} * of_{k,y})$$

Equation 5

Where:

$o_{k,net,y}$	The average operating hours during the monitoring period of the devices of the stratum "k" of LED lighting equipment in year (y)
$o_{k,y}$	The metered operating hours of the devices of the stratum "k" LED lighting equipment in year (y)

$r_{failure,k,y}$ Lamp Failure rate is the % of lamps that have failed and are replaced within stratum "k" LED lighting equipment with comparable LED lighting equipment as part of a Warranty Scheme (guaranteed by the LED manufacturer), or part of a regular maintance scheme.

$of_{k,y}$ Outage factor of LED lighting equipment within stratum "k" that discounts the operating hours, based on elapsed time between the failure of the LED lighting equipment and the replacement. To be established per site, if this is not possible, a default value of 3 months (25%) is to be used.

Emission Reductions

The emission reduction achieved by the project activity shall be determined as the difference between the baseline emissions and the project emissions and leakage.

$$ER_y = BE_y - PE_y - LE_y$$

Equation 6

Where;

ER_y Emission reductions from avoided electricity consumption in year *y* (tCO_2/y)

BE_y Baseline emissions from electricity consumption in year *y* (tCO_2/y)

PE_y Project emissions from electricity consumption in year *y* (tCO_2/y)

LE_y Leakage emissions in year *y* (tCO_2/y). The leakage effect of the use of the replaced equipment in another activity can be neglected if the replaced equipment is scrapped.

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

Data / Parameter:	$EF_{CO2,ELEC,y}$
Data unit:	$kgCO_2/kWh$
Description:	CO_2 emission factor for displacement of electricity in the grid serving the end-users that participate in the SSC-CPA during the monitoring interval y,
Source of data used:	The latest version of CDM baseline CO_2 emission database by Central Electricity Authority (CEA), Ministry of power, Government of India
Value applied:	SSC-CPA to apply value as per the grid-connectivity
Justification of the choice of data or description of measurement methods and procedures actually applied:	The CO_2 emission factor shall be calculated according to the latest approved version of the 'Tool to calculate the emission factor for an electricity system. The SSC-CPA owner shall apply the latest grid emission factor database available on the CEA website and fix the value ex-ante at the time of CPA inclusion.
Any comment:	-

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

E.7.1.Data and parameters to be monitored by each CPA:

Data / Parameter:	l_y
Data unit:	%
Description:	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the lighting equipment is installed.
Source of data to be used:	Published data by an official governmental body or 10 % Default
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post.*
Description of measurement methods and procedures to be applied:	THE SSC-CPA's database identify for eacht LED lighting equipment the relevant distribution company (DISCOM). The most recent availablel publication is to be used. The average annual grid losses will be determined upon installation of each LED lighting equipment and will be fixed throughout the crediting period.
QA/QC procedures to be applied:	By using official publications by DISCOMs or official governmental bodies the quality of the value of the data is ensured, as this is the best available source. A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.
Any comment:	-

Data / Parameter:	n_i
Data unit:	Number
Description:	Number of replaced equipment collected (brownfield) and number of avoided equipment installed (greenfield) under the SSC-CPA
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	At the time of LED lighting equipment installation, the number of replaced equipment (brownfield) or avoided equipment (greenfield) will be recorded. A distinction between brownfield and greenfield installation will be made in the data entries, which allows for allocation at a later stage.
QA/QC procedures to be applied:	A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.
Any comment:	For the calculation of the emission reductions both brownfield and greenfield number are placed under the same parameter for simplicity. As per paragraph 12 of AMS II.C. Demand-side energy efficiency activities for specific

	technologies (v13) a representative sample of the replaced devices (including the number and "power") will be recorded to allow for physical verification by the DOE. The number and "power" of the replaced equipment to be recorded for physical verification is based on the identified samples within the metered sampling survey ($\mathbf{S_{metered,k}}$). That means, if a meter is installed the replaced lamp is collected and stored for verification.

Data / Parameter:	$\mathbf{n_{scrapped}}$
Data unit:	Number
Description:	Number of replaced equipment collected (brownfield) that is scrapped under the SSC-CPA
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	As per the methodology AMS-II.C Demand-side energy efficiency programmes for specific technologies (version 13) replaced equipment (old lamps) must be scrapped, in order to prevent leakage and ensure correct disposal. The contracted scrapping entitiy will provide independently verified data on the scrapped equipment. This allows for a check whether the number of project activity equipment distributed by the SSC-CPA and the number of scrapped equipment correspond with each other. The scrapping of replaced equipment will be documented and independently verified
QA/QC procedures to be applied:	A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.
Any comment:	-

Data / Parameter:	$\mathbf{n_k}$
Data unit:	Number
Description:	Number of installed LED lighting equipment under the SSC-CPA
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	At the time of installation, the number of LED lighting equipment installed will be recorded and subsequently entered into the database of the SSC-CPA.
QA/QC procedures to be applied:	A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.

Any comment:	-

Data / Parameter:	p_i
Data unit:	Watt
Description:	Power of the replaced equipment (brownfield) or the most conservative common practice power of the avoided equipment installed (greenfield) in the baseline.
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	At the time of installation, the name plate wattage of replaced equipment (brownfield) or of the most conservative common practice as avoided equipment installed (greenfield) will be recorded.
QA/QC procedures to be applied:	A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.
Any comment:	As per paragraph 12 of AMS II.C. Demand-side energy efficiency activities for specific technologies (v13) a representative sample of the replaced devices (including the number and "power") will be recorded to allow for physical verification by the DOE. The number and "power" of the replaced equipment to be recorded for physical verification is based on the identified samples within the metered sampling survey ($S_{metered,k}$). That means, if a meter is installed the replaced lamp is collected and stored for verification.

Data / Parameter:	p_k
Data unit:	Watt
Description:	Power of the installed LED lighting equipment
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	At the time of installation, the name plate wattage of each installed LED lighting equipment will be recorded.
QA/QC procedures to be applied:	A CME representative will perform spot-checks on data entries by the CPA-owner in order to minimise data entry errors.
Any comment:	-

Data / Parameter:	$S_{metered,k}$
Data unit:	Number
Description:	Total number of metered samples for each stratum installed within a SSC-CPA in order to monitor mean operating hours of the installed LED lighting equipment under stratum k.
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined for the SSC-CPA,
Description of measurement methods and procedures to be applied:	Sample size is determined with a confidence precision ratio of 90/10. This is in line with the requirements listed in the "General guidelines for sampling and surveys for small-scale CDM project activity (Version 1)". The sample size is to be calculated for every stratum of each CPA using equation 7 (Annex 4), with a minimum of 70. Meter can be installed at the last point of control.
QA/QC procedures to be applied:	The CPA owner has to hire a by the CME approved monitoring entity for the operating hours. This to ensure there are proper QA/QC in places for the monitoring.
Any comment:	-

Data / Parameter:	$S_{non\text{-}metered,k}$
Data unit:	Number
Description:	Total number of non-metered samples for each stratum installed within a SSC-CPA in order to monitor the mean failure rate of the installed LED lighting equipment under stratum k.
Source of data to be used:	Database SSC-CPA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be determined for the SSC-CPA. • Survey to determine the failure rate are to be undertaken for each stratum of LEDs installed under the specific CPA. • Timing & Frequency: surveys are to be done once in 6 months, starting after start date of the respective CPA
Description of measurement methods and procedures to be applied:	Sample size is determined with a confidence precision ratio of 90/10. This is in line with the requirements listed in the "General guidelines for sampling and surveys for small-scale CDM project activity (Version 1)".
QA/QC procedures to be applied:	The CPA owner has to hire a by the CME approved monitoring entity for execution of the non-metered sampling survey. This to ensure there are proper QA/QC in places for the monitoring. .

Any comment:	-

Data / Parameter:	o_k
Data unit:	Hours
Description:	Mean annual operating hours of LED lighting equipment installed.
Source of data to be used:	Metered sample group(s)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*.
Description of measurement methods and procedures to be applied:	Continuous readings of monitoring equipment installed in metered sample group. Sub-populations to be monitored are stratified according to Lamp Classification. Specialised metering equipment is to be installed in monitoring sample group. This equipment will feed monitoring data back to the monitoring entity who digitalised and processes the incoming data and submits these to the CME.
QA/QC procedures to be applied:	All data entries will be checked on validity and correctness using dedicated software. A procedure has been developed to correct for non-valid data entries.
Any comment:	The number of meters to be installed per stratum k is defined under $S_{metered,k}$

Data / Parameter:	$r_{failure,y}$
Data unit:	%
Description:	Mean annual failure rate of the installed LED equipment.
Source of data to be used:	Periodic non-metered sampling survey(s).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A; available only *ex-post*..
Description of measurement methods and procedures to be applied:	Annual survey of non-metered sampling group for each stratum k. Sub-populations to be monitored are stratified according to Lamp Classification. Data will be aggregated and stored in the central database.
QA/QC procedures to be applied:	The survey will consist of identifying LED lighting equipment, based on their 'exact installation location' that are installed and operating. The exact installation location is the entry in the database that allows for a unique identification. While LED lighting equipment replaced as part of a regular maintenance or warranty program can be counted as operating, LED lighting equipment cannot be replaced as part of the survey process and counted as operating.

Any comment:	The number of LEDs to be included under the survey, per stratum k is defined under $S_{non\text{-}metered,k}$

Industry standard software, databases, infrastructure and backup procedures will allow full auditability with the aim of ensuring long-term data integrity and security so that data is not misreported, overwritten or lost. Data entry occurs decentralised at the point of LED lighting equipment installation. The full database is stored centrally.

Aggregated data will be stored in the central data base for at least two years after the crediting period or the last issuance of CERs to the programme, whichever occurs last.

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

Monitoring is performed at CPA level. See Section A-4.4.2 for detailed overview of the monitoring plan.

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 final draft of this baseline section has been completed on 27/5/2011 by Mr. Edwin Dalenoord, Mr. Kim van der Leeuw, Mr. Lucas Koolschijn and Ms. Katrin Heer.

The baseline and monitoring methodology has been prepared by Do-inc. business B.V.

Company name:	Do-inc.
Visiting Address:	Mauritskade 55-D 1092 AD Amsterdam The Netherlands
Contact Person:	Edwin Dalenoord
Telephone number:	+31 (0)6 4136 9790
e-mail:	e.dalenoord@do-inc.net

Annex 1

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

Organization:	Mabanaft Carbon India Pvt. Ltd.
Street/P.O.Box:	103, Spectra, Hiranandani Business Park, Powai
Building:	
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 076
Country:	India
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	Mr. GP Aggarwal
Title:	Director
Salutation:	Mr.
Last Name:	Aggarwal
Middle Name:	
First Name:	GP
Department:	
Mobile:	+91-9769827604
Direct FAX:	+91-22 2570 6854
Direct tel:	+91-22 6677 2768
Personal E-Mail:	gp.aggarwal@mabanaft.com.sg

Organization:	Mabanaft Carbon B.V.
Street/P.O.Box:	Wilhelminakade 101
Building:	Maastoren
City:	Rotterdam
State/Region:	Zuid-Holland
Postfix/ZIP:	3072AP
Country:	The Netherlands
Telephone:	+31 10 290 69 43
FAX:	+31 10 411 07 53
E-Mail:	alexander.savelkoul@mabanaft.nl
URL:	www.mabanaft.nl
Represented by:	
Title:	Senior Manager
Salutation:	Mr.
Last Name:	Savelkoul
Middle Name:	
First Name:	Alexander
Department:	

Organization:	Do-inc. business B.V.
Street/P.O.Box:	Mauritskade 55-d
Building:	
City:	Amsterdam
State/Region:	
Postfix/ZIP:	1092 AD
Country:	The Netherlands
Telephone:	+31 6 4136 9790
FAX:	+31 8 7784 2538
E-Mail:	e.dalenoord@do-inc.net
URL:	www.do-inc.net
Represented by:	
Title:	Director Consultancy
Salutation:	Mr.
Last Name:	Dalenoord
Middle Name:	
First Name:	Edwin
Department:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The LED's Save Energy programme does not make use of public funding.

Annex 3

BASELINE INFORMATION

The latest version of the "BASELINE CARBON DIOXIDE EMISSIONS FROM POWER SECTOR" developed by the Central Electricity Authority will be applied. The data is published on the CEA website:

http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Annex 4

MONITORING INFORMATION

A. SAMPLING

Confidence/precision
As per EB 69 – Annex 4 Standard for sampling and surveys for CDM Project Activities and Programme of Activities (para 10), where there is no specific guidance in the applicable methodology (AMS -II.C Demand-side energy efficiency activities for specific technologies), project proponents shall use 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities.

Sample frame
As per *Guidelines for sampling and surveys for CDM project activities and programme of activities (version 02.0 EB 69 Annex 5* the following five sampling schemes are available:

(i) Simple random sampling;
(ii) Systematic sampling;
(iii) Stratified random sampling;
(iv) Cluster sampling;
(v)Multi-stage sampling.

The Project Participants have selected (iii) Stratified random sampling & (i) Simple random sampling.

The PoA uses a stratified sampling procedure, the population is first partitioned into disjoint classes (the strata) which together are exhaustive. Thus each population element should be within one and only one stratum. Then a simple random sample is taken from each stratum. For the LED's save energy PoA the following strata are identified

Table 11: Lamp classification

Indoor		Outdoor	
Low power	High power	Low power	High power
<40 Watt	≥ 40 Watt	<20 Watt	≥ 20 Watt
IL (Indoor Low)	IH (Indoor High)	OL (Outdoor Low)	OH (Outdoor High)

Sample size determination
To determine the amount of metering points per CPA, the sample size for each stratum under a CPA is to be determined based on the following formula, with a minimum of 70 samples (*Guidelines for sampling and surveys for CDM project activities and programme of activities, version 02.0 EB 69, Annex 5) equation 21*,

$$n \geq \frac{1.645^2 \times NV}{(N-1)\times 0.1^2 + 1.645^2 V}$$

equation 7

Where:

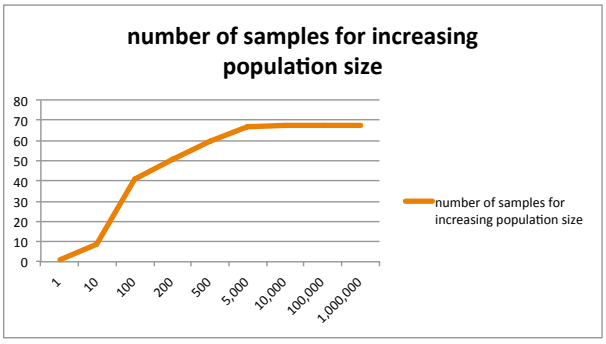
$$V = \left(\frac{SD}{mean}\right)^2$$

equation 8

n	Sample size
N	Total number of LEDs installed within a stratum, if unknown use 20,000*
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision
SD	Is the overall Standard Deviation
mean	Is the overall mean

* 20,000 is based on varying N, obtained by filling in equation 7. If N increase over 20,000 no changes occur in the number of samples. And statistical software http://www.raosoft.com/samplesize.html that states under 'what is the population size' : If you don't know, use 20,000.
The choice of 20,000 is further clarified by filling equation 7 with varying population size. After 20,000 the required sample size does no no longer increases.

Varying N Population size (N)	Sample size (n)
1	1
10	9
100	41
200	51
500	60
5,000	67
10,000	67
100,000	68
1,000,000	68



As per *Guidelines for sampling and surveys for CDM project activities and programme of activities (version 02.0 EB 69 Annex 5):* Estimates of the parameter of interest (proportion, mean and standard deviation) are required for sample size calculations. There are different ways to obtain these:

a) We may refer to the result of previous studies and use these results;
b) In a situation where we do not have any information from previous studies, we could take a preliminary sample as a pilot and use that sample to provide our estimates;
c) We could use 'best guesses' based on the researcher's own experiences.

para 44: Note that if the standard deviation is unknown but the range (maximum - minimum) is known then a rough 'rule of thumb' is that the standard deviation can be estimated as the range divided by 4.

The outcome is to be crossed checked using statistical software: http://www.raosoft.com/samplesize.html
(EB 69 Annex 4: Standard for sampling and surveys for CDM project activity activities and PoAs)

Example:

Raosoft®

What margin of error can you accept? 5% is a common choice	10 %
What confidence level do you need? Typical choices are 90%, 95%, or 99%	90 %
What is the population size? If you don't know, use 20000	20000
What is the response distribution? Leave this as 50%	50 %
Your recommended sample size is	68

Raosoft®

Sample size calculator

What margin of error can you accept? 5% is a common choice	10 %	The margin of error is the amount of error that you can tolerate. If 90% of respondents answer *yes*, while 10% answer *no*, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55. Lower margin of error requires a larger sample size.
What confidence level do you need? Typical choices are 90%, 95%, or 99%	90 %	The confidence level is the amount of uncertainty you can tolerate. Suppose that you have 20 yes-no questions in your survey. With a confidence level of 95%, you would expect that for one of the questions (1 in 20), the percentage of people who answer *yes* would be more than the margin of error away from the true answer. The true answer is the percentage you would get if you exhaustively interviewed everyone. Higher confidence level requires a larger sample size.
What is the population size? If you don't know, use 20000	20000	How many people are there to choose your random sample from? The sample size doesn't change much for populations larger than 20,000.
What is the response distribution? Leave this as 50%	50 %	For each question, what do you expect the results will be? If the sample is skewed highly one way or the other,the population probably is, too. If you don't know, use 50%, which gives the largest sample size. See below under **More information** if this is confusing.
Your recommended sample size is	68	This is the minimum recommended size of your survey. If you create a sample of this many people and get responses from everyone, you're more likely to get a correct answer than you would from a large sample where only a small percentage of the sample responds to your survey.

Operation time LEDs

The operation time of the LED lighting equipment in the metered sample will be measured. For each monitoring period a mean value is calculated; this value is used for the operating hours of all LED lighting within the respective stratum

The meter to be used is designed to measure electrical parameters of LED lighting equipment. The measured data is stored and a) relayed to Central Server digitally or b) obtained by manual read out. It is possible to down load data on a computer using an interface cable. This is explained in more detail below:

Two types of meters used:

1. GSM based metering wherein burning hours of lamps are measured for each switch on interval and relayed to the central server where in database is maintained.

2. Non GSM meters – Manual reading meters These meters measure cumulative time for which the lamp usage hours are recorded. These meters are non resettable. The monitoring entity shall visit such meters periodically and manually note down date of the reading and cumulative usage hours. Difference in cumulative usage hours on two dates divided by the number of days between two record dates shall give average usage hours of the lamp. This works similar to standard energy meter reading procedure.

Selecting the Location of meter installation.

The lamps in the project can be classified in following catagories

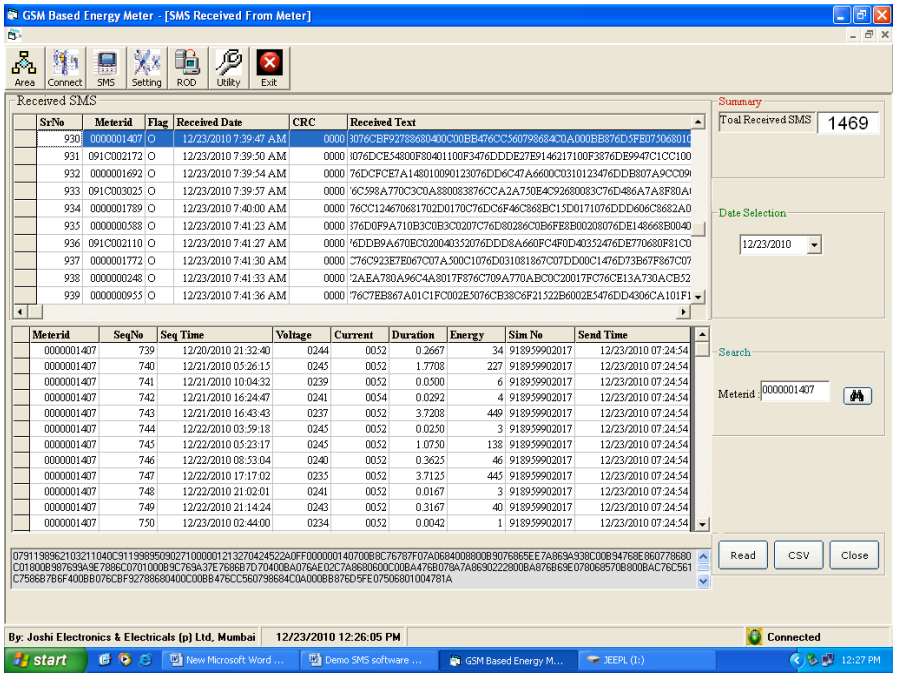
a. Individual lamp – These lamps are used individually and are switched 'ON' or 'OFF' depending up on the requirement of illumination due to such lamp only. For example – A outdoor lamp is only switched on on if lighting is required. Normally such lamps are controlled by a specific switch to control the lamp.

b. Lamp part of the group of lamps – In cases, it is required to switch on a group of lamps simultaneously. For example – The street Lights are normally switched 'ON' & 'OFF' in a group by means of a device in 'Street Light Pillar' which controls such action. This is also applicable to groups of office lamps..

1. In case if the sample lamp is an individual lamp (a), then a mete should be installed for this particular lamp.

2. If the sample lamp is a part of the lamp in group (b), Then a meter may be installed at the central switching cubical.

The figure below illustrates a typical screenshot showing the typical sampling data, the responsible monitoring actor received from an installed meter. The meter precisely records the date of switch on and switch off of the sample and calculates the duration of each operation sequence. Summed up over the entire day, the responsible monitoring actor can then calculate the daily operation time of the equipment.



B. RECORD KEEPING SYSTEM

The CPA record keeping system shall be based on the templates included in this section.

a. Template end-user old lamp data

End User		Installation Location							To be replaced equipment (Data provided by installer)		
End User / Client Name	*Contact Details of End User*	*Facility name and address (where equipment is installed)*	*Description of location of equipment installation (room number, etc)*	*Installation Location within facility specific record keeping system*	*Strata*		*Grid*		*Equipment type*	*Rated Wattage of equipment*	*Amount of Lamps*
					Indoor	*Outdoor*	*Northern*	*Southern*			

b. Template identifed LED equipment data

End User		Installation Location							To be replaced equipment (Data provided by installer)			Identified LED lighting equipment		
End User / Client Name	*Contact Details of End User*	*Facility name and address (where equipment is installed)*	*Description of location of equipment installation (room number, etc)*	*Installation Location within facility specific record keeping system*	*Strata*		*Grid*		*Equipment type*	*Rated Wattage of equipment*	*Amount of Lamps*	*Equipment type*	*Rated Wattage of equipment*	*Amount of Lamps*
					Indoor	*Outdoor*	*Northern*	*Southern*						

c. Template lamp replacement data

End User		Installation Location							Old lamp status		Removed Equipment (Data provided by installer)				Installed LED equipment (Data provided by installer)									
End User / Client Name	Contact Details of End User	Facility name and address (where equipment is installed)	Description of location of equipment installation (room number, street name, etc)	Installation Location within facility specific record keeping system	Strata		Grid		Old lamp status (working / Not working)	Eligible: yes/no (not eligible = Solar/ LED Lamp)	Removed equipment type	Rated Wattage of removed equipment	Amount of Lamps	Remark	Manufacturer of installed equipment	Type of installed equipment	Rated wattage of installed equipment	Amount of Lamps	Saving (Delta W) = Old Wattage minus New Wattage	Strata		Equipment Type ID (Sr.No./Batch No.)	Installation date dd/mm/yyyy	Installed by (Name of person)
					Indoor	Outdoor	N	S												High power	Low power			

d. Template metering database

TEMPLATE METER DATABASE														
End User		Installation Location			Equipment Type ID (Sr.No./ Batch No.)	Installation date (dd/mm/ yyyy)	Installed By (Name of person)	Metered Sample Group			Sample Location		Date Of Deinstal-lation	Hours
End User / Client Name	Contact Details of End User	Facility name and address (where equipment is installed)	Description of location of equipment installation (room number, street name, etc)	Installation Location within facility specific record keeping system				Index number of sample	Meter ID	Stratum	Description of location of sample (room number, street name, etc)	Location of sample within facility specific record keeping system		

e. Template non-metered sample survey

NON METERED SAMPLE SURVEY													
End User		Installation Location						Non metered Sample Group		Sample Location			
End User / Client Name	*Contact Details of End User*	*Facility name and address (where equipment is installed)*	*Description of location of equipment installation (room number, street name, etc)*	*Installation Location within facility specific record keeping system*	*Equipment Type ID (Sr.No./ Batch No.)*	*Installation date (dd/mm/ yyyy)*	*Installed By (Name of person)*	*Index number of sample*	*Stratum*	*Description of location of sample (room number, street name, etc)*	*Location of sample within facility specific record keeping system*	*Replaced: yes/no*	*Date of replacement (dd/mm/ yyyy)*

f. template for scrapping of replaced equipment

RECEIPT OF LAMPS FROM END USER TO BE SCRAPPED/STORED

Name of end user:	
Contact number:	
Date & Time of hand-over from end user:	
Time of hand-over from end user:	

End user location address	
CPA ref number	

Removed Equipment		
Removed equipment type	***Rated Wattage of removed equipment*** **(Data provided by installer)**	***Amount of Lamps***

Note: A signed copy of this report shall be be forwarded to CME MCI.

Signature of end user
Name:
Date:

Signature of driver transporting lamps
Name:
Date:

Signature of storage/scrapping entity
Name:
Date:

- - - - -