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

CONTENTS

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):

>>
Manufacture and Distribution of CFLs in India
Version ~~5~~6
Date: ~~07/06~~21/09/2012

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

1. General operating and implementing framework of PoA

Introduction

Balaji Greentech Products Limited (BGPL) has set up a CFL manufacturing unit in Nandikandi village, Sadashivpet mandal, Medak district of Andhra Pradesh. BGPL will be involved in distribution of these manufactured compact fluorescent lamps (CFLs) at different locations in India.

BGPL feels that it is "*company's responsive and responsible obligation to the society to produce energy efficient and environmental friendly CFLs*". BGPL would be manufacturing CFLs of different wattages and of different design, shapes and sizes. The wattage of CFLs would vary between 5W and 45W, however BGPL would manufacture 9, 15, 20 W bulbs[1] . The life of CFLs is as high as 10,000 - 20,000 hours[2] compared to incandescent lamps (ILs) which have a life of only 750 - 2000 hours[3].

As per the applied methodology AMS II.C version 13, in case of replacements the lumen output of the distributed CFL will be within the -10% to +50% of the lumen output of the replaced IL.

The purpose of the project activity is to manufacture and distribute energy efficient CFLs to replace or avoid the usage of ILs, which would help in reducing the energy demand load on the grid. The usage of energy efficient CFLs in place of conventional ILs will lead to reduction in greenhouse gas emissions. For a given lumen output, CFLs consume up to one-fifth (approx.) of power of an equivalent ILs causing reduction in requirement of electricity from the connected electricity grid which predominantly uses fossil fuel for electricity generation[4]. Lesser usage of electricity leads to reduction in fossil fuel requirement and reduction in greenhouse gas emissions. BGPL will carry out a series of activities leading to distribution of CFLs in selected areas in India; hence this group of activities leading to reduction in greenhouse gas emissions have been taken up as a 'Programme of Activity'.

Sustainable Development:

The project supports the sustainable development in the following ways:

1. Social well being:

[1] These can be verified by log books from plant

[2] Page 15, http://www.ese.iitb.ac.in/~suryad/Lighting-CEP.pdf

[3] Page 15, http://www.ese.iitb.ac.in/~suryad/Lighting-CEP.pdf

[4] http://emt-india.com/BEE-BLY/BhachatLampYojna.pdf

- India faces a situation of peak power deficit[5]. Projects such as replacing ILs with energy efficient CFLs would reduce the energy demand / load on the electricity grid and hence energy would be available for other consumers.
- The project activity helps in increasing the penetration of energy efficient lamps in the region.
- The project activity would generate both direct and indirect jobs in the region, as it involves manufacturing, distribution and surveys at various stages of implementation.

2. Economic well being:

- The project generates more business opportunities for financial institutions, technology suppliers, and other third party who could be employed for carrying out the baseline survey, distribution, and monitoring survey.
- The distributed CFL would consume less power compared to the ILs, thus providing savings in the form of reduction of electricity bills of consumers.

3. Environmental well being:

- The distribution of CFLs would reduce the power consumption in the region (India). The Indian electricity system is divided into two grids, the Southern Grid and Integrated Northern, Eastern, Western, and North-Eastern regional grids (NEWNE) . The emission factor of the fossil fuel dependent grid is 0.8557 tCO_2 per MWh in the southern grid and 0.8031 tCO_2 per MWh in NEWNE grid[6]. Thus, decrease in the usage of grid power reduces the greenhouse gas emissions associated with the electricity grid.

4. Technological well being:

- The penetration rate of CFLs is low in India when compared to ILs because of the fact that high cost of CFLs has made it less viable for the common man to use them. The CFLs distributed in the programme of activities would have high quality standards and specifications which are stated below:
  - CFLs will conform to the Indian Standard IS: 15111 – Self Ballasted Lamps for General Lighting Services.
  - Power factor of 0.8 or more.
  - Rated lifetime of 6,000 hrs or more.

2. Policy/measure or stated goal of the PoA

The current PoA "Manufacture and distribution of CFLs in India" deals with manufacturing of CFLs and distribution in different areas in India for free of cost. The cost of manufacturing and distribution of CFLs incurred by the project participant in the PoA will be recovered from the CDM funds.

[5] http://www.cea.nic.in/god/gmd/lgbr_report.pdf, Annex II, Annex III

[6] As per version 4 of Baseline Carbon Dioxide Emissions from Power Sector, CEA available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

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

There is no policy, mandate or regulation for usage of CFLs in India. Moreover, BGPL is not mandated by any regulation in India to set up a manufacturing facility for CFLs. Hence, the activity of manufacturing and distributing CFLs to replace and avoid usage of ILs is voluntary for BGPL.

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)	The Party involved wishes to be considered as project Participant (Yes/No)
Government of India (Host)	Balaji Greentech Products Limited (Private Entity)	No

Balaji Greentech Products Limited is the coordinating managing entity which communicates with the Executive Board

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

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

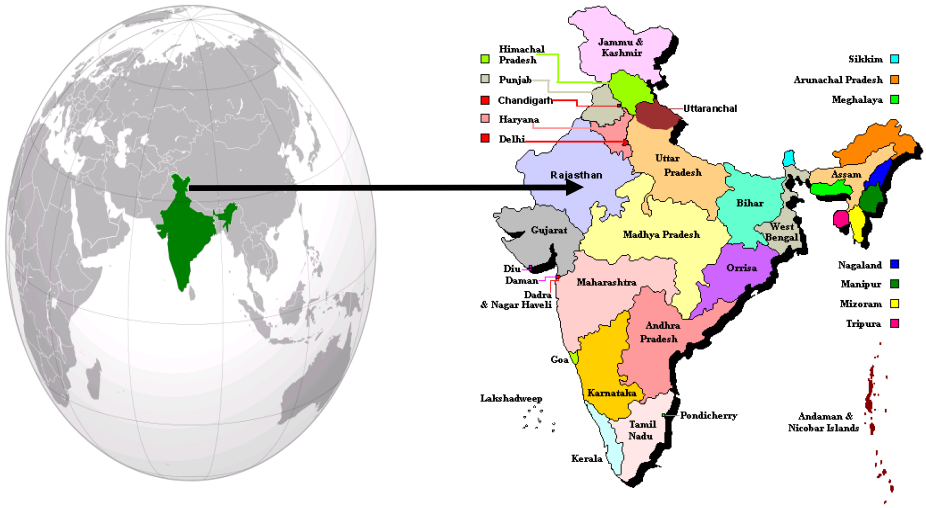
India

A.4.1.2. Physical/ Geographical boundary:

The physical boundary for the small scale PoA project is India. India is bound by[7]:

Latitude	6°44' N	35°30' N
Longitude	68°7' E	97°25' E

[7] http://wikimapia.org



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

The PoA deals with the manufacture and distribution of energy efficient CFLs to replace and avoid the usage of ILs in India. A typical SSC-CPA within this PoA will deal with distribution of CFLs in an identified area in India and the energy savings achieved in the SSC-CPA will not exceed 60 GWh, as mentioned in methodology applied to the project activity. The individual SSC-CPAs within the PoA will be implemented by the project participant.

The following steps describe the implementation of the SSC-CPA:

Manufacturing of CFLs:

1. The CFLs distributed under the PoA will be manufactured at BGPL's facility located in Nandikandi village, Sadashivpet mandal[8], Medak district, Andhra Pradesh, India. The quality CFLs produced at this factory will have the following specifications:
    a. CFLs will conform to the Indian Standard IS: 15111 – Self Ballasted Lamps for General Lighting Services.
    b. Power factor of 0.8 or more.
    c. Rated lifetime of 6,000 hrs or more.
    d. Conform to 'Restriction of Hazardous Substances (RoHS)' directive which restrict the usage of mercury to 5 mg per CFL.

[8] Mandal refers to a division with in a district which constitutes a group of villages.

The aim of the program is to increase the penetration of high quality CFLs within India through free distribution against collection of ILs. Certain regions will be identified within the geographical coordinates of India for the distribution of CFLs.

Awareness campaign:

2. Based on the information available from DISCOMs and other nodal agencies prior to the implementation of the respective SSC-CPA (if available to BGPL). BGPL will identify an area for distribution of energy efficient CFLs which can be a stand alone or combination of villages, localities, townships, commercial spaces, districts etc. in India. The chosen area will be selected such that it will satisfy the eligibility criteria of a SSC-CPA as mentioned in A.4.2.2. An awareness raising program will be carried out in the selected SSC-CPA region to educate the local people on the benefits of using a CFL over an IL leading to reduction in electricity usage for lighting purpose. The awareness raising programme can be through usage of local media or through distribution of pamphlets, orally at different places.. The project participant can also employ various means like print or television media to advertise the CFL distribution program along with the awareness campaign within the SSC-CPA region. This campaign may include advertisements in local television channels, radio, local newspapers, distributing pamphlets, posters, public meetings etc.

Baseline survey:

3. The project participant will carry out a baseline survey within the identified SSC-CPA region. The aim of the baseline survey will be to collect general information like the full address of the location, electricity service connection number, identify the type of lighting devices mainly used within the region and expected hours of lighting usage. In India, a distribution company tend to maintain records like the location of the house/shop/building, owner's name, address of the location etc for all its registered users. Wherever this data is maintained and made available to the project participant, it would be utilized as a base for collecting baseline data. Adequate records will be maintained during the baseline survey. The project participant may identify a third party for undertaking the baseline survey of the SSC-CPA region depending upon the number of locations which need to be surveyed. If required, the project participant will provide specific training to the third party representatives regarding the collection of required data for the survey. The minimum criteria required to be met by the third party agency to qualify as a surveyor would be as follows:

    a. Would be at least Secondary School Certificate (SSC) or an equivalent degree holder
    b. Literate in basic English and the local language of the region.

    BGPL may carry out specific training activities for the third party agency members for collection and recording of the required data. The training will be specific to the current SSC-CPA.

Distribution phase:

4. The CFLs will be distributed only to the registered consumers of the local electricity distribution company. Each registered consumer will be identified by his/her service connection number () within the program as recorded during the baseline survey or taken from the records of the distribution company.
5. The CFLs can be distributed in all places available in the SSC-CPA region like residences, retail stores, office buildings, industries, townships etc. for free of cost. The distributed CFLs can either

replace an existing IL or can be a new installation[9]. In case of replacement, the ILs will be collected and disposed off to avoid re-usage under independent verification. The disposal of the ILs will be done as per the standard practice available at the time of disposal or suggested by any concerned regulatory, for which adequate records will be maintained and made available to the DOE during verification.

6. The general public in the SSC-CPA region will be informed about the details of the BGPL program such as the date, venue and mode of distribution during the awareness campaign. The general public will be informed to bring their electricity bill of a particular month during the collection of the CFLs allocated to a particular location based on the baseline survey. This electricity bill will be stamped and returned to the consumer by the BGPL distribution team after handing over the CFLs. The distribution of CFLs can be done through a door-to-door survey or dedicated distribution centres. The distribution centres will be put up in common places like educational institutions, schools, market places, local DISCOM offices, resident association offices, shopping malls etc which are commonly visited and known by the general public in the SSC-CPA region. In case of distribution centres, the distribution team will educate the participating people about the advantages of installing the CFLs in most commonly used places to maximize the benefits. The CFL distribution team may comprise of representatives of the project participant, Distribution Company and a third party agency. Adequate records will be maintained for the distribution phase.

Monitoring phase

7. After the completion of the CFL distribution phase, a representative sample of CFLs will be derived from the total population of CFLs distributed in the SSC-CPA region.A random sample will have a confidence interval of 90% with a margin error of +/- 10%. The sample size will be calculated using "General guidelines for sampling and surveys for SSC project activities (version 02)"[10] of EB 65Annex 2. This sample will be termed as a 'metered sample'. Detailed sampling plan is explained in the section A.4.4,2 .

8. The runtime meters will be installed at the selected metered sample for a period of ninety days to find the operating hours of the CFLs. The runtime meters will continuously monitor the usage of energy by the installed CFLs. At the end of the first monitoring period of ninety days, these run time meters will be shifted to new metered sample for the next ninety days. This procedure is repeated throughout the year to take care of the effect of weather changes on the CFL usage. The purpose of installing the run time meters is to get the actual number of usage hours of CFLs. These actual hours of CFL usage, averaged over the monitoring period, will be used to calculate the emission reductions for that particular monitoring period of the SSC-CPA. Adequate records will be maintained for the metered samples.

9. Another random sample, identified similar to the sample meters, would be taken from the population of CFLs and termed as 'non-metered sample'. An *ex post* monitoring survey would be conducted annually by BGPL (or a third party appointed for the purpose) for the non-metered sample of installed CFLs to verify whether the distributed CFLs are operating. This sample of CFLs (non-metered sample) will not include the CFLs being included in the metered samples.

[9] New installation can include empty holders. Based on the wattage and lumen output of CFL distributed, appropriate baseline wattage of IL will be identified.

[10] http://cdm.unfccc.int/filestorage/T/P/X/TPXDOG9Q5HE7Z18CFBM3VSKIWU4YJ2/eb65_repan02.pdf?t=dDB8bTBhOTlifDDCkjgOSot-1kl2TfzkhlOG

Results of this ex-post monitoring survey for a sample number of CFLs will be extrapolated to the total population of CFLs and used to calculate the actual emission reduction achieved within a SSC-CPA[11]. Adequate records will be maintained for the metered and non-metered samples.

10. The ILs which are being replaced, will be collected, stored and disposed as per the standard practice followed in the local SSC-CPA region. The standard practice as prescribed by the respective regulatory body at the time of disposal will be adopted for the programme. The disposal procedure would be in line with the requirement of Central Pollution Control Board (CPCB). An independent monitoring of scrapping of replaced equipment would be implemented, recorded and documented for independent verification.

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

The technology employed in the SSC-CPA can be mainly classified into manufacturing process of CFLs and measures involved in the distribution of CFLs in the identified region.

Working principle of a CFL vis-a-vis IL:

A CFL works by passing a current through a gas-filled tube. The two main parts of a CFL are the gas-filled tube and the magnetic or electronic blast. The electrical energy in the form of current flows from the blast through the gas filled in the tube. The gas emits ultraviolet rays. The ultraviolet light excites a white phosphor coating on the inside of the tube. This coating emits the white light. In contrast to this, an IL emits light by heating a metal element until it is white-hot. The IL thus converts a major part of the input power into heat which is wasted. Hence a CFL uses approximately one-fifth of the power used by an IL for the same lumen output[12].

The CFLs manufactured at the manufacturing unit of BGPL in Nandikandi village in Andhra Pradesh would comply with Restriction of Hazardous Substances (RoHS) directive which is not mandatory in India. This directive puts restriction on the usage of hazardous substances including mercury[13] in electrical and electronic equipment. CFLs contain a small quantity of mercury sealed in the glass tube. The RoHS directive restricts the usage of mercury to 5 mg per CFL.

The manufactured CFLs would comply with the Indian standard IS: 15111 for CFLs.

This manufactured CFLs will be distributed in a identified CPA region. The distribution of CFLs will include awareness campaign about CFLs, baseline survey, free distribution of CFLs, collection of ILs wherever applicable, disposal of ILs as per the applicable practice, monitoring surveys, installation of run time meters and record-keeping at all stages.

The runtime meter installed for monitoring of operating hours of metered sample will have the following specification[14]:

- Supply voltage: 150-270V AC

[11] Say, for example, 5% of the total non-metered sample are found to be non-operational during the survey then a factor of 5% would be deducted from the actual CERs

[12] Page No 15 , http://emt-india.com/BEE-BLY/BhachatLampYojna.pdf

[13] Mercury content below 5mg per lamp.

[14] The project participant will use the latest available run-time meter which is suitable for the installed CFL. Hence the specifications can get upgraded during the crediting period of the PoA.

- Mounting: Suitable for mounting on a bulb holder. Holder for plugging bulb is mounted on meter
- Range: 150-300V voltage and 0-1A current
- Accuracy: +/- 1%
- Calibration: once in three years
- Time - Resolution: 15 Sec
- Voltage (Average)
  - Range: 150 – 300 V
  - Accuracy: +/- 1%
  - Averaging cycle: 180 sec
- Current (Average)
  - Range: 0 – 1 A
  - Accuracy: +/- 1%
  - Averaging cycle: 180 sec
- Memory : Capacity: >= 16 Mb, Nonvolatile

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

The eligibility criteria to include a SSC-CPA in the PoA 'Manufacture and distribution of CFLs in India' is shown in the following table. This criteria is developed in line with the "*Standard For Demonstration Of Additionality, Development Of Eligibility Criteria And Application Of Multiple Methodologies For Programme Of Activities*" , Annex-3 of EB 65 and additional criteria with respect to project activity

Eligibility criteria for CPA

Requirement according to EB-65 Annex-3	Eligibility Criteria for the CPA to be included in the PoA	YES/NO
The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA	The CFLs should be distributed in an area within the physical boundary of India.	
Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	In order to avoid double counting the CFL's manufactured by BGPL would have a unique Identification number (CPA name, XXXX)	
The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	All the CFL's manufactured in BGPL follow standard certification (IS: 15111) and the level of service will be -10 % to +50 % of the IL according to methodology	

	AMS-II C version 13 .	
Conditions to check the start date of the CPA through documentary evidence;	The start date of the CPA will be later than 10th April, 2010 [15]. The documentary evidence provided for the start date of the CPA would be a through a production plan released to the concerned department of BGPL.	
Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs	The CPA will be eligible for inclusion if the applicability criteria as per methodology is satisfied as mentioned in the section E.2 .	
The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality as specified in Section A above	The PP intends to demonstrate the addionaility at the PoA level. Demonstration of addionality for individual CPA is not carried out according to EB-60 annex-26.	
The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis	The project participant has stipulated that since the project involves manufacturing and distribution of CFL, local stakeholder consultation and environmental impact analysis has been carried out at PoA level. Further explanation on local stakeholder consultation and environmental impact analysis is given in section D of PoA DD.	
Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance	There is no funding from Annex-1 parties for the PoA as a whole. Evidence for investment and loan has been shown to DOE . The loan sanction letter has been submitted to DoE.	
Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, gridconnected/ off-grid) and distribution mechanisms (e.g. direct installation)	The target group in the project activity is residential, commercial, industrial identified from the electricity service connection no/ service no. The distribution mechanism is replacement of IL with CFL or avoidance of IL with same service level as described in the methodology AMS-II C version 13	
Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board	An illustration of sampling in accordance with EB-65 annex-2 is explained in detail in section A.4.4.2 of the PoA DD which is applicable to all the CPA included in the	

[15] http://cdm.unfccc.int/Reference/Procedures/PoA_proc01.pdf

pertaining to sampling and surveys;	PoA. Baseline survey would be carried for each CPA. The same is explained in section A.4.2 of the PoA. Each CPA to be included in the PoA will follow the same sampling and surveying procedure mentioned in the PoA DD section A.4.2.	
Where applicable, the conditions that ensure that every CPA in aggregate meets the small-scale or microscale threshold criteria and remains within those thresholds throughout the crediting period of the CPA ;(Project participant will demonstrate threshold criteria based on small scale)	Each CPA in aggregate meets the small scale or micro scale threshold as mentioned in the methodology. This would be demonstrated in the emission reduction spreadsheet.	
Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or micro scale project categories	It will be checked that the SSC-CPA is neither registered as an individual CDM project activity nor included as a CPA of another registered PoA involving energy efficient lighting initiatives. Each SCC-CPA will demonstrate this as per criteria for debundling set out in the guideline.	
According to eligibility criteria mentioned in EB 65 annex 3 for CPA(If CFLs are distributed for free of cost they will be automatically addional)	The CFLs are distributed for free of cost.	

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):

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

The activity of replacing the ILs and installation with energy efficient CFLs in identified areas of India taken up by BGPL is a voluntary activity.

There is no policy/regulation requiring usage of CFLs or restricting the use of ILs in India. Moreover, there is no regulation mandating establishing a CFL manufacturing unit for BGPL. The project participant will manufacture and distribute energy efficient CFLs in identified areas of India voluntarily. The project participant could have taken up a more familiar route like manufacturing of ILs instead of CFLs in India. However, BGPL has taken the responsibility to increase the awareness about energy efficient CFLs along with increasing the

penetration of energy efficient lighting within India. This activity would face barriers like investment compared to manufacturing and distribution of ILs.

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

BGPL will manufacture and distribute energy efficient CFLs to replace or avoid usage of ILs free of cost. BGPL is initiating an activity which will bring about greenhouse gas emissions reduction by using lesser electricity from the fossil fuel dominant electricity grid without compromising on the lumen level. BGPL will distribute the CFLs in different locations within India. The free distribution of CFLs in different locations will be taken up as SSC-CPAs under the PoA. Since the activity will not generate any revenues for the project participant from sale of CFLs, the CDM fund is imperative to make the project activity financially viable.

Lighting accounts for considerable amount of the total electricity demand in India. The large-scale use of ILs leads to high greenhouse gas emissions due to energy inefficiency. In general, a CFL uses approximately one-fifth of energy used by an IL of comparable lumen output, thus causing significant reduction in energy demand. Energy efficient measures like distribution of CFLs would reduce the load from the electricity grid which is dominated by fossil fuels.

The manufacture of high quality CFLs along with added costs of raising awareness amongst the general public, conducting surveys, record-keeping and free distribution of the CFLs is not a financially viable compared to manufacturing and distribution of ILs which is an established practice in India. The following activities are required to be done as a part of the PoA which will further add to the costs associated with the project activity:

- Manufacturing high quality CFLs
- Awareness raising campaign in the SSC-CPA region
- Baseline survey
- Free distribution of CFLs
- Maintaining baseline survey and CFL distribution records
- Sampling procedures
- Installation of run time meters
- Rotation of runtime meters to different metered samples in the same SSC-CPA
- CFL post-installation survey of non-metered sample
- Maintaining records for the monitoring surveys
- Collection and disposal of replaced ILs as per the standard practice followed in the region.

In order to encourage the local people to use CFLs over ILs, BGPL will have to run campaigns educating them about the advantages of a CFL over an IL. There has been an inflow of certain non-branded CFLs in the Indian market which are of low quality. The distributors do not provide any guarantee for the quality of such low cost CFLs. The problems associated with such low standard CFLs further discourage the customers to continue using CFLs who return to using the conventional ILs. In order to avoid such situations, the project participant would invest in manufacturing high quality CFLs conforming to Indian standards as IS: 15111. This would reinstate the faith of the local people in using the energy efficient CFLs.

The project participant plans to distribute the CFLs in identified areas to increase the penetration of energy efficient lighting for free of cost, the distribution of CFLs is not policy driven in India. There is no policy or mandate by the Government of India making CFL usage compulsory or banning the usage of ILs in India. Other major barriers to the project activity would be lack of awareness among the local people of India and high initial cost of CFLs. In order to overcome the above mentioned barriers to the project activity, the project participant requires PoA-CDM funds.

Investment analysis

Based on the identified baseline scenario, it is evident that the project participant has no other choice than to make an investment to supply IL or CFL. As per the "Tool to demonstrate and assessment of Addionality" version 6, Option I of carrying out a simple cost analysis and Option II of carrying out investment analysis is ruled out as the project involves the comparison of two scenarios. Hence Option III of doing an investment comparison analysis has been considered to determine the baseline scenario and establish the additionality of the project activity. Hence additionality is demonstrated at PoA level by means of investment comparison analysis. According to EB 60 Annex-26, demonstration of additionality at the CPA level is not required provided the eligibility criteria are satisfied (Details of the same are provided in section E5). Therefore, the additionality is not demonstrated at CPA level. The CPA included in PoA will be treated as additional if it meets with the eligibility criteria as mentioned in section A.4.4.2 of PoA as per EB 60 Annex 26.

The financial indicator chosen for the project activity at PoA level is the Project Internal Rate of Return. The IRR is calculated for the two alternatives: manufacturing and distributing ILs (Baseline) and Manufacturing and distribution of CFLs (PoA). Since the project participant will distribute the CFLs for free of cost to the users, the only available funds in the manufacturing and distribution of CFLs in the PoA programme is through CDM route.

However in order to meet the operational expenses till the program gets registered the project participant intends to sell the CFL at a cost of INR 30 and INR 50 for (single and double type respectively).The project participant has considered the sale of single and double type CFL's in open market in the percentage ratio of 15% and 85 % respectively[16]. Hence while calculating project IRR, project participant has considered this income on sale of single and double type CFL's and has demonstrated that despite this revenue the project is still additional. In circumstances where the off take for CFL's is less than 100%, to meet with operational expense, project participant intends to sell capsules (component) , a part of CFL at a cost of INR 4.5 and INR 10 (Single and Double type) respectively. While doing the financial calculation the project participant has considered the revenue from the sale of CFL at cost of INR 30 and INR 50 (single and double type) which is always higher than the income from sale of parts. Hence, financial calculations below are focused on the income from sale of CFLs and not it's component.

Further, a scenario analysis was conducted to assess the returns, if the facility utilizes 100% of its capacity for manufacturing of double type CFL's and sells the same at INR30.

It is evident from the financial calculations submitted that even in the most conservative scenario of selling the 100% CFL in the open market at cost mentioned as above, the returns

[16] Annexure 1, Page 32 of Techno-Economic Viability Report

from the project activity are lower when compared with baseline scenario of manufacturing and distribution of ILs

The following are the assumptions used in the investment comparison analysis:

At PoA level, the data available with project participant for the manufacturing facility of ILs is for production of 2000 bulbs/hr[17].

Conversion 1 Lakh = 0.1 Million

Description of the cost	Value applied for CFL	Value applied for IL
Land	200.00 Lakhs	200.00 Lakhs
Civil works	339.40 Lakhs	220.00 lakhs
Plant & machinery	1650.45 Lakhs	355.00 lakhs
Misc fixed assets	15.00 Lakhs	
Provision for contingencies	29.09 Lakhs	25.00 Lakhs
Deposits	30.00 Lakhs	15.00 Lakhs
Pre operative expenses	58.15 Lakhs	10.00 Lakhs
Margin for working capital	89.31 Lakhs	30.00 Lakhs
Total project cost	2411.40 Lakhs	855.00 Lakhs
Debt to equity ratio	1.61:1	2:1
Equity	600.00 Lakhs	575.00 lakhs
Debt	970.00 Lakhs	285.00 lakhs
Number of lamps per hour	2400	2000
Number of operating hours per day	20	
Number of operating days per year	300	
Consumables and packing material/bulb	4% gross sales	0.5 INR/ bulb
Salaries & Wages		0.75 INR/bulb
Year 1	79.76 Lakhs	
Year 2	125.62 Lakhs	
YoY escalation	5%	5%
Power & fuel		1.5 INR/bulb

[17] This production capacity does not match with the production capacity of the CFL manufacturing facility set up by BGPL.[17] The difference in the capacities is due to available capacity in the market which is closest in comparison. Hence, the cost of manufacturing and distributing one CFL will be compared with the cost of manufacturing and distributing one IL.

Year 1	117.65 Lakhs	
Year 2	209.48 Lakhs	
Year 3	225.98 Lakhs	
Year 4	242.49 Lakhs	
Repairs and maintenance	50.12 Lakhs	10 lakhs/annum
YoY escalation	20%	20%
Other mfg. Expense	3% of project cost	
Depreciation as per Companies act, 1956		
Building	10%	
Plant & Machinery	15%	
Other misc assets	15%	
Depreciation as per IT act		
Building	3.34%	
Plant & Machinery	5.28%	
Other misc assets	5.28%	
Administration charges (incl stationary, canteen services)	2 lakhs per month + 10% increment	0.7 lakhs per month + 10% increment
Year 1	16 lakhs	5.6
Year 2	26.4 lakhs	9.24
YoY escalation	10%	10%
Selling & distribution expense	7.50% on gross sales	0.25 INR/bulb
Interest on term loan	13%	13%
Interest on working capital	13%	13%
% of goods bought through LC	70%	70%
LC requirement	180 lakhs	180 Lakhs
LC utilization considered in first year	72 lakhs	72 lakhs
LC utilization considered from second year	108 lakhs	108 lakhs
Margin for working capital	25%	25%
Tax rate	33.99%	

MAT	11.33%
Excise duty	8.00%
VAT	12.50%

Based on the above assumptions, the following are the results of the investment comparison analysis

S.No	Scenario	Unit cost for manufacturing and distributing light bulb (INR/bulb)	IRR
1	Manufacture and distribution of ILs	~~9.8203~~	~~41.5040.84%~~
2	Manufacture and distribution of CFLs free of cost	42.73	-
3	Manufacturing and distribution of CFL (sold at 30 INR (single bulb) and 50 INR (double bulb)	42.35	24.02%%
4	Manufacturing and distribution of CFL(capsule)	7.98	9.71%
5	Manufacturing and distribution of CFL (at 30 INR)	45.78	22.86%

Formatted: Font color: Red
Formatted: Font color: Red
Formatted: Font color: Red
Formatted: Right, Space After: 0 pt

It is evident from the results of investment comparison analysis that the project activity of manufacturing and distribution of high quality CFLs is not financially viable compared to the alternative of manufacturing and distributing ILs.

The project activity is sensitive to the following parameters:

a. Number of CFLs manufactured in BGPL facility (Production capacity)
b. CFL raw material cost (Production cost)
c. Project cost

The results of the sensitivity analysis are as follows:

The sensitivity analysis for manufacturing and distribution of CFL for free of cost

S,No	Description		IRR of CFL	IRR of IL
	Actual		#DIV/0!*	40.84%~~41.51%~~
1	Production capacity	+10%	#DIV/0!*	48.40%~~45.06%~~
		-10%	#DIV/0!*	33.54%~~37.87%~~
2	Raw material price	+10%	#DIV/0!*	38.85%~~39.59%~~
		-10%	#DIV/0!*	42.79%~~43.39%~~
3	Project Cost	+10%	#DIV/0!*	37.46%~~38.18%~~
		-10%	#DIV/0!*	44.87%~~45.49%~~

Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)
Formatted: Font: Arial, 10 pt, English (U.K.)

The sensitivity analysis for manufacturing and distribution of CFL at INR 30 and INR 50 are as follows

S. No	Description		IRR of CFL	IRR of IL
	Actual		**23.97%**	40.84%~~**41.51**%~~
1	Production capacity	+10%	27.58%	48.40%~~45.06%~~
		-10%	20.17%	33.54%~~37.87%~~
2	Raw material price	+10%	18.30%	38.85%~~39.59%~~
		-10%	29.13%	42.79%~~43.40%~~
3	Project cost	+10%	21.79%	37.46%~~38.18%~~
		-10%	26.51%	44.87%~~45.49%~~

Formatted: Font: Not Bold

The sensitivity analysis of manufacturing and distribution of CFL at INR 30 are as follows

S. No	Description		IRR of CFL	IRR of IL
	Actuals		**27.77%**	~~**41.51**~~40.57%
1	Production capacity	+10%	31.08%	~~45.06~~48.13%
		-10%	23.76%	~~37.87~~33.29%
2	Raw material price	+10%	26.15%	~~39.59~~38.58%
		-10%	29.06%	~~43.39~~42.54%
3	Project cost	+10%	25.40%	~~38.18~~37.20%
		-10%	30.54%	~~45.49~~44.61%

Formatted: Font: Not Bold

*Indicates that the returns are lower than cost incurred in manufacturing of CFL's

During the validation of the project, the actual project cost incurred by the project participant is more than the estimated project cost. The actual project cost incurred by the project proponent is 2355 lakhs (which is 4.32 % more than estimated project cost) and interest rate is 15 %. The IRR of the project at this project cost and interest are as follows

S.No	Scenario	IRR of the project
1	Conceptualization	#DIV/0!
2	Project	23.17%
3	Project at INR30	26.78%
4	Capsule	9.35%

From the above table, it is evident that IRR of the project even with increased project cost and interest rate is below the IRR of manufacturing and distribution of IL i.e. 41.51 % (which is base case)

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

Not applicable. The current project activity is not implementing a mandatory policy/regulation.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable. The current project activity is not implementing a mandatory policy/regulation.

Chronology of events to demonstrate the serious CDM consideration and real action to achieve the same:

CDM specific activities	Dates	Project specific activities	Dates
Board meeting considering CDM	20 March 2008	Appointment of Nagabhushan B for preparation of Techno Economic Viability Report	21 November 2007
Appointment of CDM consultant	21 October 2008	Technical Economic Viability Report	February – March 2008
Commencement of dialogue with DOE	4 December 2008	PO placed for major equipment / Sanction of bank loan	16 April 2008
Stakeholder meeting	7 March 2009	CFE for manufacturing plant	21 August 2008
Commencement of the project commissioning activities.	1 August 2009	Board Meeting with revision in PoA (to sell the bulbs at a cost of Rs 30 for Single bulb and Rs 50 for double bulb) programme	22 June 2009
		Board Meeting to sell the component capsules	24th July, 2009
		Appointment of DOE	12 January 2010

Thus, from the complete financial analysis presented above, it is evident that the project activity is less viable than the conventional IL manufacturing under different conditions without the presence of CDM revenue. Thus, PoA is additional.

The consideration of CDM and all actions associated with it (presented in the table above) confirm that the PoA has been designed as a CDM activity.

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

A.4.4.1. Operational and management plan:

The project participant will identify an area within India for distribution of CFLs that are manufactured in its facility at Nandikandi village, Sadashivpet mandal, Medak district, Andhra Pradesh. BGPL will identify regions for free distribution of CFLs in India. The identified area may be a stand alone or combination of villages, localities, townships, commercial spaces, districts etc. within India. The eligibility of the activity implemented in the identified region to claim CDM funds will be determined based on the criteria set in the section A.4.2.2.

A proper record-keeping system will be implemented as a part of the PoA activity. The records will be maintained at different levels of the PoA to have a robust monitoring system for the program. The record keeping measures for the program are as follows:

(i) A record keeping system for each CPA under the PoA

Under PoA, a record with information of all the CPAs which will be registered under the PoA will be maintained. A detail record of CPA which includes the details locations, the details of the consumers to whom the CFLs have been distributed will be maintained. As a part of SSC-CPA the following information would be collected during the baseline survey:

i. Location of the place where the CFL is distributed (The exact coordinates/address of the place is required).
ii. Name of the in-charge of the place.
iii. Consumer utility number i.e. Service connection number of the place registered with the local distribution company.
iv. Number of un-used/new holders and other lighting devices used in the place.
v. Wattage of each IL in the place.
vi. Average usage hours of the IL.

The project participant may involve a third party for distribution of CFLs within the region apart from the local distribution company. During the distribution of CFLs in the CPA region, the project participant may spread awareness on the usage of CFLs over the conventional ILs within the region. This can be achieved by advertising the benefits of using CFL on IL and the project activity through the print media (newspaper, pamphlets, and posters), television or radio or public meetings.

The project participant or its appointed third party will perform the door-to-door installation of CFLs or distribute CFLs through dedicated distribution centres. The distribution centres will be put up at commonly visited places like educational institutions, schools, market places, local DISCOM offices, resident association offices, shopping malls etc. The replaced ILs will be collected by the CFL distribution team. The wattage of the replaced ILs will also be recorded against the installed CFL.

The following data will be recorded by the distribution team:

i. Date of CFL distribution
ii. Wattage of the distributed CFLs
iii. Wattage of replaced ILs

iv. Awareness acceptance and undertaking by the recipient/beneficiary of the CFLs in the form of signatures to the effect that CERs for the energy saving measure would be claimed by BGPL.

A record of the above data for each SSC-CPA will be maintained for the entire crediting period and an additional two years for a SSC-CPA.

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

BGPL would be distributing CFLs manufactured in its unit. The following measures can be taken to avoid double-counting of the CERs:

A project boundary of SSC-CPA under the current PoA will be checked with the project boundary (ies) of all the other CDM projects and CPAs of other PoAs, which use the same measure of replacing ILs with CFLs and which are available with the UNFCCC[18]. In case the SSC-CPA region overlaps with any other CPA or CDM region, the project participant will review whether the places identified for distribution are included within both CPAs/CDM project activities. The project participant may decide not to go ahead with the SSC-CPA's inclusion in PoA based on the review outcome. In cases where there is an overlap of the CPA region, a check would also be done and houses (or any other commercial place) where the CFLs have been distributed as a part of another CDM project activity or as a CPA of another PoA, the corresponding places will be identified through their consumer utility number i.e. Electricity service connection numbers and will be avoided in the SSC-CPA of the current PoA. This would ensure that there would be no double counting of emission reductions. Moreover in accordance with the "General Guidelines to SSC CDM methodologies" Version 17, the project boundary will be limited to the physical project activity.

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

According to the PoA guidelines on de-bundling as stated in "Guidelines on assessment of de-bundling for SSC project activities" of EB54 annex-13[19]:

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

According to AMS II C version 13 "*aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies.*" As per guideline on de-bundling, 1% of the small scale threshold of 60 GWh/annum is 0.6 GWh per annum. Since the calculated maximum energy saving achieved by a single CFL (~ 0.000111 GWh/year energy savings for a 100 W IL replaced by 20 W CFL taking average 3.5 hrs/day of CFL usage) is less than 1% of the small scale limit, the SSC-CPAs included in the PoA are exempted from the de-bundling check.

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

---

[18] http://cdm.unfccc.int/ProgrammeOfActivities/index.html

[19] https://cdm.unfccc.int/filestorage/B/2/G/B2G0MI867OH5JVD9FYN4CXQPKEATWZ/B2G0MI86.pdf?t=OFl8bTBiYW1sfDCgK8k-zt1iFq2vOA9Noxhb

The CFL consumers within this PoA will be informed that the CERs generated through greenhouse gas emission reduction caused by use of CFLs at their end will be a part of the PoA. Letters demonstrating the acceptance of the users of CFL in the form of their signatures would be made available to the DOE at the time of validation.

A.4.4.2. Monitoring plan:

(i) As per the 'Standard for sampling and survey for CDM project activities and Program of Activities'" version 2, Annex 3, EB 65[20], the sampling software will be used to determine the sample size. The following (and not restricted to) weblinks/softwares can be used for determining the sample size.

http://www.raosoft.com/samplesize.html

http://www.hcp.med.harvard.edu/statistics/survey-soft/#Online

http://www.freestatistics.info/stat.php

The project participant will draw out two types of samples from the total population in the SSC-CPA region: metered sample and the non-metered sample.

Metered sample: A metered sample will be identified to monitor the number of operating hours of the CFL usage. In order to measure the number of hours of CFL usage, runtime meters will be installed on sample number of CFLs and recorded as per the methodology. These samples are termed as 'metered samples'.

The project participant will use the stratified random sampling method to determine the sample of CFLs for measuring the operating hours of installed CFLs under the SSC-CPA. Since the data on operating hours of installed CFLs is critical in determining the emission reduction under the SSC-CPA, the sample will be chosen so as to achieve 90% confidence interval with 10% error margin. The sampling will be done in two stages.

Stage 1:

In the sampling method, the region would be divided into different strata (say, for example, residential, commercial shopping, office space, etc). The CFLs distributed to different stratums will greatly differ in their hours of CFL usage due to varying operational patterns. Each type of place will form a stratum. The number and types of strata (subgroups) will be categorized based on the distribution data.

Each element in the stratum is given a unique number (for example, residences are given a number from 1 to 10 in the subgroup of residences). Using the above mentioned weblink/software packages number of samples required to monitor would be derived for each stratum. A set of random numbers corresponding to the number of sample would be identified using the excel function RANDBETWEEN() in each stratum (i.e., for example, if 100 is number of samples to be monitored in a stratum of population 100,000 then randomly 100 houses would be identified in the population).

Stage 2:

---

20 http://cdm.unfccc.int/filestorage/T/P/X/TPXDOG9Q5HE7Z18CFBM3VSKIWU4YJ2/eb65_repan02.pdf?t=dDB8bTBhOTlifDDCkjgOSot-1kl2TfzkhlOG

The sample is drawn from the population as described in stage-1. Each location in the sample may have one or more CFLs installed at the distribution stage. The CFLs installed in each location are numbered and one CFL per location is randomly selected using the excel function RANDBETWEEN(). As a result, we have sample number of CFLs where the metering will be done for a period of ninety days.

The runtime meters will be installed in the sample locations for a period of ninety days. The meters will be shifted periodically to newly selected CFLs as per the above procedure to account for the seasonal variations. The records for the meter readings will be maintained for the crediting period and an additional two years.

Non-metered sample: A non-metered sample will be identified (identified similar to the metered sample) to find number of operating CFLs in the SSC-CPA. In order to monitor the number of operating CFLs at the end of each monitoring period, a sample number of CFLs will be checked to determine the percentage of inoperative CFLs. Since no metering is involved for this survey, this sample is termed as 'non-metered sample'.

A random sample of places will be drawn annually to verify the continued usage of CFLs. The sample will be drawn to achieve 90% confidence interval with 10% error margin. The sample size will be determined based on the 'Standard for sampling and survey for CDM project activities and Program of Activities version 2, Annex 2, EB 65. The project participant will be divided into subgroups or strata.

The sample is randomly selected from the population using the excel function RANDBETWEEN(). The sample number of locations will be monitored annually to check whether the CFLs are operating. The sample locations are changed every year.

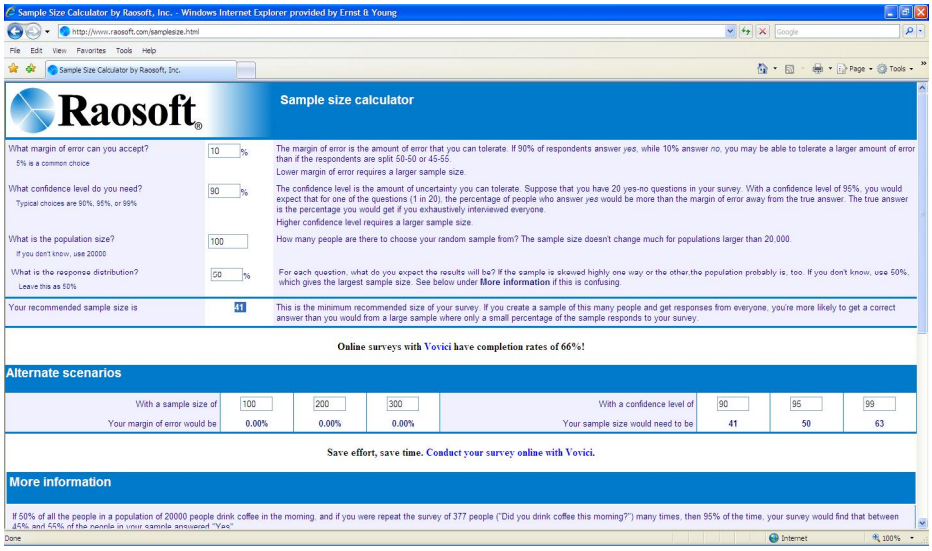
Information like the period during which the CFL has been inoperative will be collected, recorded and a suitable discounting factor will be used to reduce the emission reductions.

The detail of the CDM team with their specific responsibilities has been given in E.7.2.

Example :

To obtain the sample size

Step-1 : Say sample population 100, the sample size would be obtained by entering the values in http://www.raosoft.com/samplesize.html (one of the websites)



Step-2: Obtained sample size of say 40, then by allotting numbers to each house a sample of 40 would be picked randomly (according to stratified random sampling method) using RANDBETWEEN() function in excel.

Therefore a metered sample and non metered sample would be identified.

Step-3: After identifying the houses (in this case) , the number of CFLs distributed in those houses are numbered accordingly. One CFL per location is randomly selected using the excel function RANDBETWEEN()

Step-4: The runtime meters will be installed in the sample locations for a period of ninety days. The meters will be shifted periodically to newly selected CFLs as per the above procedure to account for the seasonal variations.

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

The programme of activity does not involve any public funding.

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

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

The start date of the project activity which corresponds to the real action taken by the project participant is the first purchase order placed for CFL manufacturing facility, which is 16/04/2008.

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

28 years 0 months from the date of commissioning of the CFL plant or date of registration of PoA with UNFCCC, whichever is later.

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 ☐

The PoA involves manufacturing and distribution of CFLs in India. As SSC-CPA would involve distribution of manufactured CFLs in identified regions in India, environmental analysis would be done at PoA level alone.

A third party analysis of the potential environmental hazard involved in the process of CFL manufacture has been done. The identified hazards are:

(1) The use of LPG/propane as fuel in the manufacturing process

(2) The use of mercury in CFL manufacture

As a typical SSC-CPA involves distribution of the manufactured CFLs, it does not involve any potential hazards.

The environmental analysis will be done only at PoA level which includes the manufacturing facility of project CFLs along with distribution of these manufactured CFLs. The SSC-CPAs will not involve activities which have an impact on the environment over and above the impact listed in the environmental analysis done for the PoA.

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

BGPL has submitted a 'Hazard Analysis and Risk Assessment' report aiming at identifying hazards with specific reference to fuels handled, in general about operations in the process of manufacturing CFLs. The report has been made in respect of LPG/propane storage, vaporizing and consumption as fuel in different stages in CFL manufacture.

The CFL manufacturing process employed by BGPL in its manufacturing unit is 'Restriction of Hazardous Substances directive' (RoHS) compliant. This directive restricts the usage of six hazardous materials including mercury in the manufacture of various types of electronic and electrical equipment. Under this directive, the maximum allowed usage of mercury is 5 mg per CFL. The following are the measures adopted by BGPL

S.No	Measures taken to avoid hazards
1.	PROPANE Unloading Platform is paved with concrete.
2.	Secure Stand is to be provided for locating hosepipes when hosepipes are not in use.
3.	Hosepipes are tested for electrical continuity to prevent accumulation of static charge.
4.	Propane Pipe flanges (liquid and vapour lines) are to be bonded.
5.	Earth Clamp is provided to be used for truck during unloading
6.	On Liquid line and Vapour Line, thermal relief vent lines are provided

7.	For the liquid line, view glass for Liquid Flow is provided.
8.	Both storage vessels are provided with flat earth and flat earth adequately connected to the earth pit.
9.	Propane vapour gas detector is installed between the two storage vessels, close to the ground with a canopy on each detector for effective sensing.
10	Vapourisers are located in a ventilated lean to shed, with good safety distances. Each Vapouriser is provided with a built in level indicator and thermostat for cutting off power arrangement on reaching about 80 deg.C temperature.
11	All electricals conform to flame proof conditions in the vapouriser room.
12	The PROPANE vapour pipe is all welded pipe without flange joints except at the PROPANE Stations in the work sheds.
13	One dedicated water tank with continuous water supply is provided for vapouriser use.
14	Security arrangement to check and frisk for any lighters, flammables and mobile phone etc and recording names in a register can be followed.
15	For the storage area, two monitors are provided and two Hydrants are to be provided to protect the area.
16	On each vessel, sprinkler cooling system is provided.
17	The above are in addition to fire extinguishers to be provided
18	Heating System Burner Safety Management system is as per standard and has ventilation cycle built in and has to meet requirements of Equipment Supplier.
19	Design and Operational Safety features PROPANE System (including decanting, storing, vapourising, transferring to work area, manifolds at Heating Systems, leak / vapour detection system, Heating System are placed on record.
20	Safe Operating Procedures are to be prepared, validated and implemented and familiarized with operating and maintenance personnel and are to be displayed at respective locations, in simple form in easily understood language by majority of employees.
21	In view of the large size shed construction and covered work areas, PROPANE Manifolds at Heating Systems, Kilns are the probable sources of Leak. Leaks become significant in view of covered areas.
22	In view of the large size shed construction and covered work areas, PROPANE Manifolds at Heating Systems, Kilns are the probable sources of Leak. Leaks become significant in view of covered areas. Therefore, a PROPANE Leak Detection system is placed
23	PROPANE Unloading Instructions, Water Draining Instructions, Vapouriser Operating Instructions, Emergency Instructions including Emergency Shutdown arrangements
24	Sprinklers arrangement over the unloading platform area are provided.
25	PROPANE Detectors are provided in Pump area, in proper location and are to be integrated with alarm system.
26	For Each PROPANE Storage Vessel, simple and clear identification (like vessel 1 and vessel 2),

	haz chem. Symbol in bold are painted.
27	Distance between two valves in the water draining line to be not more than 0.6 met.
28	It is recommended to provide identification number to each storage vessel and vapouriser for operational convenience.
29	PROPANE Vapour detectors give signal at this location. The alarm repeater at Security Guard's Room.
30	The PROPANE Storage, Vapouriser, Tanker Unloading area is notare to be protected by lightning protection arrangement. This does not mean locating lightning arresters in such area.
31	Maximum vessel filling capacity is to be displayed.
32	Over-fill protection arrangement is to be provided, in addition to recording in Log book of filling operation and water draining operations is maintained.
33	Tanker Unloading, vapouriser operation, and Burner Operations are carried out by persons with specific experience of safe handling of PROPANE and operation of Heating Systems s.
34	In the Security Room, Vapouriser shed, Fire Pump room, have an emergency light.
35	It is recommended provide secondary protections to supporting columns for the main PROPANE Vapour Line planned to cross the road. This to avoid unexpected damage to the pipelines because of moving vehicles
36	Provide one emergency light in DG Room and Electrical Panel Room.
37	It is recommended to provide PROPANE Detectors at each PROPANE Manifold or PROPANE Station and PROPANE Distribution set up on the top of Heating System s.
38	For the PROPANE Manifold / Station, PROPANE Distribution at Heating System, sprinklers are provided, in addition to hose reels around.
39	In view of operation of Heating Systems, Kilns and Electrical Heating system, it is recommended to establish number of air changes in the work area as per design and its adequacy. This becomes important because of width of shed and installations inside
40	The licensed premises shall not be used for any purpose other than storage and transfer of compressed gas and purposes directly connected therewith.
41	For PROPANE Storage Vessels, Over Fill Protection Arrangement either by instrument or by logging and effective supervision are to be established.
42	All fitments of the vessel including temperature indicator, level indicator, rotogauge, drain line, safety relief valve are well maintained and record of such maintenance is to be maintained
43	PROPANE Unloading operation shall not be taken between the hours of sunset and sunrise unless authorized specifically.
44	All valves in the premises are permanently marked in a manner clearly indicating the direction of opening and shutting the valve.
45	Use of Earth-Right system (arrangement to ensure earthing and grounding before unloading PROPANE) could be considered.
46	A warning sign or notice of minimum size of 800mm x 600mm shall be permanently and legibly

	displayed at the front of the installation.
47	Red letterings of minimum height of 40mm which reads: "PROPANE / HIGHLY FLAMMABLE / NO SMOKING / NO NAKED LIGHTS" on white background shall be written on the left portion of the warning sign/notice.
48	Immediately under the classification of Hazmat, three equal boxes showing: (1) the emergency action (Hazchem Code); (2) the licensed quantity in litres and (3) the telephone number and name of the supplier company whom specialized advice can be obtained a
49	One Emergency Siren is planned.
50	Wind sock are planned and installed so as to be seen from all over the plant.
51	Occupational Health is contemplated with all required facilities.
52	One Electrical Pump, One Standby Diesel Pump, one jockey pump are installed. Jockey pump has to maintain a line pressure of 7.5 kg/sq.cm and on pressure dropping to 6.5 kg/sqcm, jockey pump has to start and on pressure falling to 5.5 kg/sq. cm either
53	In case the pressure falls to 4.5 kg/sq.cm or electrical pump does not start and pressure continues to fall, diesel pump has to start on auto.
54	The Leak or Fire Detection system to cater to plant areas also in view of number of operations, where Propane is used as fuel
55	The Truck must have the brakes set and the wheels chocked before any loading/unloading activities are started.
56	While a Truck is connected for loading/unloading, caution signs must be placed on the track as required by regulations and corporate procedures.
57	Proper non sparking tools should be used for unloading operations. They are cleaned and in proper condition at all times.
58	It is strongly recommended that tank trucks containing flammable or combustible gases or liquids be electrically grounded during loading and unloading operations.
59	All unloading operations must be performed by qualified persons who have been properly trained. They are responsible for compliance with all corporate procedures and regulatory requirements during the complete operation.
60	All unloading inspections should be properly documented through a check list or similar method.
61	Unloading area should have adequate lighting and be free of obstacles or unnecessary equipment
62	During the unloading process, cars must be attended by trained personnel or monitored by an approved monitoring system. Do not allow the unload operation to stand unattended or unmonitored while connections are attached to the truck.
63	Do not stand directly above a gage rod when using it. Internal pressure may rapidly force the rod upward.
64	Do not use a wrench for additional leverage to raise and lower sticking gage rods.
65	As it can be observed, PROPANE Storage system is not in the lightning protected zone. This needs to be reviewed and opinion of the designers is to be taken. Guidance can be drawn from IS

	2309, OISD 180 and NFPA 780 or API RP 2003.
66	MSDS for all Chemicals, Health and Safety Precautions related to such chemicals while handling, glazing, disposal of left over glaze are to be prepared and included in the Guidance Manual.
67	Test bed for products is to have necessary safety features incorporated.

.

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),:

According to the guidelines given by Ministry of Environment and Forests, the manufacturing and distribution of CFL do not require Environmental Impact Assessment[21] to be done.

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 ×

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

The project activity involves the manufacturing of CFLs at Nandikandi village and distribution of CFLs in different regions across India. As the project also involves the manufacturing of CFLs, the project participant has chosen to carry out the stakeholder meeting at the location where plant is located. Hence the stakeholder meeting has been done at PoA level. The major stakeholders associated with this manufacturing plant are as listed in the section D.2 . The project participant did not envisage any comments during distribution of CFL

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

The following stakeholders were identified for the PoA:

- Village sarpanch (head of the village)
- Andhra Pradesh Pollution Control Board (APPCB) officials
- Personnel involved in the plant
- Contractors associated with the plant
- Local Villagers

The stakeholders thus identified were given a formal invitation in advance (vide letter dated 11/02/2009) for taking part in a consultation process. The local villagers were invited personally by the project

[21] http://envfor.nic.in/legis/eia/so1533.pdf

participant. A questionnaire was also distributed to the identified stakeholders along with the invitation to collect their comments and feedbacks with respect to the project activity. These filled in questionnaire were collected during the stakeholder meeting. The stakeholders were invited to the CFL manufacturing facility at Nandikandi village.

A stakeholder meeting was conducted on 07/03/2009 at 11:30 am.

D.3. Summary of the comments received:

The summary of the comments received is as follows:

Mr. G. Hemanth Reddy appreciated the comments received from the stakeholders. He explained how the usage of CFLs would reduce electricity consumption compared to the ILs. He said CFLs would consume approximately one-fifth of electricity for the same lumen output compared to the IL. He also explained how the usage of energy efficient lighting and hence reducing the electricity consumption would help in reduction of CO_2 emissions and help in mitigation of climate change.

Village Sarpanch: Village sarpanch expressed happiness that project would generate jobs for the local people in the manufacturing plant and improve the standard of living of the people. The products such as CFLs will reduce the electricity bills of the village households and hence reduce demand on the regional electricity grid.

APPCB: Mr. Rajender, APPCB representative appreciated BGPL's initiative in helping to save energy through distribution of CFLs and avoiding usage of inefficient ILs without causing any adverse effect on the surrounding environment. He also said that such activities should motivate other organizations to take up similar initiatives to help the community fight global warming.

The villagers had the following comments for the project activity:

- It is an eco-friendly project.
- CFL products reduce electricity consumption for lighting and hence their electricity bills.
- Raises awareness about energy efficient products like CFL
- The project would generate jobs for people.

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

No negative comments were obtained for the project activity from the stakeholders.

SECTION E. Application of a baseline and monitoring methodology

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

The following small-scale baseline and monitoring methodology is applicable to a small-scale CPA under the PoA:
Sectoral scope 3 – Energy Demand

AMS II.C – Demand-side energy efficiency activities for specific technologies

Version: 13

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

The proposed project activity involves manufacturing and distribution of CFLs in identified regions of India. For the same lumen output, a CFL consumes one-fifth of the electricity that is consumed by an IL. Thus, usage of CFLs instead of ILs would lead to less energy demand from the fossil fuel dominant electricity grid. The project activity meets the applicability conditions mentioned in the AMS II.C methodology is as follows.

Sl. No	Applicability Condition	Project Activity
1	This methodology comprises activities that encourage the adoption of energy-efficient equipment, lamps, ballasts, refrigerators, motors, fans, air conditioners, appliances, etc. at many sites. These technologies may replace existing equipment or be installed at new sites.	The activity taken under the SSC-CPA is distribution of the energy efficient CFLs in identified regions in India to replace or avoid usage of ILs. This will lead to reduction in electricity import from the fossil fuel dominant grid.
2	The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end use energy efficiency technologies. For fossil fuel end use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.	The energy savings achieved in a single SSC-CPA under the PoA shall not exceed 60 GWh, thus making the SSC-CPA eligible for the small scale methodology.

<table>
<tr><td>3</td><td>For each replaced appliance/equipment/system the rated capacity or output or level of service (e.g., light output, water output, room temperature and comfort, the rated output capacity of air-conditioners etc.) is not significantly smaller (maximum - 10%) than the baseline or significantly larger (maximum + 50%)[22] than the baseline</td><td>The energy efficient CFLs installed in the place of ILs will have equal or higher lumen output than the previously used ILs. In case the lumen output of the CFL is more than the replaced IL, it will not be larger than the baseline IL lumen output by more than 50%. The total lumen output for the ILs can be referred from the table below[23]:
<table>
<tr><td>Baseline Technology – IL (Watt)</td><td>Light Output (Lumen)</td><td>CFL (Watt)</td><td>Lumen output(Lumen)</td><td>% Increase in CFL</td></tr>
<tr><td>40</td><td>345</td><td>9</td><td>423</td><td>22.6</td></tr>
<tr><td>60</td><td>620</td><td>15</td><td>765</td><td>23.4</td></tr>
<tr><td>100</td><td>1240</td><td>20</td><td>1120</td><td>-9.7</td></tr>
</table>
From the above table it can be seen that the service level/ light output is within the range of -10% to + 50% than the baseline.</td></tr>
<tr><td>4</td><td>If the energy efficient equipment contains refrigerants, then the refrigerant used in the project case shall be CFC free. Project emissions from the baseline refrigerant and/or project refrigerants shall be considered in accordance with the guidance of the Board (EB 34, paragraph 17). This methodology credits emission reductions only due to the reduction in electricity consumption from use of more efficient equipment/appliances.</td><td>There is no use of any type of refrigerants in the project activity. The project activity involves manufacture and distribution of CFLs in identified regions in India. The resultant emission reductions in the project activity will be due to use of energy efficient CFLs.</td></tr>
<tr><td colspan="3">Applicability criteria for a project activity under PoA:</td></tr>
</table>

[22] Project activities involving increase in output level compared to the baseline scenario are only eligible if they comply with the related and relevant guidance in the General Guidance for SSC methodologies which require a demonstration that the baseline scenario for the increased amount of output is the same as the baseline scenario defined by this methodology. Otherwise, in the event project output in year y is greater than the average historical output (average of three most recent years +/-10%) before the implementation of the project activity, the value of the output in year y is capped at the value of the historical average output level.

[23] As per Indian standard for ILs, IS 418:2004

5	In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	BGPL would collect the ILs which will be replaced with CFLs under the project activity. Each CFL distributed under the PoA will have a unique identification. The wattage of the replaced ILs will be documented against the installed CFL. Both paper and electronic records would be maintained. The collected ILs would be stored by BGPL unless the entire procedure is validated by the DOE as suggested in the methodology. BGPL would dispose these collected ILs as per the available norms in an environmentally safe manner.

The above explanation justifies the application of the baseline methodology AMS II.C to the SSC-CPA of the PoA.

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

The project activity of manufacturing and distributing CFLs in India would cause less energy demand for the same amount of lighting. Thus, the project activity leads to reduction in greenhouse gas emissions in the fossil fuel dependent electricity grid.

	Emission source	Gas	Included / Excluded	Justification/Explanation
Baseline	Electricity consumption due to manufacturing of ICFL	CO_2	Excluded	Excluded for simplification~~Main emission source~~
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Electricity ~~generation,~~consumed at user end due to use of IL grid or captive source	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Emissions due to	CO_2	~~Included~~Excluded	~~Main emission source~~Excluded

Formatted Table

	usage of propane			for simplification
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Emissions due to usage of diesel in DG set	CO_2	~~Included~~Excluded	~~Main emission source~~Excluded for simplification
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
Project activity	Electricity consumption due to manufacturing of CFL	CO_2	Excluded	Excluded for simplification
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Electricity ~~generation~~consumed at user end due to use of CFL, grid or captive source	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Emissions due to usage of propane	CO_2	~~Included~~Excluded	~~Main emission source~~Excluded for simplification
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Emissions due to usage of diesel in DG set	CO_2	~~Included~~Excluded	~~Main emission source~~Excluded for simplification
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

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

The project activity involves manufacturing and distributing CFLs manufactured at its plant. In each SSC-CPA, BGPL will identify a region where it will distribute CFLs in order to increase the penetration of energy efficient lighting in the region.

The most plausible baseline scenario is identified according to the guidelines provided for the SSC project activities under Type II greenfield projects".

Some of the key assumptions and rationale made to identify the alternative scenarios for baseline identification is as follows:

- The alternatives are consistent and compliant with the applicable laws and regulations enforced in the region.
- It is evident that the penetration of ILs is higher in India when compared to CFLs. Various factors (as discussed below) result in high penetration of ILs in India. In the absence of the project activity,

the activity of manufacturing and distributing ILs through an already established distribution network is a possible alternative for BGPL.

- It is evident from the baseline survey and the barrier analysis (as discussed below) that there is a higher usage of ILs in India / specific CPA region than the energy efficient CFLs and sufficient awareness on the usage of CFLs is not existing. Even if the local public is aware of the benefits of using CFLs, high market price of CFLs compared to ILs acts as a hindrance for them to use CFLs. Hence there is a high probability that if the project participant does not involve in the PoA activity, the general public of the SSC-CPA region will replace the used ILs with new ILs from the market rather than buying CFLs from the market. As a result, the baseline of IL usage holds good for the entire crediting period of the SSC-CPA.

Identification of alternative scenarios

The identification of baseline scenario is carried out as per General Guidelines to SSC CDM methodologies, version 17.

Step 1:

The alternative scenarios to the project activity would be:

a) The PoA activity of manufacturing and distribution of CFLs in identified regions of India is undertaken without the assistance of CDM funds and

b) Manufacture of ILs followed by sale through established distribution network within the country.

Step 2:

The alternatives identified are consistent and compliant with the applicable laws and regulations enforced in the region. Hence the alternatives available after the step 2 are

a) The PoA activity of manufacturing and distribution of CFLs in identified regions of India is undertaken without the assistance of CDM funds and

b) Manufacture of ILs followed by sale through established distribution network within the country.

Step 3:

Based on the barrier analysis provided in Section A.4.3, it can be said that the above identified plausible baseline scenarios do not face the barriers that are faced by PoA of manufacturing and distribution of CFLs. Hence the alternatives available after the step 3 are

a) The PoA activity of manufacturing and distribution of CFLs in identified regions of India is undertaken without the assistance of CDM funds and

b) Manufacture of ILs followed by sale through established distribution network within the country.

Step 4:

Based on the above analysis it can be said that the alternative (a) faces significant prevailing practice barrier. Hence the scenario of "Manufacture of ILs followed by sale through established distribution network within the country" is an easy route for the project participant since the usage of ILs is an established practice within the country and does not incur extra costs related to distribution and awareness-raising. Moreover the project participant faces various barriers like lack of awareness on CFLs amongst general public, high selling cost of CFLs in Indian market, low quality CFLs dumped in Indian market leading to lower penetration of CFLs within India. In order to alleviate such barriers through CDM funds, the project participant has undertaken the PoA where they will be distributing high quality

CFLs free of cost after conducting awareness campaign in different regions of India. The project participant will meet this condition of 'high costs and no revenue' through CDM revenues.

Hence the identified alternative scenario for the Programme of Activity is option (b) Manufacture of ILs followed by sale through established distribution network within the country.

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:

the additionality has completely been assessed at the PoA DD level in the section A.4.2, hence a SSC-CPA level additionality is not required. As per the guideline The project participantmeets the eligibility criteria set out in section A.4.2.2 above.

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

As per EB -60 annex 26 addionality requirement for each CPA need not be demonstrated provided it satisfy the eligibility criteria identified in the PoA. Hence in the present PoA for the demonstration of additionality at CPA level is not carried out.

The SCC-CPA would be addional if it satisfy the following criteria:

1. The CFLs are distributed for free of cost.
2. The CFLs manufactured at the BGPL's plant located in Nandikandi village of Medak district are distributed in the current SSC-CPA

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:

Methodology AMS II C version 13, would be applied to the SSC- CPA. As AMS IIC refers to AMS ID for calculation of net electricity savings (NES) times an Emission Factor (*EF*), hence AMS –ID has also been applied to the CPA. The applicability criteria of the same has been met for PoA DD and CPA DD in detail in the section E. 2 [24].
The AMS.I.D refers to the "Tool to calculate the grid emission factor for an electricity system", Version 02.2.1 for calculation of the grid emission factor. The emission factor of the grid has been calculated to be in accordance with the tool. The details of the calculations are provided in Annex 3 of PoA-DD.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission

[24] http://cdm.unfccc.int/UserManagement/FileStorage/7QXAZ5036WN8BEYKUDFRPJGL21V4I9

reductions of a SSC-CPA:

The equations used for emission calculations are as follows:

(A) Baseline emissions:

The baseline emissions would correspond to emissions occurring ~~in the manufacturing and distribution of ILs. The emissions which can be attributed to the manufacturing and distribution of ILs are as follows:~~ due to usage of IL at user end. .

~~i. Emissions due to power consumption in manufacturing process of ILs:~~

~~The emissions due to power consumption in manufacturing of ILs will be calculated based on the total power expected to be consumed for a given capacity of IL manufacturing facility and emission factor for the electricity grid. It will be given as follows:~~

~~$BE_{IL,gridelec} = IE_{IL} * EF_{CO2,ELEC,y} + Q_{ref,BL} * GWP_{ref,BL}$~~

~~where~~

~~$BE_{IL,gridelec}$ = Baseline emissions due to import of grid electricity for manufacturing one IL, tCO_2/yr~~

~~IE_{IL} = Electricity imported from grid for manufacturing of one IL, kWh~~

~~= 0.201 kWh per lamp[25]~~

~~$EF_{CO2,ELEC,y}$ = Emission factor in year y calculated according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1 using the CEA emission data (version 4.0)[26]~~

~~= 0.8557 (for the southern grid)~~

~~= 0.8031 (for the NEWNE grid)~~

~~$Q_{ref,BL}$ = Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Values from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used~~

~~= 0~~

~~$GWP_{ref,BL}$ = Global Warming Potential of the baseline refrigerant (t CO_2e/t refrigerant) =0~~

~~The baseline emissions would include the following also:~~

- ~~Emissions from consumption of propane used as fuel~~
- ~~Emissions associated with diesel generator (DG) set~~
- ~~Emissions occurring due to power consumption by incandescent lamps installed in the baseline situation.~~

~~[25] Pre-Feasibility Report for ILs carried out by B.Nagabhusanam & Co~~

~~[26] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm~~

ii. Emissions due to consumption of propane used as fuel: The usage of propane as a fuel in the manufacturing process of ILs will lead to CO_2 emissions.

The emissions due to propane consumption in manufacturing of ILs will be calculated based on the total propane expected to be consumed and the calculated emission factor of propane.

$BE_{IL,propane} = Q_{IL,propane} * EF_{propane}$

where

$BE_{IL,propane}$ = Baseline emissions due to use of propane fuel for manufacturing one IL, t_{CO2}/yr

$Q_{IL,propane}$ = Quantity of propane fuel used for manufacturing one IL, t_{C3H8}

= 0.015 kg of propane per lamp

$EF_{propane}$ = Emission factor of propane, t_{CO2}/t_{C3H8}. The emission factor of propane considered is 3[27].

= 3

iii. Emissions associated with diesel generator (DG) set:

In the baseline scenario of manufacturing and distribution of ILs, the project participant would have used a DG set to provide power in case of power cut offs. The diesel fuel used to run the DG set will also cause CO_2 emissions.

$BE_{IL,diesel} = Q_{IL,diesel} * \eta_{diesel} * NCV_{diesel} * EF_{diesel}$

where

$BE_{IL,diesel}$ = Baseline emissions due to use of DG set in IL manufacturing unit, t_{CO2}/yr

$Q_{IL,diesel}$ = Quantity of diesel used in DG set, l

η_{diesel} = Density of diesel, kg/l = 0.83 kg/l

NCV_{diesel} = Net calorific value of diesel, kcal/kg = 43 kcal/kg

EF_{diesel} = Emission factor of diesel, t_{CO2}/TJ = 72.6.1[28] tCO_2/TJ

iv. i. Emissions occurring due to power consumption by incandescent lamps installed in the baseline situation.

The baseline consumption of electricity by ILs and the emission factor of the grid:

$$BE_y = E_{BL,y} * EF_{CO_2,y} \quad \text{....Equation (1)}$$

[27] 1 mole of propane when combusted emits 3 moles of CO_2. Hence, as the molecular weights of propane and carbon-di-oxide are same, 1kg of propane when combusted will emit 3 kg of CO_2.

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

where

BE_y	=	Baseline emissions in year y (tCO_2e)
$E_{BL,y}$	=	Energy consumption in the baseline year y (kWh)
$EF_{CO2,~~ELEC~~,y}$	=	Emission factor in year y calculated according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1 using the CEA emission data (version 4.0)[29] = 0.8557 (for the southern grid) = 0.8031 (for the NEWNE grid)

The energy consumption in the baseline year can be calculated as follows:

$$E_{BL,y} = \sum_i \left(n_i * p_i * o_i\right) / \left(1 - l_y\right) \quad \text{.....Equation (2)}$$

where

$\sum_i$	=	Sum over the group of "*i*" bulbs (e.g. 40W, 60W ILs) replaced or avoided by usage of CFL which is operating during the year implemented as part of the project activity
n_i	=	Number of ILs in each group "*i*" (e.g. 40W IL) replaced or avoided by installing CFLs
p_i	=	Power of the ILs of the group of "*i*" (e.g. 40W IL).
o_i	=	Average annual operating hours of the ILs of the group of "*i*"
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. = 0.1 (default) [In the calculation of the baseline and project emissions during the crediting period, if any recent data is available for the grid in the SSC-CPA region for technical losses in the grid, the same would be used. In the absence of availability of such data, the project participant intends to use the default value of 0.1.]

~~Total baseline emissions due to manufacturing and distribution of ILs~~

$$~~= BE_{y,\,total} = BE_y + \sum_i n_i \times \left(BE_{CFL,gridelect} + BE_{CFL,propane} + BE_{CFL,diesel}\right)~~$$

(B) Project emissions:

~~i.~~ The project emissions will include emissions occurring ~~in~~due to usage of CFL at the ~~manufacturing and distribution of CFLs. Emissions due to power consumption in manufacturing process of CFLs:~~

Formatted: Font color: Red

Formatted: Font color: Red

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

i. user end . The project emissions would include the following also:

- ~~Emissions from consumption of propane used as fuel~~
- ~~Emissions associated with diesel generator (DG) set~~
- ~~Emissions occurring due to power consumption by incandescent lamps installed in the project situation.~~

The emissions due to power consumption in manufacturing of CFLs will be calculated based on the total power imported from the grid and emission factor for the electricity grid.

~~$BE_{CFL,gridelec} = IE_{CFL} * EF_{CO2,ELEC,y}$~~

Emissions occurring due to power consumption by CFLs at the user end:

$$PE_y = EP_{Pj,y} * EF_{CO2,ELEC,y} \quad \text{.....Equation (3)}$$

where

~~$BE_{CFL,gridelec}$ = Baseline emissions due to import of grid electricity for manufacturing one CFL, t_{CO2}/yr~~

~~IE_{CFL} = Electricity imported from grid for manufacturing of one CFL, kWh~~

~~= 0.391 kWh per lamp (Chapter 12 of Techno Economic Viability Report)~~

$EF_{CO2,ELEC,y}$ = ~~Emission factor in year y calculated according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1 using the CEA emission data (version 4.0)[30]~~

~~= 0.8557 (for the southern grid)~~

~~= 0.8031 (for the NEWNE grid)~~Energy consumption by CFLs in year *y*. This shall be determined *ex post* based on monitored values

$E_{Pj,y}$

ii. ~~Emissions due to consumption of propane used as fuel :~~

~~The emissions due to propane consumption in manufacturing of CFLs will be calculated based on the total propane consumed for manufacturing one CFL and the emission factor for the propane.~~

~~$BE_{CFL,propane} = Q_{CFL,propane} * EF_{propane}$~~

~~where~~

~~$BE_{CFL,propane}$ = Baseline emissions due to use of propane fuel for manufacturing one CFL, t_{CO2}/yr~~

~~$Q_{CFL,propane}$ = Quantity of propane fuel used for manufacturing one CFL, t_{C3H8}~~

~~[30] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm~~

Formatted: Font color: Red
Formatted: Indent: Left: 0.37 cm, Numbered + Level: 1 + Numbering Style: i, ii, iii, … + Start at: 1 + Alignment: Center + Aligned at: 0.63 cm + Indent at: 1.27 cm
Formatted: Font color: Red
Field Code Changed
Formatted: Left, Indent: Left: 0 cm
Formatted: Left, Indent: Left: 0 cm
Formatted: Centered
Formatted Table
Field Code Changed
Formatted: Left

~~= 0.063 kg of propane per CFL (Chapter 12 of Techno Economic Viability Report)~~

~~$EF_{propane}$ = Emission factor of propane, t_{CO2}/t_{C3H8}~~

~~= 3 (One mole of propane when combusted releases three mole of carbon dioxide. As the molecular weight of propane and carbon dioxide are same (44), each tonne of propane when combusted will release three tonnes of carbon dioxide.)~~

~~iii. Emissions associated with diesel generator (DG) set:~~

~~At the manufacturing facility of CFL, BGPL has installed a DG set which will be used for power back up during power failures from the grid.~~

~~$BE_{CFL,diesel} = Q_{CFL,diesel} * \eta_{diesel} * NCV_{diesel} * EF_{diesel}$~~

~~where~~

~~$BE_{CFL,diesel}$ = Baseline emissions due to use of DG set in CFL manufacturing unit, t_{CO2}/yr~~

~~$Q_{CFL,diesel}$ = Quantity of diesel used in DG set, l~~

~~η_{diesel} = Density of diesel, kg/l = 0.83 kg/l~~

~~NCV_{diesel} = Net calorific value of diesel, kcal/kg = 10272 kcal/kg~~

~~EF_{diesel} = Emission factor of diesel, t_{CO2}/TJ = 74.1 tCO_2/TJ~~

~~As the DG set usage can be taken as same both in the baseline and project scenario, the emissions due to operation of DG set can be ruled out from the calculations.~~

~~iv. Emissions occurring due to power consumption by CFLs:~~

~~The project emissions will include the emissions due to electricity usage by the CFLs installed to replace or avoid the usage of ILs.~~

~~$PE_y = EP_{Pj,y} * EF_{CO_2,ELEC,y}$ .....Equation (3)~~

~~where~~

~~$E_{Pj,y}$ = Energy consumption by CFLs in year *y*. This shall be determined *ex post* based on monitored values~~

$EF_{CO_2,y}$ = Emission factor in year y calculated according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1 using the CEA emission data (version 4.0)= 0.8557 (for the southern grid)

= 0.8031 (for the NEWNE grid)

The energy consumption by CFLs can be calculated as:

$$E_{PL,y} = \sum_i \left(n_i * p_i * o_i\right) / \left(1 - l_y\right) \quad \text{.....Equation (4)}$$

Where

p_i = Power of the CFLs of the group of "*i*" (e.g. all the configuration 10W CFL).

~~Total project emissions = PE_{ytotal} = PE_y + $\sum_i n_i \times \left(PE_{CFL,gridelect} + PE_{CFL,propane} + PE_{CFL,diesel}\right)$~~

(C) Leakage:

The leakage is avoided by collecting the replaced ILs. Adequate records will be maintained for the collected ILs. The ILs will be stored and then disposed off as per the standard practice.

where

LE_y = Leakage emissions in year y (tCO_2e)

The emission reductions will be calculated as follows:

$$ER_y = BEy - PE_y' - LE_y \quad \text{……..Equation (5)}$$

~~where~~

~~LE_y = Leakage emissions in year y (tCO_2e)~~

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

Data / Parameter:	~~$Q_{CFL,propane}$~~
~~Data unit:~~	~~kg per CFL manufactured~~
~~Description:~~	~~The quantity of propane used as fuel for manufacturing of CFL~~
~~Source of data used:~~	~~Techno- Economic Viability Report/ plant records~~
~~Value applied:~~	~~0.063~~
~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~The value is initially taken from the Techno- Economic Viability Report. The value will be revised for actual CER calculation at the end of a monitoring period by taking yearly average value.~~
~~Any comment:~~	~~--~~

Formatted: Not Superscript/ Subscript

Data / Parameter:	$Q_{IL,propane}$
Data unit:	kg per IL manufactured
Description:	The quantity of propane used as fuel for manufacturing CFL
Source of data used:	Pre Feasibility Report done for IL manufacturing unit
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is taken based on Pre Feasibility Report done by the project participant for manufacturing of ILs. This value is fixed ex-ante.
Any comment:	–

Data / Parameter:	$Q_{CFL,diesel}$
Data unit:	kg per CFL manufactured
Description:	The quantity of diesel used as fuel for manufacturing of CFL
Source of data used:	Plant log records (which can be cross verified with diesel purchase invoices)
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is used for validation as the diesel is expected to be used only during the power outage. The value will be measured for actual CER calculation at the end of a monitoring period by taking yearly average value.
Any comment:	–

Data / Parameter:	$Q_{IL,diesel}$
Data unit:	kg per IL that would have been manufactured
Description:	The quantity of diesel used as fuel that could have been consumed during manufacturing of CFL
Source of data used:	Calculated based on plant log records for CFL plant. [Based on the diesel consumed and power required for CFL plant, the diesel requirement for the IL plant would be calculated.] The formula used is as follows Diesel consumed for IL plant = Diesel consumed for CFL plant * (0.391 / 0.201)
Value applied:	0

~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~The value is used for validation as the diesel is expected to have been used only during the power outage. The value measured for manufacturing of CFL would be considered for actual CER calculation at the end of a monitoring period by taking yearly average value.~~
~~Any comment:~~	~~--~~

~~**Data / Parameter:**~~	~~$EF_{propane}$~~
~~Data unit:~~	~~tCO_2e/tC_3H_8~~
~~Description:~~	~~Emission factor of propane~~
~~Source of data used:~~	~~Calculated based on the stoichiometric equation~~
~~Value applied:~~	~~3~~
~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~One mole of propane when combusted releases three mole of carbon-dioxide. As the molecular weight of propane and carbon dioxide are same (44), each tonne of propane when combusted will release three tonnes of carbon dioxide.~~
~~Any comment:~~	~~--~~

~~**Data / Parameter:**~~	~~EF_{diesel}~~
~~Data unit:~~	~~gCO_2/MJ~~
~~Description:~~	~~Emission factor of diesel~~
~~Source of data used:~~	~~CEA emission data (version 4.0).~~
~~Value applied:~~	~~72.6~~
~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~CEA emission data (version 4.0) which provides emission factor at national level has been used.~~ ~~The information can be sourced from~~ ~~http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm~~
~~Any comment:~~	~~--~~

~~**Data / Parameter:**~~	~~IE_{CFL}~~
~~Data unit:~~	~~kWh per CFL~~
~~Description:~~	~~Import electricity consumed for manufacturing one CFL~~

~~Source of data used:~~	~~Techno- Economic Viability Report~~
~~Value applied:~~	~~0.547~~
~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~During the verification period this value would be taken from electricity bills. However, currently it has been adopted from the Techno- Economic Viability Report This is a uni-directional meter with accuracy is 0.2 %. This meter would be calibrated by electricity department of Andhra Pradesh , India.~~
~~Any comment:~~	~~--~~

~~**Data / Parameter:**~~	~~IE_{IL}~~
~~Data unit:~~	~~kWh per IL~~
~~Description:~~	~~Import- electricity consumed for manufacturing one IL~~
~~Source of data used:~~	~~Prefeasibility Report done for a IL manufacturing unit~~
~~Value applied:~~	~~0.207~~
~~Justification of the choice of data or description of measurement methods and procedures actually applied :~~	~~The value is taken based on Prefeasibility Report done by the project participant for manufacturing of ILs. This value is fixed ex-ante.~~
~~Any comment:~~	~~--~~

~~**Data / Parameter:**~~	~~*I*~~
Data unit:	Number
Description:	Number of different wattage ILs replaced with CFLs in each SSC-CPA region
Source of data used:	Baseline survey data of each SSC-CPA region
Value applied:	To be filled by SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is determined based on the baseline survey of each SSC-CPA region where the details of each type of lighting devices existing within the location is collected and recorded.
Any comment:	--

Data / Parameter:	n_i
Data unit:	Number
Description:	Number of ILs replaced with CFLs / avoided due to new installations of CFLs in each SSC-CPA
Source of data used:	Baseline survey data of each SSC-CPA region
Value applied:	To be filled by SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is determined based on baseline survey of each SSC-CPA region. The surveyor will collect and record the details of the existing ILs within each location of the SSC-CPA region. These ILs will be eligible for replacement under the PoA.
Any comment:	--

Data / Parameter:	p_i
Data unit:	MW
Description:	Wattage of replaced/avoided ILs in each SSC-CPA
Source of data used:	Baseline survey data
Value applied:	To be filled in SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is determined based on baseline survey data of each SSC-CPA region.
Any comment:	The wattage of ILs is the nameplate wattage.

Data / Parameter:	o_i
Data unit:	Hours per annum
Description:	Operating hours of ILs in each SSC-CPA
Source of data used:	Baseline survey data of SSC-CPA region
Value applied:	To be filled in SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually	The average use of existing ILs will be recorded during the baseline survey.

applied :	
Any comment:	--

Data / Parameter:	l_y
Data unit:	-
Description:	Average annual technical grid losses
Source of data used:	Published data from DISCOMs/ Transmission and distribution agencies/Default
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	In the calculation of the baseline and project emissions during the crediting period, if any recent data is available for the grid in the SSC-CPA region for technical losses in the grid, the same would be used. In the absence of availability of such data, the project participant intends to use the default value of 0.1.
Any comment:	--

Data / Parameter:	$EF_{CO_2,ELEC,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor of the electricity grid as applicable for CPA region
Source of data used:	CEA emission data (version 4.0). The information can be sourced from http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.8557 (for the southern grid) 0.8031 (for the NEWNE grid)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calculations used according to the "Tool to calculate the emission factor for an electricity system" version 02.2.1. The grid emission factors are fixed ex-ante.
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 SSC-CPA:

Data / Parameter:	$Q_{CFL,propane}$
Data unit:	kg propane per CFL manufactured
Description:	The quantity of propane used as fuel to manufacture one CFL
Source of data to be used:	Plant log records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.063
Description of measurement methods and procedures to be applied:	Measurement: Plant records Data Type: Measured for one batch Archiving Procedure: Paper & electronic Responsibility: Managing Director would be responsible for regular monitoring
QA/QC procedures to be applied:	The plant log records will provide the information on the propane consumed for a batch of CFLs manufactured. The plant records for propane usage will be cross checked with the propane bills and production capacity for a given time period available with the project participant.
Any comment:	Data archived : Crediting period + 2 years

Data / Parameter:	$IE_{,CFL}$
Data unit:	kWh per CFL
Description:	Import electricity consumed for manufacturing one CFL
Source of data to be used:	Plant records – import electricity meters.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.391
Description of measurement methods and procedures to be applied:	Measurement: Plant records Data Type: Measured Archiving Procedure: Paper & electronic Responsibility: measurement will be done by electricity meter Managing

	~~Director would be responsible for regular monitoring~~
~~QA/QC procedures to be applied:~~	~~The import meters will provid the data for total electricity consumed by the plant. The import electricity figures will be cross-checked with the monthly electricity bills and production figures available with the project participant. This is a uni-directional meter with accuracy is 0.2 %. This meter would be calibrated by electricity department of Andhra Pradesh , India. This meter is property of APCPDCL, PP does not have control on this.~~
~~Any comment:~~	~~Data archived : Crediting period + 2 years~~

Data / Parameter:	*I*
Data unit:	-
Description:	Number of different wattage CFLs installed
Source of data to be used:	Distribution data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled in SSC-CPA
Description of measurement methods and procedures to be applied:	Measurement: Recorded during distribution of CFLs. Data Type: Recorded Archiving Procedure: Paper & Electronic Responsibility: Managing Director would be responsible for regular monitoring
QA/QC procedures to be applied:	Proper records will be maintained for the different wattage CFLs installed as a part of the program by the project participant.
Any comment:	Data archived : Crediting period + 2 years

Data / Parameter:	l_y
Data unit:	-
Description:	Average annual technical grid losses
Source of data used:	Published data from DISCOMs/ Transmission and distribution agencies/Default
Value applied:	0.1
Value of data applied for the purpose of	In the calculation of the baseline and project emissions during the crediting period, if any recent data is available for the grid in the SSC-CPA

calculating expected emission reductions in section B.5	region for technical losses in the grid, the same would be used. In the absence of availability of such data, the project participant intends to use the default value of 0.1.
Description of measurement methods and procedures to be applied:	Measurement: -- Data Type: Recorded Archiving Procedure: Paper & Electronic Responsibility: Managing Director would be responsible for regular monitoring
QA/QC procedures to be applied:	--
Any comment:	Data archived : Crediting period + 2 years , where ever the value is available PP would use the same data if not available default value will be used.

Data / Parameter:	n_i
Data unit:	-
Description:	Number of CFLs of each wattage distributed in SSC-CPA region
Source of data to be used:	Distribution data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled in SSC-CPA
Description of measurement methods and procedures to be applied:	Measurement: Recorded during distribution of CFLs. Data Type: Recorded Archiving Procedure: Paper & Electronic Responsibility: Managing Director would be responsible for regular monitoring
QA/QC procedures to be applied:	Proper records will be maintained for the different wattage CFLs installed as a part of the program by the project participant.
Any comment:	Data archived : Crediting period + 2 years

Data / Parameter:	p_i

Data unit:	W
Description:	Wattage of CFLs
Source of data to be used:	Distribution data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled in SSC-CPA
Description of measurement methods and procedures to be applied:	Measurement: Recorded during distribution of CFLs. Data Type: Recorded Archiving Procedure: Paper & Electronic Responsibility: Managing Director would be responsible for regular monitoring
QA/QC procedures to be applied:	Proper records will be maintained for the different wattage CFLs installed as a part of the program by the project participant.
Any comment:	Data archived : Crediting period + 2 years

Data / Parameter:	o_i
Data unit:	Hours per annum
Description:	Operating hours of CFL
Source of data to be used:	Runtime meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled in SSC-CPA[31]
Description of measurement methods and procedures to be applied:	Runtime meters will be installed at the determined sample locations. The runtime meters will be of following specifications: • Range: 150-300V voltage and 0-1A current

[31] A representative sample of CFLs will be derived from the total population of CFLs distributed in the SSC-CPA region. The random sample will have a confidence interval of 90% with a margin error of +/- 10%. The sample size will be calculated using "General guidelines for sampling and surveys for SSC project activities (version 01)" of EB 50 and EB 65. 90 days has been chosen as the minimum number of days required for monitoring the operating hours of the installed CFL for a particular sample CFL. In a given monitoring year, a runtime meter is expected to be fixed at four different locations within a SSC-CPA region (i.e. 90x4=360). Hence if there are any seasonal variations in a year, the variations in usage of CFL operating hours will be captured by the run-time meters for determining the actual operating hours of the CFLs.

	• Accuracy: +/- 1% Measurement: Measured by runtime meters installed at the sample CFLs determined in the SSC-CPA[32]. Data Type: Measured Archiving Procedure: Paper & Electronic Responsibility: Managing Director would be responsible for regular monitoring of the parameter and calibration of the meter. Calibration frequency: Once in three years
QA/QC procedures to be applied:	The runtime meters will be installed on a sample of CFLs in one SSC-CPA. The same run time meters will be rotated to a different sample of the same CPA after a period of ninety days[33]. This will be repeated[34] until the completion of the monitoring period of the SSC-CPA which may be the CFL lifetime installed in the SSC-CPA region or the crediting period specified for that particular SSC-CPA, whichever is the shorter period. However, after the completion of the monitoring period for that particular SSC-CPA, the run time meters can be used for another SSC-CPA within the PoA. The meter would be able to record Voltage, Current energy and usage hours with switch on time stamp. The runtime meters which are being planned in the CPA would typically have 3 types of data sharing mechanism viz., through saving data in non-volatile memory, through a PC interface connected to microcontroller and through a GSM module. During every switch-on of the lamp the GSM module would send data for the previous cycle through SMS to a wirelessly connected server located either at BGPL or any third party appointed for the purpose. A PC interface will be available which can be connected to the runtime meter through a USB Dongle. In case of any damage to the runtime meter, the data can be downloaded from the internal memory of runtime meter. The runtime

[32]The run-time meters being planned to use in the programme will be compatible with all type of CFLs with same size base, irrespective of the CFL capacity. The run-time meter would come with proper sealing mechanism. A typically sealing mechanism will consist of a one-time adhesive tape/sticker which would be stuck on the holder, runtime meter and CFL). A unique number corresponding to the electricity meter number along with date of the start of monitoring period in the sample location will be mentioned on the seal. Once a CFL is fitted to the runtime meter for monitoring, the owner of the house/building will not be able to detach the run time meter from the project CFL and use it with any other CFL. In case of any failure of CFL lamp, or incase the consumer has replaced the CFL distributed in the programme with another CFL, or if it is observed in the metered sampling that the seal is broken at the end of monitoring period, it will be recorded and accounted proportionately in estimating the actual number of CERs. If say, for an example, a 5% of lamps are found to be non-operational during non-metered sampling then proportionately 5% of CERs would be deducted for the monitoring period.

[33] The working conditions of the runtime meters would be periodically checked (after end of each cycle of 3 months). Moreover, the data from the runtime meters would be manually downloaded every month. This would further enable the project participant to check operating conditions of the runtime meter. If the runtime meter becomes defective, the meter would be immediately replaced with a new meter. If a meter is found to be defective during the monitoring period then the readings of the same will not be considered for calculation of actual CERs.

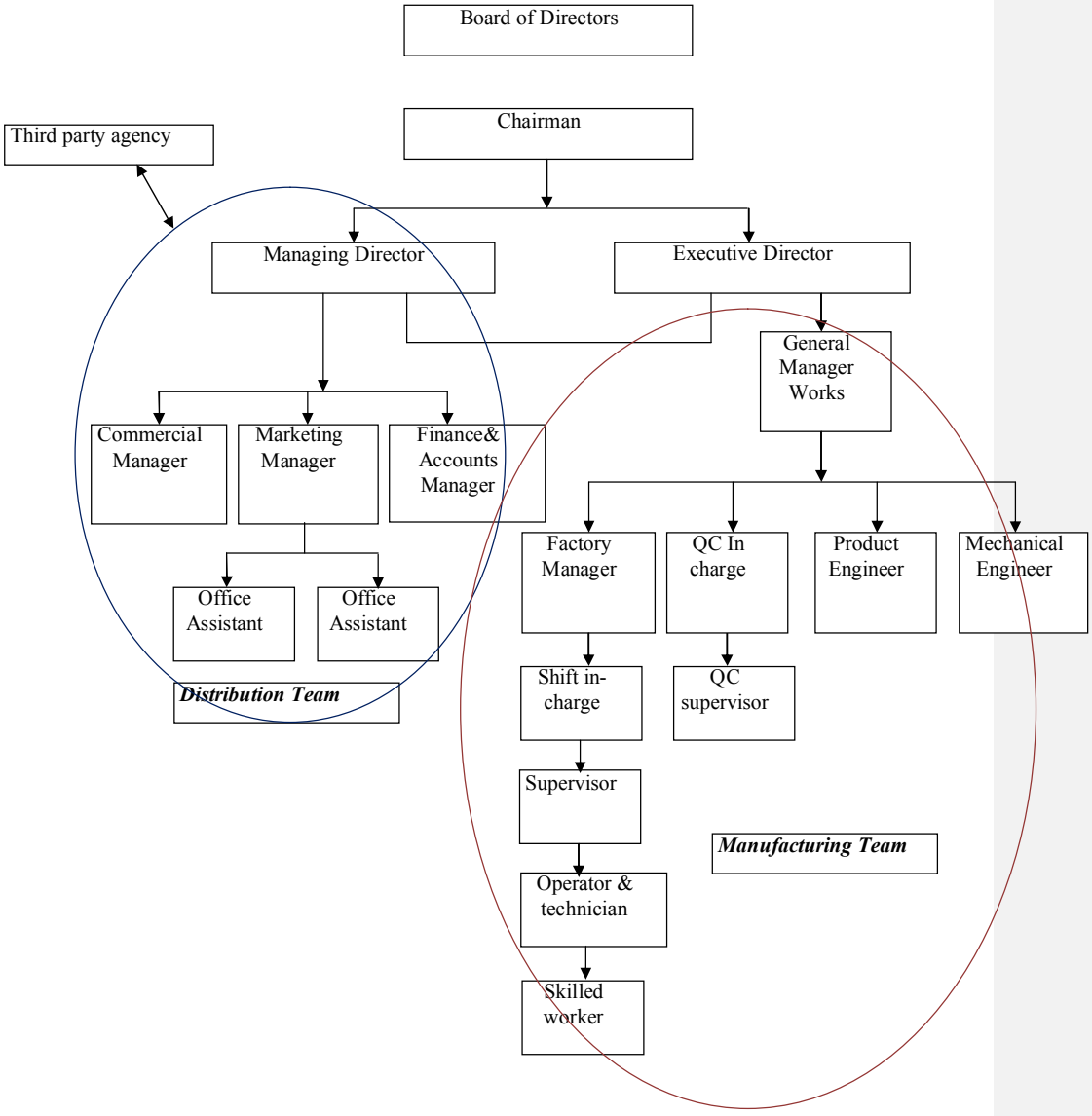
[34] The runtime meter being used for the sampling would be replaced before the end of its life for future analysis. For example, if a meter has been used for operating life of 4 year 11 months, then such meters would not be used for further installations.

	meter also has an internal memory of 16MB which has a life of 10 years. All the data stored in the memory can be downloaded to a wireless device, whenever required.
Any comment:	Data archived : Crediting period + 2 years

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

>>

BGPL has formed an internal team for the monitoring of the SSC-CPAs under the PoA as follows:


Board of Directors
Chairman
Third party agency
Managing Director
Executive Director
General Manager Works
Commercial Manager
Marketing Manager
Finance& Accounts Manager
Factory Manager
QC In charge
Product Engineer
Mechanical Engineer
Office Assistant
Office Assistant
Distribution Team
Shift in-charge
QC supervisor
Supervisor
Manufacturing Team
Operator & technician
Skilled worker

BGPL may involve third party agencies for the baseline survey, distribution and monitoring of a SSC-CPA. In order to ensure that the third party is qualified in carrying out the below stated tasks, the people involved in the third party shall have the following minimum qualifications:

a. Would be at least Secondary School Certificate (SSC) or an equivalent degree pass holder

b. Literate in basic English and the local language of the region.

Roles and Responsibility

Components of monitoring	**Tasks to be done**	**Executed by**	**Maintenance of records responsibility**
1. Manufacturing of CFLs (para 11 of AMS-II.C version 13)	The total manufacturing process is taken care of by the manufacturing team as indicated above. The plant records are maintained by the shift engineers as log books in all shifts of operation. Regular maintenance activities and training practices will be followed by the manufacturing team. The QC supervisors are responsible to inspect all manufacturing processes involved in the CFL manufacturing unit and report any deviation from the quality norms. The manufacturing facility has the required testing facilities where the manufactured CFLs are tested by BGPL to check the quality of the CFLs. The following parameters are monitored and recorded by the manufacturing team: i. Number of CFLs manufactured ii. Quantity of propane used as fuel iii. Import electricity used for manufacturing of CFLs iv. Quality standards of manufactured CFLs in the test reports (1) Power Factor (2) CFL lifetime (hours)	BGPL	Managing Director / Executive Director, BGPL
2. Baseline survey	Following information will be collected and recorded during the baseline survey: i. Name of the interviewee / owner / manager of the place ii. Full address of the place within	BGPL / third party	Managing Director, BGPL

	SSC-CPA region iii. Type and number of lighting devices existing in the given place, i.e. number of ILs / CFLs / other lighting devices / unused holders in the place iv. Wattage of ILs existing in the place v. Average annual hours of operation of ILs in the place vi. Electricity bill / electricity meter / service connection number vii. Number of project CFLs allocated to that place (depending on the installed ILs and unused holders)		
3. Distribution of CFLs (para 12 of AMS-II.C version 13)	The following parameters will be recorded during the distribution of CFLs: i. Date of CFL distribution ii. Wattage of the distributed CFL iii. Wattage of IL replaced by the project CFL iv. Awareness & acceptance by the recipient of the CFLs in the form of signatures to the effect that CERs for the energy saving measure would be claimed by BGPL. The CFLs will be distributed through a door-to-door survey or dedicated distribution centres.	BGPL / third party	Managing Director, BGPL
4. Ex post monitoring survey(para 13 and 14 of AMS-II.C version 13)	Sampling is done as per the EB guidelines to monitor the following: i. Actual number of operating CFLs – Annual ex-post survey for non-metered sample. ii. Operating hours of CFLs (metered using runtime meters) – The run time meters will be installed on the sample CFLs for a period of ninety days. These run time meters will be repeatedly shifted to new sample CFLs at the end of ninety days to take account of the seasonal variations. iii. Another random sample, identified	BGPL / third party	Managing Director, BGPL

	similar to the sample meters, would be taken from the population of CFLs and termed as 'non-metered sample'. An *ex post* monitoring survey would be conducted annually by BGPL (or a third party appointed for the purpose) for the non-metered sample of installed CFLs to verify whether the distributed CFLs are operating.		
5. Devices which have variable current characteristics and monitoring for pumping systems (para 15 and 16 of AMS-II.C version 13)	Not applicable as the devices being installed (ie. the CFL lamps) do not have variable current characteristics and pumping systems.	-	-
6. Collection / disposal of used ILs[35] (para 17 of AMS-II.C version 13)	Wattage of replaced IL will be recorded against the wattage of the distributed CFL. The ILs will be disposed as per the standard practice followed in the local SSC-CPA region.	BGPL / third party	BGPL

The collected data at different stages of monitoring would be collected and archived electronically by BGPL for the entire crediting period of the SSC-CPA plus two years.

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)

>>

Date of completion of the application of baseline and monitoring methodology: 25/01/2010

The contact detail of the responsible entity is given in Annex-1.

[35] The standard practice as prescribed by the respective regulatory body at the time of disposal will be adopted for the programme. The disposal procedure would be in line with the requirement of CPCB. An independent monitoring of scrapping of replaced equipment would be implemented, recorded and documented for independent verification.

Annex 1

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

Organization:	Balaji Greentech Products Limited
Street/P.O.Box:	--
Building:	KPR House, SP Road
City:	Secunderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500 003
Country:	India
Telephone:	+91 40 2789 8206 / 2071
FAX:	+91 40 2781 6171
E-Mail:	info@zora.in
URL:	www.balajigreentech.com , www.zora.in
Represented by:	--
Title:	Managing Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	--
First Name:	G Hemanth
Department:	--
Mobile:	+91 9866529067
Direct FAX:	+91 40 27816171
Direct tel:	+91 40 27890630
Personal E-Mail:	ghr@zora.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is available for the small scale PoA.

Annex 3

BASELINE INFORMATION

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, in its Version 4, has estimated the Build Margin and the Simple Operating Margin for the Southern grid and NEWNE grid as detailed below:

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

http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip

Emission Factor

Simple Operating Margin (tCO_2/MWh) (incl. Imports)

	2005-06	2006-07	2007-08
NEWNE	1.02	1.01	1.00
South	1.01	1.00	0.99
India	1.02	1.01	1.00

Net Generation Total (GWh)

	2005-06	2006-07	2007-08
NEWNE	437,877	465,361	496,119
South	138,329	152,206	157,315
India	576,206	617,567	653,434

Build Margin (tCO_2/MWh) (not adjusted for imports)

	2005-06	2006-07	2007-08
NEWNE	0.67	0.63	0.60
South	0.71	0.70	0.71
India	0.68	0.65	0.63

Calculation of the Baseline Emission Factor

Step 1: Identifying the relevant electricity system

A "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

A "connected electricity system" is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint. The tool requires the following considerations while determining whether significant transmission constraints exist or not:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

In the Indian context, as no well established spot markets exist, the first criterion is not applicable. Similarly, a transmission line fulfilling the second criteria is an exception in Indian Context. Hence the use of these criteria does not result in a clear grid boundary. In such a scenario, the use of a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial, regional/national) is recommended. Further, it states that a provincial grid definition may in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity.

The Indian power system is divided into two independent regional grids, namely Northern Eastern Western North-Eastern grid and southern grid. The southern grid covers four states and two Union Territories including the state of Andhra Pradesh, where the project activity is located.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional gird in which it is located. Hence for the purpose of estimation of the baseline emission factor, the Southern grid has been chosen as the relevant electricity system.

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

The project participant wishes to choose Option I to calculate the operating margin and build margin emission factor. Hence project participant would follow the procedure contained in earlier version of this tool[36]

Step 3: Select a method to determine the Operating Margin method

The project participant wishes to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation. The Ex ante option has been chosen for the calculation of the Simple OM. In Ex ante option, a 3 year generation-weighted average based on the most recent data available at the time of submission of CDM PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period has been used.

[36] Option I: Only grid power plants are included in the calculation.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The data provided by the Central Electricity Authority (CEA), an official data source has been relied upon for the calculation of the OM[37]. The same has been detailed in Annex 3. The latest version of the database, Version 4 has been used. The OM calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Assumptions

The following assumptions have been in case of unavailability of data at station level:

Net generation: In case of stations where only gross generation data is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1 The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:

- All units of a station fall into the build margin; or
- All units of a station have the same installed capacity; or
- The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO_2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

Where:

$EF_{grid,Omsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)

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

$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
M	=	All power plants / units serving the grid in year y except low-cost / must-run power plants / units
I	=	All fossil fuel types combusted in power plant / unit m in year y
Y	=	either the three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

The Operating Margin would be estimated ex ante. For Ex ante calculation, the average simple operating margin of the past three years (2006-07 to 2008-09) has been calculated.

OM = 0.9982 (Southern grid)

= 1.0086 (NEWNE grid)

The sample group of power units m selected for calculation of the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. The data pertaining to the units thus identified are detailed in the Version 4 of the Baseline Carbon Dioxide Emissions database of the CEA[38].

With regards to data vintage, the project participant wishes to use Option 1 viz., for the crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.

Step 5: Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)

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

M	=	Power units included in the build margin
Y	=	Most recent historical year for which power generation data is available

The Build Margin would be calculated annually ex ante during the crediting period. For ex ante calculation the most recent data available (2008-09) has been used and the build margin thus calculated is 0.71.

Therefore,

BM = 0.7133 (Southern grid)
= 0.5977 (NEWNE grid)

Step 6: Calculate the combined margin emissions factor

The combined margin will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The default values to be used for Power projects other than using wind and solar energy as the source are

w_{OM}= 0.5 w_{BM}= 0.5

Hence, the Baseline Emission Factor is calculated as below:

EF = w_{OM} * OM + w_{BM} * BM
= 0.5 * 0.9982 + 0.5 * 0.7133 (Southern grid)
= 0.5 * 1.0086 + 0.5 * 0.5977 (NEWNE grid)

= 0.8557 tCO_2/MWh (Southern grid)
= 0.8031 tCO_2/MWh (NEWNE grid)

Annex 4

MONITORING INFORMATION

The information is provided in Section A.4.4.2 and E.7.2.