NAME /TITLE OF THE PoA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab.

CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

CONTENTS

Annexes

NOTE:

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

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

NAME /TITLE OF THE PoA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab.

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab, **CPA – XX**[3]

Version: 1.0
Date: 23/12/2009

A.2. Description of the small-scale CPA:

Description of CPA:
The proposed CPA is implemented by Punjab State Electricity Board (PSEB) as an initiative to reduce the technical losses by replacing the existing 3-phase 400V Low Voltage Distribution System (LVDS) feeding Agricultural Pumps (AP), with an 11kV High Voltage Distribution System (HVDS) in the identified distribution divisions in the state of Punjab, India. The low voltage (400V) lines are to be replaced with high voltage (11kV) and also, all the existing distribution transformers with a number of smaller transformers of low capacity (ratings 25/50/63/100/200kVA).

Scope of CPA:
The proposed CPA comprises of following division(s) where PP has implemented the program. These divisions are uniquely identified by the Scheme ID given by REC and the name of the circle these fall in.

SN	Division Name	REC Scheme Code[4]	Circle Name
1		Code -	
2		Code -	
3		Code -	

The details about the division(s) part of proposed CPA are provided in Appendix 1 of this CDM-SSC-CPA-PD.

Project contribution to sustainable development
The project contributes to sustainable development of the region and of the country in terms of environment, socio-economic, technology, and economy. Following are the sustainable development benefits accruing from the SSC-CPA:

- **Social Well Being**
  In order to implement the SSC-CPA, PSEB shall engage (directly and indirectly) a large number of people. These people would be involved in a variety of tasks, including dismantling of old

[3] The reference number shall be generated by Programme Managing Entity (PSEB).

[4] Please add rows as required.

transformers, installation of new transformers, laying of overhead lines etc. People will also be involved in various monitoring procedures. Thus, it shall lead to social well being in the area.

- **Economic well being**
  The project activity will contribute to economic well being by eliminating the power losses. The state of Punjab has been seeing a rise in its power demand over the past years. However, the electricity demands outdo the electricity supplies, leading to shortage of electricity. The technical and commercial losses make the situation worse. By implementing HVDS, PSEB is able to reduce the losses. Thus, with the same level of supply, it would be able to provide more electricity to its consumers or be able to cater to a larger section of society for its electricity needs.

- **Environmental well being**
  The project activity leads to reduced losses in electricity distribution. Thus, less energy, which is produced mainly from fossil fuel fired power plants, is required to supply power to the same consumers. Thus, is leads to a cleaner environment by having to produce relatively less power from the dominantly coal fired power plants feeding power to the NEWNE grid of India.

- **Technological well being**
  The project activity comprises of changing the existing low voltage distribution system to a high voltage one. This leads to reduction of technical losses associated with distribution. Also, it provides a better power supply to the consumers.

A.3. Entity/individual responsible for the small-scale CPA:

CPA Implementer(s):
PSEB is the CPA implementer (also the project participant)

Coordinating Manager - CPA
Superintendent Engineer or Addl.SE/Senior Executive Engineer, PSEB (XXX Division) is the designated CPA coordinating manager.

Coordinating Manager - PoA
Engineer in Chief, RE&APDRP, PSEB, F-2 Shakti Vihar Patiala, is the designated PoA coordinating manager.

A.4. Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

A.4.1.1. Host Party:

India

NAME /TITLE OF THE PoA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab.

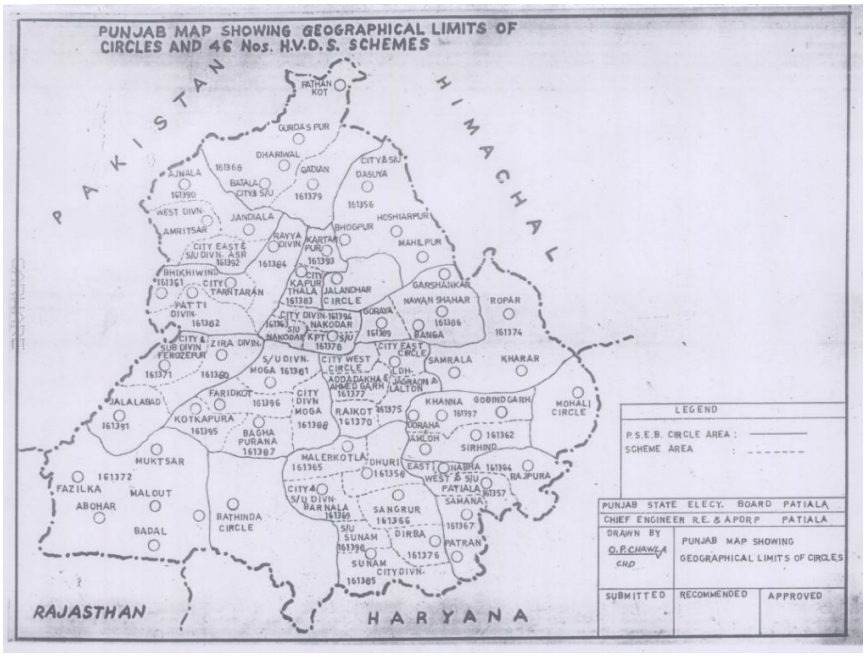
A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The SSC-CPA will be implemented in the following Division(s), in the State of Punjab. Punjab is located at 31^0 0' North and 76^0 0' East. Below is the geographical representation of the SSC-CPA.

Location of state of Punjab in India

NAME /TITLE OF THE PoA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab.



Location of the XXX Circle in the state of Punjab

SN	Division Name	Circle Name
1		
2		
3		

Name and Contact details of the entity/ individual responsible for CPA:

Name
Designation
PSEB (XXX Division)
Mob: +91-
XX substation, XX Division,
District XX, Punjab - 148024

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

DD/MM/YYYY (Date of release of works contract for REC schemes under which Division part of SSC-CPA falls in)

A.4.2.2. Expected operational lifetime of the small-scale CPA:

30 years

A.4.3. Choice of the crediting period and related information:

Fixed Crediting period

A.4.3.1. Starting date of the crediting period:

Date of inclusion of the SSC-CPA in to the registered PoA or commissioning date whichever is later.

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

10 years but limited to the end date of PoA.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tones of CO_2e
(for ex. 2010-11)	
Total estimated reductions (tonnes of CO_2e**)**	
Total number of crediting years	10 years
Annual average of estimated reductions over the crediting period (tonnes of CO_2e**)**	

A.4.5. Public funding of the CPA:

There is no public funding available for the project activity. The funding for the project activity has been done through a mix of loan from REC and internal resources of PSEB.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

For the purposes of registration of a Programme of Activities (PoA)[5] a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity[6], which:

(a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same sectoral scope, and;

(b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

In the HVDS program case, PSEB is the only organization mandated to carry out transmission and distribution projects in Punjab. Power generation is liberalized, but transmission and distribution is mandated for PSEB only. No other project or PoA has been developed /implemented in the same sectoral scope in the state of Punjab.

The proposed SSC-CPA is not a de-bundled part of any large scale activity as *PSEB*, the SSC-CPA implementer, has not proposed any other large scale PoA of the same sectoral scope within boundary of 1 km from SSC-CPA.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

It is confirmed that Division which is part of proposed SSC-CPA is neither registered as an individual CDM project activity nor as part of another registered PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Title of the PoA:
Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the rural areas of Punjab.

[5] Only those POAs need to be considered in determining de-bundling that are: (i) in the same geographical area; and (ii) use the same methodology; as the POA to which proposed CPA is being added

[6] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity

Proposed CPA is submitted along with PoA as part of PoA registration process. This is in line with the requirement of "PROCEDURES FOR REGISTRATION OF A PROGRAMME OF ACTIVITIES AS A SINGLE CDM PROJECT ACTIVITY AND ISSUANCE OF CERTIFIED EMISSION REDUCTIONS FOR A PROGRAMME OF ACTIVITIES"; Annex 29, EB 47

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

The division(s) part of the proposed CPA meets the eligibility criteria for a CPA to be included in a PoA. In the below table it is demonstrated how divisions meet the requirement of PoA:

SN	Eligibility Criteria	Remarks
1	*The SSC-CPA shall comprise of a single division or a group of divisions.*	The considered SSC-CPA comprises of a single/ group of division(s). Details enclosed in Appendix 1.
2	*The SSC-CPA shall be located in the State of Punjab*	The division(s) in the SSC-CPA falls under the geographical boundaries of Punjab.
3	*The SSC-CPA shall be located in an area not covered by any other SSC-CPA enrolled in this PoA*	PSEB is the only agency in the state responsible for carrying out the project activity. This is the only SSC-CPA under the proposed PoA covering this division
4	*The SSC-CPA shall be located in an area not covered by any other PoA targeting LVDS to HVDS*	PSEB is the only agency in the State responsible for carrying out the project activity. The SSC-CPA falls under the only proposed PoA covering these divisions.
5	*An SSC CPA shall be constituted of one or more divisions with all divisions being part of an approved REC Scheme[7] with an REC assigned Scheme Code*	The division(s) in the SSC-CPA is a part of Schemes approved by REC. Details of which are provided in the Appendix 1 of this CDM-SSC-CPA-DD.
6	*The SSC-CPA shall involve conversion of LVDS to HVDS by upgrading the supply voltage from 400V to 11kV to Agriculture Consumers*	The SSC-CPA, involves conversion of LVDS to HVDS i.e. upgrading distribution lines from 400 V to 11 kV.
7	*The SSC-CPA shall not result in more than 60 GWh of electricity saving for a year*	The SSC-CPA will not be crossing over the limit of 60 GWh of electricity savings per year. *The annual energy savings for the SSC-CPA are ~XX GWh.*
8	*Each SSC-CPA must be approved by the coordinating*	....

[7] Scheme is a term used by REC in their loan approval process. A scheme may comprise of a single division or a group of divisions. The details of all Schemes are provided in Annex 4.

	entity prior to its incorporation into the PoA	
9	*The SSC-CPA activity is not a debundled component of a large scale activity*	The SSC-CPA will not be a part of any large scale activity other than the proposed PoA. The division(s) involved is part of Schemes under the proposed PoA having unique identification.

Hence, the CPA is eligible to be a part of the registered PoA.

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

As defined in the PoA, to demonstrate that the SSC-CPA is additional, following set of conditions should be met. The conditions are in line with the additionality argument for the PoA.

Additionality Criterion	Applicability of SSC-CPA
The power from the feeders under SSC-CPA is supplied to Agriculture Consumers for free.	PSEB confirms that the power for agriculture consumers from the feeders under SSC-CPA is available for free. Relevant document shall be made available at the time of validation.
SSC-CPA is undertaken using the funds from REC	This SSC-CPA comprises of single/group of Division(s) which is part of an approved REC Scheme with a unique REC Scheme Code - XXX.
Debt to Service Coverage Ratio (DSCR) for the division(s) part of SSC-CPA is not attractive	For the SSC-CPA, DSCR is below 1.5.

DSCR Calculation:
For estimation of DSCR for the SSC-CPA, following set of data has been used –

Parameter	Value	Unit	Remarks
Project cost		INR lacs*	Project cost of Division(s) /REC Loan Assistance document; dated DD/MM/YY
Loan amount		INR lacs	Loan has been availed from REC
Moratorium period		years	As per REC loan document
Loan period		years	As per REC loan document
Equated quarterly installment		INR lacs	As per REC loan document
Power savings		GWh/ a	Estimated savings for XXX Division(s)
Interest Rate		%	Loan from REC /http://recindia.nic.in/download/interloan.pdf

*1Lac = 0.1 Million

Based on the above data, average DSCR comes out at XX which is below the benchmark DSCR.

Considering the above steps, the considered SSC-CPA is additional.

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

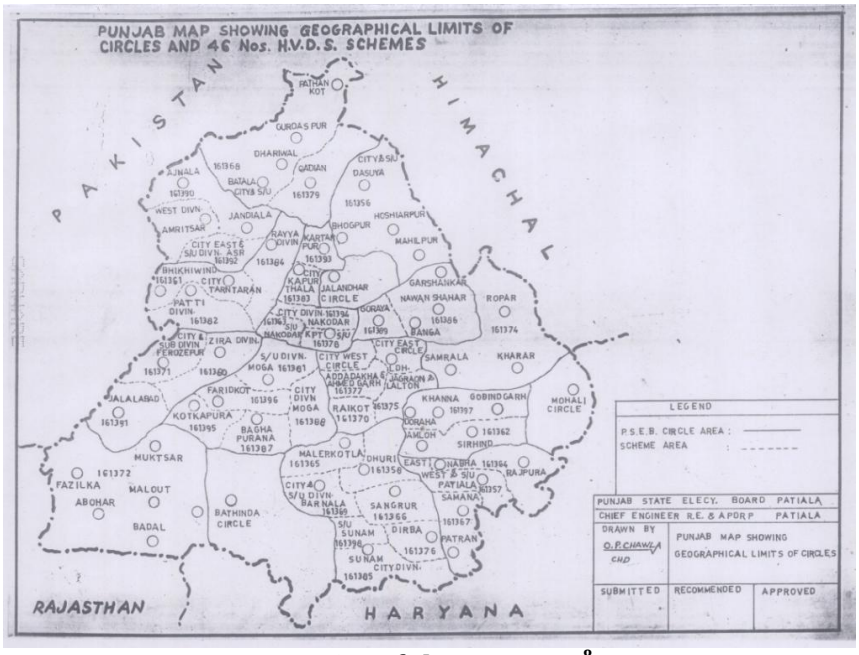
Emissions Sources and Gases Included in the SSC-CPA Boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation (equivalent to technical loss in LVDS in the baseline) in fossil fuel fired power plants of the grid	CO_2	Yes	Main Emission Source
		CH_4	No	Minor Emission Source
		N_2O	No	Minor Emission Source
SSC-CPA	CO2 emissions from electricity generation (equivalent to technical loss in HVDS in SSC-CPA) in fossil fuel fired power plants of the grid	CO_2	Yes	Main Emission Source
		CH_4	No	Minor Emission Source
		N_2O	No	Minor Emission Source

The geographical boundary of PoA is the state of Punjab in India. The division(s) part of the proposed CPA is also located in the same state. Hence it can be concluded that CPA falls in the geographical boundary of the PoA. Location of CPA is also depicted in the maps below –

NAME /TITLE OF THE PoA:

Punjab State Electricity Board: High Voltage Distribution System for Agricultural consumers in the Rural Areas of Punjab.



Location of the SSC-CPA[8]

The above figure shows that the SSC-CPA under consideration is under the geographical boundary of the PoA.

Following document(s) is provided as proof to above-

Document	Remarks
REC sanction letter(s) for the schemes under the PoA	It shows names of all the schemes under implementation, XXX division (also the scheme) being one of them under Scheme -XXX

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

Data / Parameter:	**Name-Div$_i$**
Data unit:	Text
Description:	Name of Division i
Source of data used:	Detailed Project Report
Value applied:	Dhuri
Justification of the choice of data or description of	Each SSC-CPA is identified by the Division(s) it comprises of. To avoid double accounting and uniquely identify a SSC-CPA, recording name of the division(s) is essential.

[8] Taken from the Detailed Project Report

measurement methods and procedures actually applied :	
Any comment:	Refer to Appendix 1 for details

Data / Parameter:	**Name-feeder**$_{j,i}$
Data unit:	Text
Description:	Name of Feeder j of Division i
Source of data used:	Detailed Project Report
Value applied:	Please refer to *Appendix 1* for the list of feeder names.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Each SSC-CPA is identified by the Division(s) it comprises of. Each Division further comprises of Feeder(s). To avoid double accounting and uniquely identify a SSC-CPA, recording name of the feeder(s) is essential.
Any comment:	-

Data / Parameter:	**$EF_{grid,CM}$**
Data unit:	tCO2/MWh
Description:	Grid Emission Factor (Combined Margin) for NEWNE grid
Source of data used:	CEA data
Value applied:	0.840
Justification of the choice of data or description of measurement methods and procedures actually applied :	Central Electricity Authority (India) is a government body and data published is in line with the ACM0002 and tool for calculating grid emission factor (version 2). http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver5.zip
Any comment:	This is ex-ante fixed for the entire crediting period.

Data / Parameter:	**$N_{transformer,i,j,\ baseline}$**
Data unit:	kVA
Description:	Capacity-wise number of Transformer(s) dismantled in the baseline in feeder j of division i in the baseline
Source of data used:	Detailed Project Report
Value applied:	All details shall be provided at the time of validation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is required to demonstrate that each of the dismantled transformers has been safely disposed off. This detail shall be made available for each SSC-CPA for future verification. Each substation officer will monitor the list of transformers in the baseline and of those replaced under each SSC-CPA. Records will be maintained for verification purpose. The transformer procurement details in the store can be used to cross-check the rating of each transformer procured and that of the replaced ones.

Any comment:	Transformers are of varying capacities.

Data / Parameter:	$L_{s,i,j,baseline}$
Data unit:	Km
Description:	Length of distribution line for section s of feeder j in division i.
Source of data used:	Detailed Project Report
Value applied:	All details shall be provided at the time of validation
Justification of the choice of data or description of measurement methods and procedures actually applied :	The actual loss calculation is performed separately for different line sections carrying different loads.
Any comment:	

Data / Parameter:	$R_{s,i,j,baseline}$
Data unit:	Ohm/km
Description:	Resistance of distribution line for section s of feeder j in division i.
Source of data used:	REC standard for a type of line
Value applied:	All details shall be provided at the time of validation
Justification of the choice of data or description of measurement methods and procedures actually applied :	The actual loss calculation is performed separately for different line sections carrying different loads. The DPRs have details on type of conductors and their resistance values (as per standard specifications) and the same information will be used for baseline emission calculations.
Any comment:	

Data / Parameter:	$P_{s,i,j,baseline}$
Data unit:	kVA
Description:	Load in a distribution line for section s of feeder j in division i.
Source of data used:	Detailed Project Report
Value applied:	All details shall be provided at the time of validation
Justification of the choice of data or description of measurement methods and procedures actually applied :	The actual loss calculation is performed separately for different line sections carrying different loads. The load in a distribution line for each section will be collected based on the connected loads of each section and the details will be based on the information of the DPRs. The connected load details can also be cross checked with the PSEB consumer database for agriculture loads.
Any comment:	Data is available in BHP which will be converted into kVA.

Data / Parameter:	$N_{transformer,i,j,\ CPA}$
Data unit:	kVA

Description:	Capacity-wise number of Transformer(s) installed in feeder j of division i in the SSC-CPA
Source of data used:	On-site data
Value applied:	Appendix 2 shows the list of installed transformers in SSC-CPA.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The list of the distribution transformers in the baseline and of those replaced under each SSC-CPA will be monitoredand records will be maintained for verification purpose. The transformer procurement details in the store can also be used to cross-check the rating of each transformer procured and replaced ones.
Any comment:	-

Data / Parameter:	$\mathbf{L_{s,i,j,CPA}}$
Data unit:	Km
Description:	Length of distribution line for section s of feeder j in division in SSC-CPA
Source of data used:	On-site data
Value applied:	All details shall be provided at the time of validation
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is required for loss calculation in the SSC-CPA. This data will be collected from the PSEB database on procurement of new materials for implementation for each SSC-CPA. The information can also be cross checked with the invoices of the material procured.
Any comment:	

Data / Parameter:	$\mathbf{R_{s,i,j,CPA}}$
Data unit:	Ohm/km
Description:	Resistance of distribution line for section s of feeder j in division i in SSC-CPA
Source of data used:	REC standard for a type of line
Value applied:	All details shall be provided at the time of validation
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is required for loss calculation in the SSC-CPA. This will be based on the type of the material procured for implementation and the resistance value will be collected from standard references and/or literature or from supplier details.
Any comment:	

Data / Parameter:	$\mathbf{P_{s,i,j,CPA}}$
Data unit:	kVA
Description:	Load in section s of feeder j in division i in SSC-CPA
Source of data used:	On-site data
Value applied:	All details shall be provided at the time of validation
Justification of the	This is required for loss calculation in the SSC-CPA. This information will be

choice of data or description of measurement methods and procedures actually applied :	based on the connected loads (APs) for each section of the feeder and is based on the PSEB database on the agriculture consumers connected to each feeder.
Any comment:	Data is available in BHP for all APs which will be converted into kVA.

Data / Parameter:	$\mathbf{LF}_{i,j}$
Data unit:	-
Description:	Load Factor of feeder j part of division i
Source of data used:	Calculated based on the data recorded on a daily basis.
Value applied:	0.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is based on REC guidelines and is constant throughout. However, this value will be cross checked with actual values on a sample feeder and the conservative value will be chosen for calculation purposes.
Any comment:	

Data / Parameter:	$\mathbf{LLF}_{i,j}$
Data unit:	-
Description:	Loss Load Factor of feeder j part of division i
Source of data used:	Calculated based on the data recorded on a daily basis.
Value applied:	0.13
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is based on REC guidelines and is constant throughout. However, this value will be cross checked with actual values on a sample feeder and the conservative value will be chosen for calculation purposes.
Any comment:	

Data / Parameter:	$\mathbf{LDF}_{i,j}$
Data unit:	-
Description:	Load distribution factor
Source of data used:	Calculated based on the data recorded on a daily basis.
Value applied:	2
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is based on REC guidelines for uniformly distributed load and is a constant throughout. However, this value will be cross checked with actual values on a sample feeder and the conservative value will be chosen for calculation purposes.

Any comment:	

Data / Parameter:	**$DF_{i,j}$**
Data unit:	-
Description:	Diversity factor for feeder j of division i
Source of data used:	Calculations based on the data recorded on a daily basis.
Value applied:	1.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is based on REC guidelines. This value will be considered as constant throughout based on REC guidelines. However, this value will be cross checked with actual values on a sample feeders and the conservative value will be chosen for calculation purposes.
Any comment:	

B.5.2. Ex-ante calculation of emission reductions:

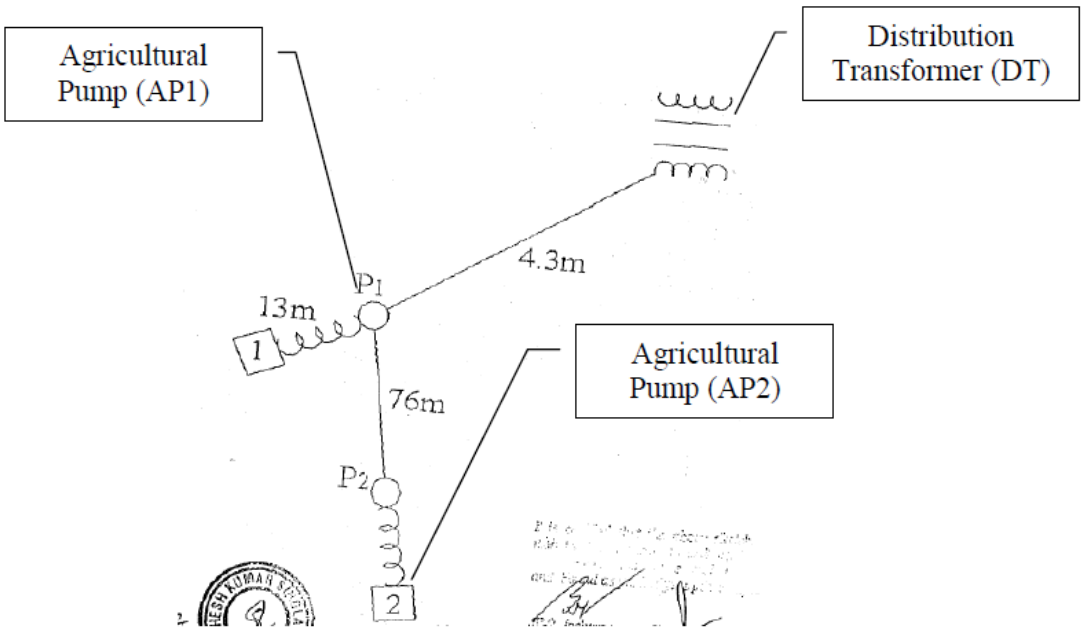
The project activity is the conversion of 400V LVDS to 11kV HVDS. The purpose of the activity is to effect reduction of technical loss in electricity distribution. Emission reductions take place as there is net energy saving due to reduction in loss. Below is the method of calculation of loss reduction based on REC formulae –

Loss in baseline (LVDS)

Each SSC-CPA is a group of Division(s) and each division is further divided into subdivisions and substations. Each of the sub-stations then is connected to many feeders. Each feeder supplies power to Distribution Transformers (DT) connected to the consumers.

Step 1: Retrieval of section-wise information for a feeder

Following shows the arrangement of power distribution to consumers from a typical DT.



The above figure shows the connected loads to a particular distribution transformer (DT). There are two line sections here, after the transformer: DT to P_1 & P_1 to P_2. All the DTs have a particular code assigned to them. The following information is to be retrieved for each section.

SN	Section	Load in BHP*	Load P (kVA)	Resistance R (Ohms/km)	Length L (km)
1	DT-P1	Load – AP1+AP2	Equivalent of Load in BHP	R of DT-P1	0.0043
2	P1-P2	Load – AP2	Equivalent of Load in BHP	R of P1-P2	0.0760

*This is the connected load of Agriculture Pumps for a section.
For example, for above arrangement this would be the sum of load of AP1 and AP2 for section DT-P1 and load of AP2 for section P1-P2

Step 2: Calculation of section-wise baseline loss (kW)

$kW_{loss,s,b} = P^2 * R * L * (10^{-3}/V^2)$

Step 3: Calculation of section-wise annual baseline loss (kWh)

$kWh_{loss,s,b} = P^2 * R * L * (10^{-3}/V^2) * h$

h is the number of operating hours for one year for a section. PSEB has taken 'h' as 1920 based on historical data of operation.

Applying the value of V = 0.350kV (in reality, the value is a little less than 400V), and h = 1920 the formula is simplified into:

$kWh_{loss,s,b} = 15.67 * P^2 * R * L$

Step 4: Calculating the feeder-wise annual baseline loss

The loss for a full feeder will become the summation of all the section-wise loss.

$kWh_{loss,b,i} = \sum kWh_{loss,s,b}$

Step 5: Calculating the annual baseline loss in SSC-CPA

The loss for a full feeder will become the summation of all the feeder-wise loss.

$$E_{loss,b} = \sum_{i=1}^{F} kWh_{loss,b,i}$$

As all the feeders considered under CPA are radial feeders with only agriculture consumers connected, the loss percentage out of total energy sent out will be calculated for a sample of feeders using the above mentioned approach and the same value will be applied to all other feeders uniformly.

Loss in SSC-CPA (HVDS)

For 11kV lines losses, load distribution factor and load loss factor have to be considered as it would be difficult to calculate losses on each section of all 11kV feeders. The present practice adopted by the electricity utility for computing line losses is to use what is generally known as the km-kVA method[9]. The annual feeder losses are computed using the following formula given below -

Step 1: Calculating the section-wise annual project loss

The arrangement of a typical DT as shown in the figure in the baseline has been taken as one section.

$$AnnualLoss_{section} = 0.105 \times \frac{P^2 R_T}{2 * LDF} \frac{LLF}{DF^2}$$

where;

[9] Rao P. S. N., Deekshit, R. 2006. Energy Loss Estimation in Distribution Feeders. IEEE Transactions on Power Delivery, Vol. 21, No. 3, July 2006

Annual Loss: kWh loss per annum (section wise)
P: Sum of kVAs of all installed DTs (connected loads)
R_T: Resistance of the section (ohms)
LLF: Loss load factor
LDF: Load distribution factor
DF: Diversity factor

The above formula assumes the operating hours as 8760 but the actual operating hours will be as per the substation recordings.

The resistance of the feeder, R_T is calculated as:

$$R_T = \sum_{i=1}^{N} R_i L_i$$

Where,
R_i: Resistance per unit length of the section segment i[10] (ohm/km)
L_i: Length of the section segment i (km)
N: Number of segments of sections

Loss Load Factor is calculated as:
$LLF = 0.2LF + 0.8LF^2$

Where,
LF is the load factor

Load Distribution Factor is calculated as:
LDF = P x L / km-kVA

Where,
$L = \sum Li$

Km-kVA = $\sum_{i=1}^{N} L_i P_i$

The value of LDF is 2 for the uniformly distributed load as per REC.

Diversity Factor is calculated as:
DF = P/ Peak Load in kVA

This is considered as 1.2.

Load Factor is calculated as:

[10] The value of R_i shall be taken as per REC standards for a line type

LF = energy sent / peak load x h (no of hours)

The value of LF is taken as 0.3.

Step 2: Calculating the feeder wise annual loss

The loss for one full feeder will become the summation of all section losses.

$$AnnualLoss_{feeder} = \sum_{1}^{S} AnnualLoss_{section}$$

Step 3: Calculating the annual project loss in SSC-CPA

The loss for a full feeder will become the summation of all the feeder-wise loss.

$$E_{loss,CPA} = \sum_{i=1}^{F} AnnualLoss_{feeder(i)}$$

Baseline emissions:

As per approved small scale methodology AMS II A version 10, the baseline emissions are the energy baseline multiplied by the emission factor. In this case, the emission factor is the combined margin grid emission factor (**$EF_{grid,CM}$**) for NEWNE grid of India, which comes out to be 0.840 tCO2/ MWh (see Annex 3 for details). This value will be updated at the time of inclusion of each CPA and will be kepy constant for entire crediting period of the particular CPA.

Thus, baseline emissions shall be calculated as:

$BE_y = E_{loss,b,} * EF_{grid,CM}$

Project emissions:

Similarly, project emissions shall be calculated by multiplying the grid emission factor by the E_{loss} in the project activity scenario, i.e

$PE_y = E_{loss, CPA} * EF_{grid,CM}$

Leakage

In accordance with the AMS II.A methodology, "If the energy efficiency technology is equipment transferred from another activity, leakage is to be considered".

The project will only involve the procurement and installation of new HV conductors through an open bidding process. No equipment will be transferred from another activity. Also, the replacement of old transformers will also happen with the new low capacity transformers.

For the PoA, the methodology states the following: *"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 the scrapping of replaced equipment needs to be implemented. The monitoring should include checking 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".*

The project principally targets line loss reductions by replacing LVDS with HVDS and rearranging the system. All removed cables as well as transformers will be scrapped in an organized and monitored way. Annex 6 shows the detail of the transformer replacements. In the specific case of this PoA, as mentioned above, the dismantled LV cables could be used if the cables are suitable for new applications. No leakage is expected as a result of such re-use.

Based on the above discussions, there is no possible leakage for the proposed SSC-CPA.

LEy = 0

Emission Reductions

Emission reductions will be the difference between the emissions that would have occurred without the CDM project activity and the emissions due to energy loss in the project activity. Emission reductions are calculated by:

$$ER_y = BE_y - PE_y - LE_y$$
$$ER_y = (E_{loss,CPA} - E_{loss,b}) * \mathrm{EF}_{\mathrm{grid,CM}} - LE_y$$

Where,

ER_y	Emission reductions in tCO_2 for year "y" due to technical energy loss within the SSC-CPA boundary.
BE_y	Baseline emissions in tCO_2 for year "y" due to technical energy loss within the SSC-CPA boundary in the absence of the proposed SSC-CPA.
PE_y	Project emissions in tCO_2 for year "y" due to project technical energy loss within the SSC-CPA boundary.
LE_y	Leakage emissions in tCO_2 for year "y".

Calculation Results for SSC-CPA

The loss calculations shall be performed for all feeders in a division and an average net loss savings of the total energy sent out shall be arrived at.

Applying the above values, the emission reduction for a particular year shall be calculated

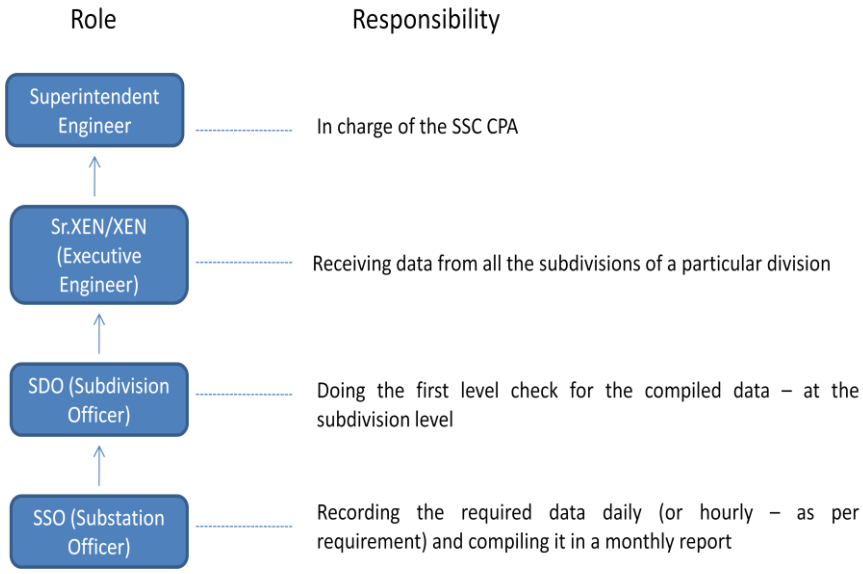
B.5.3. Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
(for ex. 2010-11)			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
			0	
Total (tonnes of CO_2 e)			0	

B.6. Application of the monitoring methodology and description of the monitoring plan:

B.6.1. Description of the monitoring plan:

Roles and Responsibilities for the monitoring plan



In line with AMS IIA version 10, the CPA proposes to reduce the 'Technical Loss' through conversion of LVDS to HVDS. The 'Technical Loss' have been analytically calculated using the standard formulas derived by REC. This is in line with point (ii) of Option 2, para 4 of AMS IIA, version 10. The details have been provided in the PoA.

The 'Technical loss' reduction by conversion of the LVDS to HVDS and the corresponding Emission Reduction calculated using the REC derived formulas provided in sections E.6.2 of the PoA-DD. The detailed monitoring plan for a SSC-CPA has been detailed in section A.4.4.2 of the PoA-DD.

PSEB is responsible for the implementation of the Monitoring Plan (see the above figure). Under this, various sub-divisional and divisional officers will:

- Supervise data collection and ensure the completeness, timeliness and correctness of the monitoring records
- Calculate emission reductions
- Ensure quality control and quality assurance, administrate and maintain all CPA databases at the PSEB head office in Patiala.

Operational data will be recorded on an hourly basis by substation officer and daily compilation will be transmitted to the subdivision office.

The Monitoring Plan will also consist in the following:

Electricity Monitoring:

- The metering system consists in ampere meters (A), power meters (kVA), voltmeters (kV) and energy meters (MWh). The substation officers will record important parameters for energy loss calculations on an hourly basis. PSEB substations and feeders are equipped with an in-house

metering system, which monitors the performance of the individual substations and feeders. Professional metering equipment will be installed at substations where required, whereas existing meters will be calibrated.

- The parameters to be metered include current and MW drawn by the substation concerned and each connected feeder , the voltage (kV) energy sent out by substation and feeder (MWh), power supply time (hours), power outage time (hours).
- The operators at individual substations shall take hourly readings of the meters and shall keep complete and accurate records in the substation log book for proper administration.

Reports will be reviewed by the subdivision officers, who will then prepare a monthly report based on these and send it to the Executive Engineer.

Calibration:
The calibration of electricity meters is the responsibility of the PSEB using internal procedures. The results of the calibration will be included in the monitoring report at the CPA and the PoA levels. If there are any anomalies in the readings of the metering instruments throughout the year, the instruments will be recalibrated.

Data Management:
All electronic and hard copy records of the metering devices, electricity monitoring records, relevant documentation and the results of calibration will be collated in a central area by the Superintendent Engineer. All recorded data in the project activity used in the calculation of emission reductions or in terms of quality control and quality assurance will be archived for a period of 2 years after the end of the crediting period.

Damages to Monitoring Equipment:
In case monitoring equipment is damaged and no reliable readings can be recorded, the PoA managing entity will use the lowest historical values to estimate the technical losses in the CPA.

Emergencies:
In the case of emergencies, emission reductions will not be claimed for the duration of the emergency. Emergencies cases include events that do not allow the project activity to be physically operational: natural disasters, such as earthquakes, hurricanes, floods, tornados, and fires. At the end of the emergency period, the following procedure will be launched to re-establish emission reductions accounting: the PoA entity will examine all meters and notify the readiness of all requirements for the monitoring of emission reductions and normal operations. A third party could witness the procedures.

Data and parameters to be monitored by each SSC-CPA:	
(Copy this table for each data and parameter)	
Data / Parameter:	$\mathbf{P}_{max,i,j}$
Data unit:	kVA
Description:	Peak Load in feeder j of division i
Source of data to be used:	Energy meter for the feeder installed at the respective substation

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Value varies for each feeder in the CPA.
Description of measurement methods and procedures to be applied:	The reading is taken by the substation officer from the Electronic Tri-vector Meter (accuracy class of 0.5) in the hourly log sheets. Frequency of recording- Daily
QA/QC procedures to be applied:	The readings will be recorded in the required format daily by the substation officer. For each SSC-CPA, the first control will be done by the sub division officer. The Executive Engineer will approve the records at division level and then goes to the Superintendent Engineer for CPA level approval and finally to the Engineer in Chief for the PoA level approval. Energy meter shall be tested/ calibrated once a year as per PSEB internal standards. In case of discrepancies, the readings will be cross checked with the connected load details of the feeder.
Any comment:	-

Data / Parameter:	$\mathbf{EG_{i,j}}$
Data unit:	kWh
Description:	Energy sent from feeder j of division i
Source of data to be used:	Energy meter for the feeder installed at the respective substation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	195,846,1000
Description of measurement methods and procedures to be applied:	The reading is taken by the substation officer from the Electronic Tri-vector Meter (accuracy class of 0.5) in the hourly log sheets. Frequency of recording- Daily
QA/QC procedures to be applied:	The readings will be recorded in the required format daily by the substation officer. For each SSC-CPA, the first control will be done by the sub division officer. The Executive Engineer will approve the records at division level and then goes to the Superintendent Engineer for SSC-CPA level approval and finally to the Chief Engineer for the PoA level approval. Energy meter shall be tested/ calibrated once a year as per PSEB internal standards. In case of discrepancies, the readings will be cross checked with the connected load details of the feeder and operating hours.
Any comment:	-

Data / Parameter:	$\mathbf{PF_{j,i}}$
Data unit:	-

Description:	Power Factor for feeder j of division i
Source of data to be used:	Energy meter for the feeder installed at the respective substation.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The reading is taken by the substation officer from the Electronic Tri-vector Meter (accuracy class of 0.5) in the *daily* log sheets.
QA/QC procedures to be applied:	The readings will be recorded in the required format daily by the substation officer. For each SSC-CPA, the first control will be done by the sub division officer. The Executive Engineer will approve the records at division level and then goes to the Superintendent Engineer for SSC-CPA level approval and finally to the Engineer in Chief for the PoA level approval. Energy meter shall be tested/ calibrated once a year as per PSEB internal standards. In case of discrepancies, the readings will be cross checked with the kW and kVA details of the feeder.
Any comment:	-

Data / Parameter:	$\mathbf{n_{j,i}}$
Data unit:	-
Description:	Number of operating hours for a feeder j for division i
Source of data to be used:	On-site power supply schedule
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The reading is taken by the substation officer.
QA/QC procedures to be applied:	-
Any comment:	-

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:

√ Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

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

NA

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

NA

SECTION D. Stakeholders' comments

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

√ Please tick if this information is provided at the PoA level. In this case,sections D.2. to D.4. need not be completed in this form.

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

>>
NA

D.3. Summary of the comments received:

>>
NA

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

>>
NA

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	The Danish Ministry of Climate and Energy (The Danish Energy Agency)
Street/P.O.Box:	Amaliegade 44
Building:	
City:	Copenhagen
State/Region:	
Postcode/ZIP:	1256
Country:	Denmark
Telephone:	+45 3392 6700
FAX:	+45 3311 4743
E-Mail:	ens@ens.dk
URL:	www.kemin.dk
Represented by:	Mr. Malmdorf Torsten
Title:	Senior Adviser
Salutation:	Mr.
Last name:	Malmdorf
Middle name:	Torsten
First name:	Erik
Department:	Climate Change and Energy Economics
Mobile:	+45 2249 4427
Direct FAX:	
Direct tel:	+45 3392 6779
Personal e-mail:	tma@ens.dk

Organization:	Punjab State Electricity Board
Street/P.O.Box:	-
Building:	XXX
City:	XXX
State/Region:	Punjab
Postfix/ZIP:	XXX
Country:	India
Telephone:	+91-STD Code-Number
FAX:	+91- STD Code-Number
E-Mail:	XXX
URL:	
Represented by:	
Title:	

Salutation:	Mr./ Ms.
Last Name:	XXX
Middle Name:	XXX
First Name:	XXX
Department:	XXX
Mobile:	+91-Number
Direct FAX:	+91-STD Code-Number
Direct tel:	+91- STD Code-Number
Personal E-Mail:	XXX

Organization:	International Bank for Reconstruction and Development (IBRD) as a Trustee of Danish Carbon Fund
Street/P.O.Box:	1818 H St
City:	Washington, DC
State/Region:	District of Columbia
Postfix/ZIP:	20433
Country:	USA
Telephone:	202-458-1873
FAX:	202-522-7432
E-Mail:	IBRD-carbonfinance@worldbank.org
URL:	www.carbonfinance.org
Represented by:	Ms. Joelle Chassard
Title:	Manager
Salutation:	Ms.
Last Name:	Joelle
Middle Name:	-
First Name:	Chassard
Department:	Environment Department
Mobile:	-
Direct FAX:	202-522-7432
Direct tel:	202-458-1873
Personal E-Mail:	-

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public funding available to the SSC-CPA.

Annex 3
BASELINE INFORMATION

Grid emission factor:
As per AMS 1.D, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:

A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system' Version 2Annex 14 EB 50.
OR
The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used. Calculations must be based on data from an official source (where available) and made publicly available.

Baseline for the project activity is power generated from renewable energy source multiplied by the grid emission factor of NEWNE grid calculated in transparent and conservative manner.

Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' version 2 Annex 14 EB 50 as per the methodology as data is available from an official source.

Baseline Methodology Procedure
Project participants shall apply the following six steps:
STEP 1: Identify the relevant electric power system.
STEP 2: Select an operating margin (OM) method.
STEP 3: Calculate the operating margin emission factor according to the selected method.
STEP 4: Identify the cohort of power units to be included in the build margin (BM).
STEP 5: Calculate the build margin emission factor.
STEP 6: Calculate the combined margin (CM) emissions factor.

STEP 1: Identify the relevant electric power system
The tool defines the electric power system as 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. Keeping this into consideration, the CEA[11], Government of India has divided the Indian Power Sector into five regional grids as East, West, North, South and North Eastern grids respectively.

However for the purpose of estimation of baseline emissions, CEA has classified the grid system into two parts, Southern Region grid and NEWNE grid. The NEWNE grid comprises of –

Northern	Eastern	Western	North-Eastern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh

[11] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf

Delhi	Jharkhand	Gujarat	Assam
Haryana	Orissa	Daman & Diu	Manipur
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya
Jammu and Kashmir	Sikkim	Madhya Pradesh	Mizoram
Punjab	Andaman- Nicobar	Maharashtra	Nagaland
Rajasthan		Goa	Tripura
Uttar Pradesh			
Uttarakhand			

Since the project supplies electricity to the Northern Region grid a part of NEWNE grid, emissions generated due to the electricity generated by the NEWNE grid as per CM calculations will serve as the baseline for this project.

STEP 2: Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{OM,y}$) is based on one of the following methods:
Simple OM, or
Simple adjusted OM, or
Dispatch data analysis OM, or
Average OM

Any of the four methods can be used. However, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Region	2005-06	2006-07	2007-08	2008-09
NEWNE	18.0%	18.5%	19.0%	17.3%
South	27.0%	28.3%	27.1%	22.8%
India	20.1%	20.9%	21.0%	18.6%

(Source: http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf)

The above table clearly shows that the percentage of total grid generation by low-cost/must-run plants (on the basis of average of four most recent years) for the NEWNE grid is only 18.2% which is much lesser than 50% of the total generation. Thus, Simple OM method can be used for calculating the emission factor.

STEP 3: Calculate the operating margin emission factor according to the selected method

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required for calculating the emission factor for year y is usually only available later than six months after the end of year y,

alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

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.

Method adopted for Simple OM in the project activity
In the project activity, (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. The data is published annually by the CEA.

It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed during the crediting period.

Parameter	Value (tCO_2/ MWh)	Source
Simple OM, 2006-07	1.008	The OM is based on ACM0002 as calculated in CEA database for grid emission factor (Version 5). http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Simple OM, 2007-08	1.000	
Simple OM, 2008-09	1.006	
Simple OM, average	1.005	

STEP 4: Identify the cohort of power units to be included in the build margin (BM)
The value of the data has been taken from the data published by CEA as referred in earlier step. The details of the key assumptions considered to calculate the figure can be found in the User Guide of the same.

Project participants can choose one of the following two options:

Option 1
Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission. The sample group m consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2
For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1 above. The sample group m consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have

been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

STEP 5: Calculate the build margin emission factor ($EF_{grid,BM,y}$)
Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

As per the CEA CO_2 Baseline Database, the BM for the 2008-09 has been calculated to be $EF_{grid,BM,y}$ = 0.675 tCO_2e/MWh

STEP 6: Calculate the combined margin (CM) emissions factor ($EF_{grid,CM,y}$)
The CM can be calculated as per the following:

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

Where,

$EF_{grid,OM,y}$ = Build Margin CO_2 emission factor in the year y (tCO_2/GWh)
$EF_{grid,BM,y}$ = Operating Margin CO2 emission factor in the year y (tCO_2/GWh)
W_{OM} = Weighting of operating margin emission factor (%)
W_{BM} = Weighting of build margin emission factor (%)

Where:
The default weights for OM and BM are as follows: W_{OM} = 50% and W_{BM} = 50%

In the project activity, combined margin has been chosen as the baseline emission factor for grid emission factor. The value chosen is taken from relevant official sources and is publicly available[12].

Parameter	**Value (tCO_2/ MWh)**
OM, Operating Margin	1.005
BM, Build Margin	0.675
CM, Combined Margin	**0.840**

Thus, the CM emissions factor ($EF_{grid,CM,y}$) for the project has been calculated to be $EF_{grid,CM,y}$ = 0.840 tCO_2/MWh and is fixed ex-ante for the entire crediting period.

Source: Baseline Carbon Dioxide Emissions from Power Sector Version 5 published by the CEA, India[13].

[12] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf

[13] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Annex 4

MONITORING INFORMATION

For details on monitoring, please refer to Section B.6 of this CPA-DD.

- - - - -

Appendix 1

Details of Divisions of the SSC-CPA

SN	Division Name	Scheme ID	Circle Name
1		Code -	
2		Code -	
3		Code -	

Details of Feeders in Division - XXX

SN	Sub-Division	Name of Feeder
1		
2		
3		

Appendix 2

Details of Distribution Transformers (DT) Installed in Division - XXX

SN	Feeder Description	Sub-division	No of (6.3 kVA)	No of (kVA)	No of (16 kVA)	No of (25 kVA)
1						
2						
3						