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

CONTENTS

A. General description of CDM programme activity (CPA)

B. Eligibility of CPA and Estimation of Emission Reductions

C. Environmental Analysis

D. Stakeholder comments

Annexes

Annex 1: Contact information on entity/individual responsible for the CPA

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

Appendix 1: Details of the divisions of the SSC-CPA

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).

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 the Punjab, **CPA – XX**

Version: 1.5
Date: 05/06/2012

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

Description of SSC-CPA:

The proposed SSC-CPA is planned by Punjab State Power Corporation Limited as a part of the PoA, which is an initiative to reduce green house gas emissions by reducing the technical losses by upgrading 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 conversion of LVDS to HVDS reduces line losses due to reduced current flow in the lines. The energy savings would thus contribute to reduction of GHG emissions corresponding to equivalent amount of energy saved as electricity generation is primarily fossil fuel based. The conversion is done by replacing the high capacity distribution transformers with low capacity dedicated transformers.

There is no significant difference between the working of the project and pre-project scenario. Only the number and ratings of transformers have changed with no change in the other components of the distribution system e.g. conductors, sub-station, operation methodology etc. There shall be no change in the length of the conductor, however the high voltage line length increases due to the reduction in the length in the low voltage lines, as the transformers are taken closer to the customers.

The table below shows the essential differences between the SSC-CPA and the pre-project scenario:

Parameter	Pre-project scenario	Project scenario
Line voltage – transformer to AP	Low (400V)	High (11kV)

Transformer capacities	High capacity transformers (25 kVA – 200 kVA) connecting many consumers	Low capacity transformers (6.3kVA - 25 kVA[3]) connecting individual consumers
Energy Consumption of end use equipments	No change (as consumption remains the same)	
Current in the Lines (Amps)	High	Low
Resistance of Lines	High	Low
HT : LT Ratio[4]	Low	High
T & D losses	High	Low
Power Supply Hours	- No change	
Transformer failure	More	Less
Voltage Quality at the consumer end	Poor	Better (due to no step down transformers in the distribution network till the consumer end (minimized LT length), voltage losses/variability is minimized)

Application of environmentally safe and sound technology

The transformers and other equipments used in the SSC-CPA are newly manufactured and their operation does not cause any harm to the environment. Thus, the SSC-CPA uses environmentally safe and sound technology.

Scope of SSC-CPA:
The proposed SSC-CPA comprises of following division(s) where the Project Participant (PP) has implemented the program. These divisions are uniquely identified by the names of the divisions they encompass. The REC scheme code and name of the circle (where the division falls in) has also been provided. The scheme code is an identification provided by the funding agency REC (Rural Electrification Corporation Ltd.).

SN	Division(s) Name	Circle Name	Identification code (REC Scheme code)
1	XXX	XXX	XXX
	(insert rows as necessary)		

[3] 25 kVA transformers are used in pre-project and project scenario

[4] HT represents High Tension lines (11 KV), and LT represents Low Tension lines (400 V)

The number of transformers in pre and post project scenario is as mentioned below:

Baseline Transformer Details		
Capacity	**Nos.**	**Baseline installed capacity:**
25 kVA	XXX	XXX kVA
63 kVA	XXX	
100 kVA	XXX	
Total TFs	**XXX**	

Project Transformer Details		
Capacity	**Nos.**	***Project installed capacity:***
6.3 kVA	XXX	XXX kVA
10 kVA	XXX	
16 kVA	XXX	
25 kVA	XXX	
Total Transformers newly installed in the project	XXX	

Each agriculture connection is supplied through a dedicated transformer of required capacity and accordingly the total no. of pumps (and hence connections) in present CPA are XXX as newly installed transformers i.e. XXX nos.

The details about the division(s) part of proposed SSC-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 considerations, technology, and the economy. Following are the sustainable development benefits accruing from the SSC-CPA:

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

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

- **Economic well being**
  The state of Punjab has been seeing a rise in its power demand over the past years. However, the electricity demand exceeds the electricity supplies, leading to the power deficit[5]. The technical and commercial losses incurred in the sector make the situation even worse. The power savings in the state of Punjab will help, to an extent, in catering to the power demand more efficiently. 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. Electricity, being one of the most important infrastructure needs, shall provide ground for the economy to generate economic opportunities.

- **Environmental well being**
  The SSC-CPA 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. This leads to a cleaner environment.

- **Technological well being**
  The length of low voltage line will be limited to service lines as transformers will be installed close to APs. Due to the reduced length, the voltage drop will be reduced (especially during peak time) improving the voltage profile available to the pump sets and consequently leading to reduced losses in the AP motors.

  Transformer failure resulting from overloading will become less frequent because the capacity of the new transformers which would match with the load requirements of a specific consumer.

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

SSC-CPA Implementer(s):
Punjab State Power Corporation Limited is the SSC-CPA implementer (also the managing entity)

Coordinating Manager - CPA
Chief Engineer, RE/APDRP, PSPCL, *(Latest address as available)*, is the designated SSC-CPA coordinating manager.

[5] http://www.financialexpress.com/news/power-scenario-in-states/164568/

Coordinating Manager - PoA

Chief Engineer, RE/APDRP, PSPCL, 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:

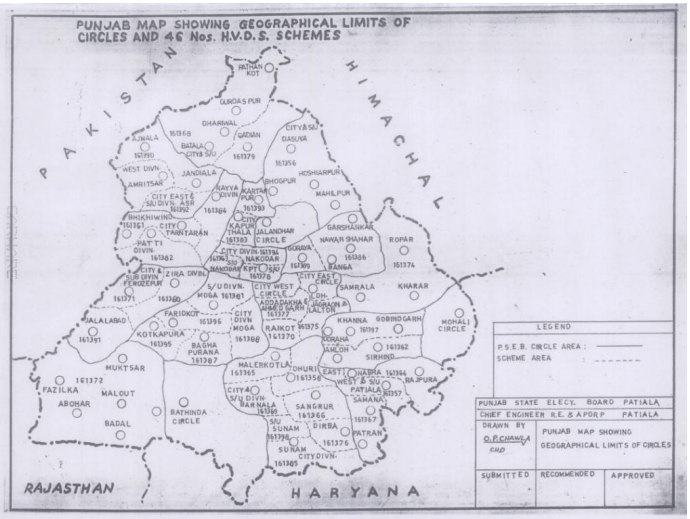
A.4.1.1. Host Party:

Government of India

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. Below is the geographical representation of the SSC-CPA.

Location of state of Punjab in India



Location of the Sangrur Circle in the state of Punjab

SN	Division Name	Circle Name	Geographical Location
1	XXX	XXX	**Lat: Lon:**

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

Name
Designation
PSPCL
Mob: XXX
Phone: XXX
Email: XXX
Address: XXX

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)

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

28 years 00 months

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

Fixed Crediting period

A.4.3.1. Starting date of the crediting period:

dd/mm/yyyy (Expected date of inclusion of the SSC-CPA or the actual date of inclusion, whichever is later)

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

10 years 00 months 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
1	(e.g XXXX)
2	
3	
4	
5	
6	
7	
8	
9	
10	
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 SSC-CPA.

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)[6] 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[7], 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.

PSPCL 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 PSPCL 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 Punjab State Power Corporation Limited, 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 the XXX division(s) which constitutes proposed SSC-CPA is neither registered as an individual CDM project activity nor as part of another registered PoA. This CPA is the part of the PoA under consideration by PSPCL, which is the sole body responsible for distribution of power in the state of Punjab.

[6] 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

[7] 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

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 the Punjab.

Proposed SSC-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 SSC-CPA meets the eligibility criteria for a SSC-CPA to be included in a PoA.

In the below table it is demonstrated how divisions meet the requirement of PoA:

SN	Eligibility Criteria	Justification for meeting the eligibility criteria
1	*The SSC-CPA shall comprise of a single division or a group of divisions located in the State of Punjab, India*	
2	*The SSC-CPA shall be located in an area not covered by any other SSC-CPA enrolled in this PoA,*	
3	*The SSC-CPA shall be located in an area not covered by any other PoA targeting LVDS to HVDS*	
4	*The SSC-CPA shall involve conversion of LVDS to HVDS by upgrading the supply voltage to 11kV till the dedicated step down transformer at the agricultural consumer end.*	
5	*The starting date of the SSC-CPA should be after 22nd June 2007 (to be checked through documentary evidence like i.e. Work Order issue date)*	

6	*SSC-CPA includes loss reductions measures allowed in the methodology AMS II.A, Version 10*	
7	*The SSC-CPA shall prove that PSPCL gets compensated financially by the Government if power is supplied to the agricultural consumers for free.*	
8	*The SSC-CPA shall prove the applicability of the financing barrier by evidencing at least one of the following conditions – (i) PSPCL continues to incur financial losses or (ii) financial analysis of the SSC-CPA proves the average DSCR of the SSC-CPA to be less than 1.3*	
9	*Each SSC-CPA must be approved by the coordinating entity prior to its incorporation into the PoA*	
10	*The SSC-CPA shall include electricity distribution feeders meant for the agricultural consumers*	
11	*The SSC-CPA shall reduce technical energy losses in the distribution feeders in amount not more than 60 GWh of electricity saving in a year*	
12	*The SSC-CPA activity is not a debundled component of a large scale activity. The SSC-CPA shall prove that the schemes/feeders included in the CPA have not been part of any other registered projects/PoAs.*	
13	*The C/ME shall provide documentation to prove that the SSC-CPA is not funded by any Annex 1 party. In case the SSC-CPA is funded by an Annex 1 party, the C/ME shall produce a declaration from the Annex 1 party that funding of the SSC-CPA does not result in a diversion of official development assistance*	

Hence, the SSC-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 SSC-CPA shall prove the applicability of the prevailing practice barrier by proving that PSPCL gets compensated financially by the Government if power is supplied to the	The tariff order referred in the additionality calculation shows that the rate of power purchase and the rate of compensation to the electricity board, demonstrating that the power is supplied for free to the

agricultural consumers for free.	consumers and the compensation is received from the government.
The SSC-CPA shall prove the applicability of the financing barrier by evidencing at least one of the following two criteria – (i) PSPCL continues to incur financial losses or (ii) financial analysis of the SSC-CPA proves the average DSCR of the SSC-CPA to be less than 1.3	For the SSC-CPA, DSCR is XXX, which is below the benchmark value of 1.3.

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*	Initial estimate of the project cost (conservative as the actual sanctioned cost is higher)
Revised cost		INR lacs	*(Document to be mentioned)*
Loan amount		INR lacs	Revised cost; however, for the purpose of DSCR calculation, initial estimate (project cost) has been considered.
Moratorium period		years	As per the loan document
Loan period		years	As per REC loan document
Equated quarterly installment		INR lacs	As per REC loan document
Power savings#		MWh/ annum	Estimated savings for XXX Division
Interest Rate	9.75%	%	As per the loan policy circular available at the time of decision making http://recindia.nic.in/download/Loan_Policy_Circular_14_06_06.pdf

*1 Lac = 0.1 Million

to be on a conservative side for the demonstration of additionality, technical as well as commercial savings has been considered. However, only technical savings have been considered for the calculation of emission reduction

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

To check the robustness of the DSCR value arrived, a sensitivity analysis has also been performed with respect to critical parameters i.e. Annual savings achieved, Power rate, Project cost, and the Lending rate

Results	Change over base value	Average DSCR
Savings achieved in a year	10%	
	-10%	
Unit rate of savings	10%	
	-10%	
Project cost	10%	
	-10%	
Lending Rate	10%	
	-10%	

It can be seen that even with the sensitivity variations in the parameters, the DSCR remains under the benchmark, making the project additional.

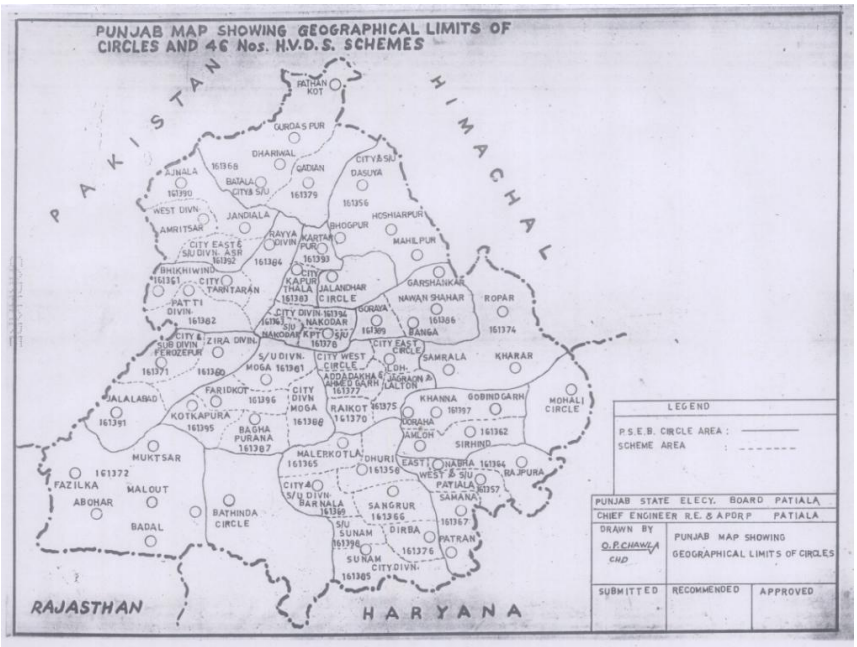
B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

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-	CO_2	Yes	**Main Emission Source**
		CH_4	No	Minor Emission Source

	CPA) in fossil fuel fired power plants of the grid	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 SSC-CPA is also located in the same state. Hence it can be concluded that SSC-CPA falls in the geographical boundary of the PoA. Location of SSC-CPA is also depicted in the maps below –



Location of the SSC-CPA

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
(Document to be mentioned)	It shows names of all the schemes/divisions under implementation, XXX division(s) (also the scheme) being one of them under Scheme- XXXX

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:	XXX
Justification of the choice of data or description of measurement methods and procedures actually applied :	Each SSC-CPA is also identified by the names of the Division(s) it comprises of subdivision(s), feeder(s). To also helps in avoiding double accounting.
Any comment:	

Data / Parameter:	**Name-feeder$_{j,i}$**
Data unit:	Text
Description:	Name of Feeder j of Division i (in this case only one division, XXX)
Source of data used:	Detailed Project Report
Value applied:	The list of feeders in XXX division is provided in the Appendix 1
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:	XXX
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 to calculate the emission factor for an electricity system (Version 2.2.0). http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Any comment:	The latest values available during validation/inclusion of a CPA shall be used. The value shall be fixed for the entire crediting period.

Data / Parameter:	NL_i
Data unit:	Watts
Description:	No load losses of transformer of category i
Source of data used:	Specifications from the manufacturers.
Value applied:	6.3 kVA: 35 W 10 kVA: 45 W 16 kVA:60 W 25 kVA: 85 W 50/63 kVA: 155W 100 kVA:220 W 200 kVA: 400 W
Justification of the choice of data or description of measurement methods and procedures actually applied :	The transformer losses are used in the calculation of both project and baseline emissions. Data on no load losses is available from the specifications of the transformers used in the distribution system. The same is therefore used.
Any comment:	This is ex-ante fixed for the entire crediting period.

Data / Parameter:	FL_i
Data unit:	-
Description:	Load losses of transformer of category i
Source of data used:	Specifications from the manufacturers.
Value applied:	6.3 kVA: 210 W 10 kVA: 270 W 16 kVA:360 W 25 kVA: 685 W 50/63 kVA: 1235 W 100 kVA:1760 W 200 kVA: 3135 W
Justification of the choice of data or description of measurement methods and procedures actually applied :	The transformer losses are used in the calculation of both project emissions and baseline emissions. Data on load losses is available from the specifications of the transformers used in PSPCL's distribution system and hence the same is used.
Any comment:	This is ex-ante fixed for the entire crediting period.

Data / Parameter:	$\%E_{loss,PE}$
Data unit:	%
Description:	% technical loss in the case of the SSC-CPA out of total energy sent-out

Source of data used:	Calculation done for the sample feeders (in the above sections of the PoA DD)
Value applied:	0.005%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value shall be used for the estimation/calculation of project emissions for any particular SSC-CPA.
Any comment:	The value has been identified ex-ante and shall remain fixed for the entire period of the PoA.

Data / Parameter:	**$\%E_{loss,BL}$**
Data unit:	%
Description:	% technical loss in the case of the baseline for the SSC-CPA out of total energy sent out.
Source of data used:	Calculation done for the sample feeders (in the above sections of the PoA DD)
Value applied:	3.605%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value shall be used for the estimation/calculation of baseline emissions for any particular SSC-CPA.
Any comment:	The value has been identified ex-ante and shall remain fixed for the entire period of the PoA.

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

The SSC-CPA 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.

As per approved small scale methodology AMS II A version 10, the technical energy loss determined based on monitored parameters shall be cross checked with the calculation based on estimation approach and more conservative of the two values shall be considered for estimating emission reductions. These two approaches of determining the loss in the baseline are further described below.

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).

As per the emission reduction calculation procedure outlined in the section E.6.2 of the PoA DD, calculation has been performed for the current SSC-CPA as below:

Baseline emissions:

(A) Determining Losses and corresponding emissions in the baseline based on the monitored parameters, :

The absolute technical loss (KWh) for each feeder in the baseline scenario has two components – line loss and transformer loss.

$$BE_{y,monitored} = (E_{loss,monitored,BL,y} + TR_{BL,y}) \times (EF_{grid,CM} / 1000)$$

Where

$BE_{y,monitored}$	Baseline emissions in the SSC-CPA in year y, tCO_2
$E_{loss,\ monitored,BL,y}$	Baseline technical line loss in SSC-CPA in year y, kWh
$TR_{BL,y}$	Baseline transformer loss in year y, kWh
$EF_{grid,CM}$	Combined margin grid emission factor, tCO_2/MWh

The line loss depends upon the energy sent out from the feeder and the technical line loss percentage. As described in the section E.6.1 of the POA-DD, the technical line loss percentage has been fixed ex-ante based on analysis of a sample group of feeders. The only parameter that needs to be monitored and used in determination of line loss in the baseline is thus the energy sent out from the feeders. The energy sent out data will be monitored using energy meters.

a) Baseline technical line loss calculation based on monitored energy sent out from feeders

$$E_{loss,monitored,BL,y} = EG_{monitored,y} \ \ x \ \ \%E_{loss,BL}$$

Where

$E_{loss,monitored,BL,y}$	Baseline technical line loss based on monitored energy sent out data, kWh

$EG_{monitored,y}$	Monitored energy sent out from all feeders in the CPA in year y, kWh
$\%E_{loss,BL}$	Baseline technical line loss percentage , fixed.%

$\%E_{loss,BL}$ = 3.605%

$$EG_{monitored,y} = \sum_i EG_{Feeder(i),y}$$

$EG_{feeder(i),y}$	Monitored energy sent out from feeder i in year y, kWh

b) Baseline transformer loss calculation

$$TR_{BL,y} = \sum_i N_{TF,BL,i} \ x \ (NL_i + FL_i) \ x \ h$$

$TR_{BL,y}$	Baseline transformer losses in year y, kWh
$N_{TF,BL,i}$	Number of baseline transformers category i
NL_i	No load loss of transformer category i, kW
FL_i	Load loss of transformer category i, kW

(B) Determining Losses and corresponding emissions in the baseline based on the estimation approach[8]:

$$BE_{y,estimated} = (E_{loss,estimated,BL,y} + TR_{BL,y}) \times (EF_{grid,CM} / 1000)$$

[8] The approach (B) has been used for the purpose of ex-ante estimation of emission reductions in the CPA-DD. In the monitoring phase, both approaches (A) and (B) will be used and the one that leads to conservative emission reductions will be used.

Where

$BE_{y,estimated}$	Baseline emissions in the SSC-CPA in year y, tCO_2
$E_{loss,\ estimated,BL,y}$	Baseline technical line loss in SSC-CPA in year y, kWh
$TR_{BL,y}$	Baseline transformer loss in year y, kWh
$EF_{grid,CM}$	Combined margin grid emission factor, tCO_2/MWh

The approach for line loss and transformer loss calculations remains same as approach (A) above. Under this approach, the energy sent out from feeders is estimated based on the connected loads and operating hours.

a) Baseline technical line loss calculation based on estimated energy sent out from feeders

$$E_{loss,estimated,BL,y} = EG_{estimated,y}\ x\ \%E_{loss,BL}$$

Where

$E_{loss,estimated,BL,y}$	Baseline technical line loss based on estimated energy sent out data, kWh
$EG_{estimated,,y}$	Estimated energy sent out from all feeders in the CPA in year y, kWh

Energy sent out is estimated based on connected loads and an average operating hours.

Thus,

$$EG_{estimated,y} = (TL_{CPA,y})_{kw}\ x\ h$$

$$h = avg(h_{Feeder(i)})$$

$(TL_{CPA,y})_{kw}$	Total connected load in feeders in CPA in year y, kW
h	Average operating hours of feeders per annum, hours
$h_{feeder(i)}$	Operating hours of feeder i per annum, hours

b) Baseline transformer loss calculation

The baseline transformer loss calculation remains the same as described under approach (A), i.e.

$$TR_{BL,y} = \sum_i N_{TF,BL,i} \ x \ (NL_i + FL_i) \ x \ h$$

Results of Baseline Emissions using CPA specific inputs

Procedures described in approach (B) above have been adopted for the ex-ante calculation of baseline emissions. The following input values specific to this CPA, are used in the calculations.

Transformer category (i)	$N_{TF,BL,i}$	**NL_i**	**FL_i**	$(TL_{CPA,y})_{kw}$	**H**	$\%E_{loss,BL}$	$EF_{grid,CM}$
25 kVA					hrs	3.605%	XXX tCO2/MWh
63 kVA							
100 kVA							

Following results are obtained using the above values. Refer to the ER Calculation Excel Sheet for details.

Parameters	**Variables**	**Units**	**Values**
Baseline transformer losses in year y	$TR_{BL,y}$	kWh	
Baseline technical line loss based on estimated energy sent out data	$E_{loss,estimated,BL}$	kWh	
Baseline emissions based on estimated energy sent out from feeders	$BE_{y,estimated}$	tCO2	

Project emissions:

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

The technical energy loss is calculated using two approaches same as described under baseline emissions as follows.

(A) Determining Losses and corresponding emissions in the project based on the monitored parameters

$$PE_{y,monitored} = (E_{loss,monitored,PE,y} + TR_{PE,y}) \times (EF_{grid,CM} / 1000)$$

Where

$PE_{y,monitored}$	Project emissions in the SSC-CPA in year y, tCO_2
$E_{loss,\ monitored,PE,y}$	Technical line loss in SSC-CPA in year y, kWh
$TR_{PE,y}$	Project transformer loss in year y, kWh
$EF_{grid,CM}$	Combined margin grid emission factor, tCO_2/MWh

a) Project technical line loss calculation based on monitored energy sent out from feeders

$$E_{loss,monitored,PE,y} = EG_{monitored,y} \ \ x \ \ \%E_{loss,PE}$$

Where

$E_{loss,monitored,PE,y}$	Project technical line loss based on monitored energy sent out data, kWh
$EG_{monitored,y}$	Monitored energy sent out from all feeders in the CPA in year y, kWh
$\%E_{loss,PE}$	Project technical line loss percentage , fixed *ex-ante*,%

$$EG_{monitored,y} = \sum_i EG_{Feeder(i),y}$$

$EG_{feeder(i),y}$	Monitored energy sent out from feeder i in year y, kWh

b) Project transformer loss calculation

$$TR_{PE,y} = \sum_i N_{TF,PE,i} \ x \ (NL_i + FL_i) \ x \ h$$

$TR_{PE,y}$	Total project transformer losses in year y, kWh
$N_{TF,PE,i}$	Number of project transformers category i
NL_i	No load loss of transformer category i, kW
FL_i	Load loss of transformer category i, kW

(B) Determining Losses and corresponding emissions in the project based on the estimation approach[9]:

$$PE_{y,estimated} = (E_{loss,estimated,PE,y} + TR_{PE,y}) \times (EF_{grid,CM} / 1000)$$

Where

$PE_{y,estimated}$	Project emissions in the SSC-CPA in year y, tCO_2
$E_{loss, estimated,PE,y}$	Technical line loss in SSC-CPA in year y, kWh
$TR_{PE,y}$	Project transformer loss in year y, kWh
$EF_{grid,CM}$	Combined margin grid emission factor, tCO_2/MWh

[9] The approach (B) has been used for the purpose of ex-ante estimation of emission reductions in the CPA-DD. In the monitoring phase, both approaches (A) and (B) will be used and the one that leads to conservative emission reductions will be used.

a) Project technical line loss calculation based on estimated energy sent out from feeders

$$E_{loss,estimated,PE,y} = EG_{estimated,y} \ x \ \%E_{loss,PE}$$

Where

$E_{loss,\ estimated,PE,y}$	Project technical line loss based on estimated energy sent out data, kWh
$EG_{estimated,y}$	Estimated energy sent out from all feeders in the CPA in year y, kWh
$\%E_{loss,PE}$	Project technical line loss percentage , fixed.%

$\%E_{loss,PE}$ = 0.005%

Energy sent out is estimated based on connected loads and an average operating hours.

Thus,

$$EG_{estimated,y} = (TL_{CPA,y})_{kw} \ x \ h$$

$$h = avg(h_{Feeder(i)})$$

$(TL_{CPA,y})_{kw}$	Total connected load in feeders in CPA in year y, kW
h	Average operating hours of feeders per annum, hours
$h_{feeder(i)}$	Operating hours of feeder i per annum, hours

b) Project Transformer Loss Calculation

The project transformer loss calculation remains the same as described under approach (A), above, i.e.

$$TR_{PE,y} = \sum_i N_{TF,PE,i} \ x \ (NL_i + FL_i) \ x \ h$$

Results of Project Emissions using CPA specific inputs

Procedures described under approach (B) above have been adopted for ex-ante estimation of project emissions. The following input values specific to this CPA, are used in the calculations.

Transformer category (i)	$N_{TF,PE,i}$	**NL_i**	**FL_i**	$(TL_{CPA,y})_{kw}$	**h**	$\%E_{loss,BL}$	$EF_{grid,CM}$
6.3 kVA					hrs	0.005%	XXX tCO2/MWh
10 kVA							
16 kVA							
25 kVA							

Following results are obtained using the above values. Refer to the ER Calculation Excel Sheet for details.

Parameters	**Variables**	**Units**	**Values**
Project transformer losses in year y	$TR_{PE,y}$	kWh	
Project technical line loss based on estimated energy sent out data	$E_{loss,estimated,PE}$	kWh	
Project emissions based on estimated energy sent out from feeders	$PE_{y,estimated}$	tCO2	

Leakage

An explanation regarding the leakage with respect to all the projects in the proposed PoA has been provided in the section E.6.2 of the PoA DD. Based on the same, there is no possible leakage for the considered SSC-CPA.

LE_y = 0

Emission Reductions

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

$$ER_y = BE_y - PE_y - LE_y$$

$$ER_y = \min(BE_{y,monitored} - PE_{y,monitored}, BE_{y,estimated} - PE_{y,estimated}) - LE_y$$

$$BE_{y,monitored/estimated} = BE_{Energy,monitored/estimated} + BE_{TR,monitored/estimated}$$

$$PE_{y,monitored/estimated} = PE_{Energy,monitored/estimated} + PE_{TR,monitored/estimated}$$

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".

However, for the emission reduction estimation in the SSC-CPA DD, only estimation approach is to be used for the purpose of calculation i.e. the monitored and the estimated approach shall provide the same values for the estimation purpose.

To be conservative, while calculating BE_y and PE_y, the emissions due to transformer losses shall be included in the scope of emission reductions with the following considerations

$$BE_{TR} - PE_{TR} = BE_{TR} - PE_{TR} \; when \; BE_{TR} - PE_{TR} < 0$$

&

$$BE_{TR} - PE_{TR} = 0 \; when \; BE_{TR} - PE_{TR} > 0$$

In the case of the SSC-CPA,

$BE_{TR} - PE_{TR}$ = <value>

Therefore,

ER_y = <value>

Emission reduction spreadsheet being provided to the DOE.

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

As the project emissions due to transformer replacement have been **ignored** above.

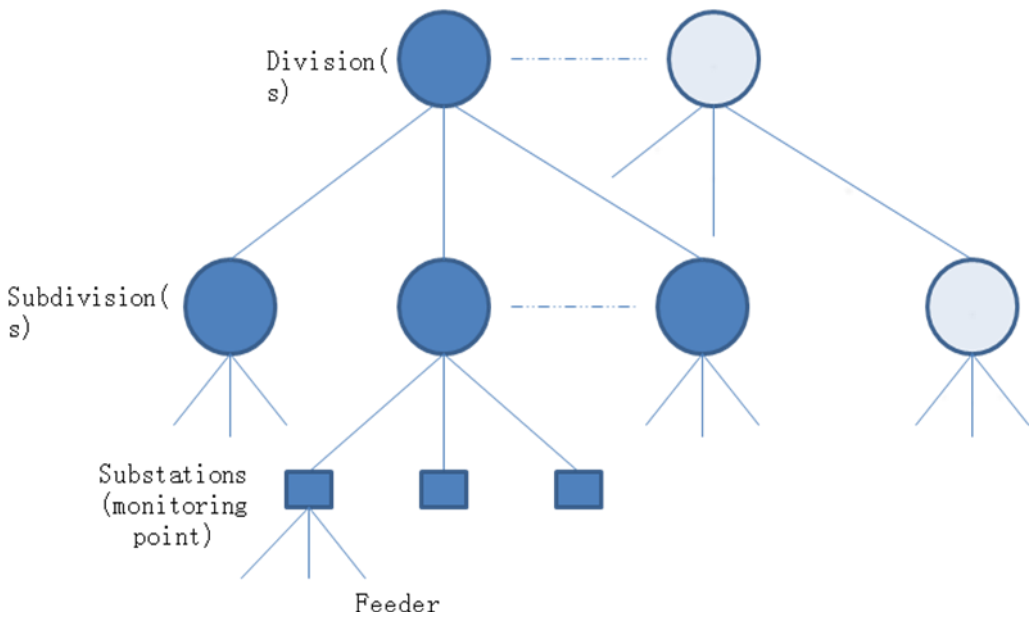
Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
1			0	
2			0	
3			0	
4			0	
5			0	
6			0	
7			0	
8			0	
9			0	
10			0	

It should be noted that the actual emission reductions will depend on the demand in any particular year. As the demand for power usually grows over time, the annual emissions reductions shall grow accordingly.

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

B.6.1. Description of the monitoring plan:

The block diagram below shows the structure of a typical SSC-CPA:



One SSC-CPA comprises of one or more divisions which are further divided into subdivisions. For the purpose of the data monitoring of the PoA, AMR (Automated Meter Reading) based Central Energy Accounting and Audit System will be used. Based on the system, energy sent reports will be generated and compiled.

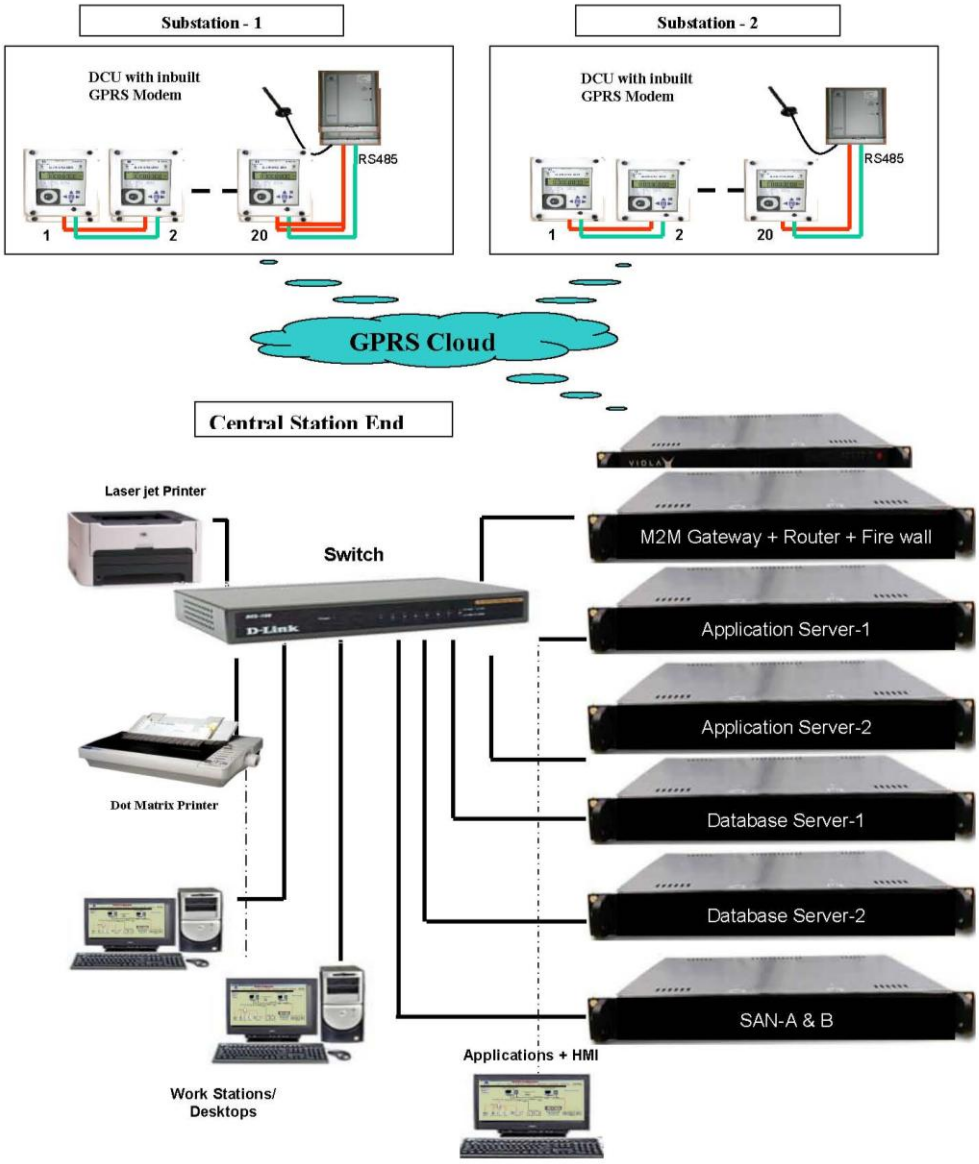
The relevant reports (for the required data parameters) shall be compiled SSC-CPA wise and will be maintained as separate files. The SSC-CPA file will include the details of data collected as described below. All the SSC-CPA files will be compiled and stored at the Chief Engineer's (RE/APDRP) office for

the PoA level monitoring. For each SSC-CPA, all the data mentioned above will be kept in electronic versions and/ or hard copies.

Metering System

PSPCL is responsible for the implementation of the Monitoring Procedure for all the SSC-CPAs. PSPCL has electronic energy meters installed for all 11 kV feeders (for agricultural consumers) at its various substations. For the data monitoring for the SSC-CPA, an based AMR (Automatic Meter Reading) system would be used to acquire the meter data through Automate Meter Reading (AMR). The AMR system generates web-enabled Management Information System (MIS) reports at Base Computer Station at the EAA (Energy Audit and Accounting Centre), located at Head Office, PSPCL, Patiala.

This AMR System is based on GPRS over GSM technology. Its functionality includes data acquisition & data management like reporting and data archiving. The base central station (BCS) comprises servers, workstations along with software and intelligent industrial grade router. The router at BCS has the capacity for collecting data from thousands of meters through Data Concentrator Units (DCUs). This router connects to the meters end through GPRS network and provide secured and data encrypted connection to the remote meters. The flow chart provided below draws a pictorial representation of the AMR system:



Monitoring Parameters

The monitoring plan, established by the implementing entity, includes the following parameters to be monitored, in line with the SSC-PoA-DD. The following parameters shall be used (given or monitored) feeder-wise for the purpose of emission reduction calculations for any SSC-CPA:

- Energy sent out in SSC-CPA(EG)
- No. of operating hours (h)
- Connected Load (TL)
- No. of transformers (N_{TF})

The AMR system operates to receive data on GPRS and creates a common database with data for each Feeder Meter (represented by a particular feeder code). Among the several parameters monitored by the system, the following two parameters relevant to the PoA shall be covered in the monitoring:

- Number of operating hours for feeder
- Energy sent out in the feeder

The remaining two parameters shall be monitored manually by PSPCL. Energy data from these meters will also be recorded manually and used for preparing monthly energy audit & account statements. The system will monitor the parameters per feeder basis and thus avoiding the need of apportionment of data. Further details about the manual monitoring have been provided below.

The details of monitoring data & parameters of each SSC-CPA are as follows:

Data / Parameter:	$\mathbf{EG_{Feeder(i)y}}$
Data unit:	kWh
Description:	Energy sent in feeder(i) of the SSC-CPA for the year y
Source of data to be used:	The energy reports generated by the AMR system.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Value varies for each feeder in the SSC-CPA.
Description of measurement methods and procedures to be applied:	The reading is to be recorded by the AMR system on a per minute basis, which is connected to the Energy meters (of accuracy class 0.2S) at the substations via GPRS. As per the methodology, the required monitoring frequency is hourly. Thus, per minute monitoring in the monitoring plan is more conservative than what is required by the methodology.
QA/QC procedures to be applied:	The energy meters shall be tested/ calibrated every 3 years. Readings can be cross checked with the manual records compiled by the Sub Station officer as described in the QA/QC in section B.6.1 of the SSC-CPA.
Any comment:	-

Data / Parameter:	$h_{Feeder(i),y}$
Data unit:	hours
Description:	Average number of hours of power supply for feeder(i) for the SSC-CPA
Source of data to be used:	The energy reports generated by the AMR system.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XXXX *(The value available (previous year) at the time of SSC-CPA inclusion shall be used for the purpose of ER estimation in the SSC-CPA DD)*
Description of measurement methods and procedures to be applied:	The reading is to be recorded by the AMR system, which will record the duration of power supply as well as the time of power supply. (daily basis)
QA/QC procedures to be applied:	The energy meters shall be tested/ calibrated every 3 years. Readings can be cross checked with the manual records compiled by the Sub Station officer as described in section A.4.4.1 of the PoA DD.
Any comment:	-

Data / Parameter:	$TL_{CPA,y}$
Data unit:	kW
Description:	Total connected load for all the feeders of the SSC-CPA for the year y
Source of data to be used:	The records prepared by PSPCL will be used for the consideration of total connected load to all the feeders of a particular SSC-CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	XXXX Varies for each feeder and will be provided for each SSC-CPA. Value available at the beginning of any particular monitoring period shall be used for the purpose of emission reduction calculation for the particular monitoring period.
Description of measurement methods and procedures to be applied:	The connected load to any particular feeder shall be monitored on a regular basis. Any new load is incorporated in the distribution system by properly recording the same as a new connection. These records are updated on a regular basis.
QA/QC procedures to be applied:	-
Any comment:	-

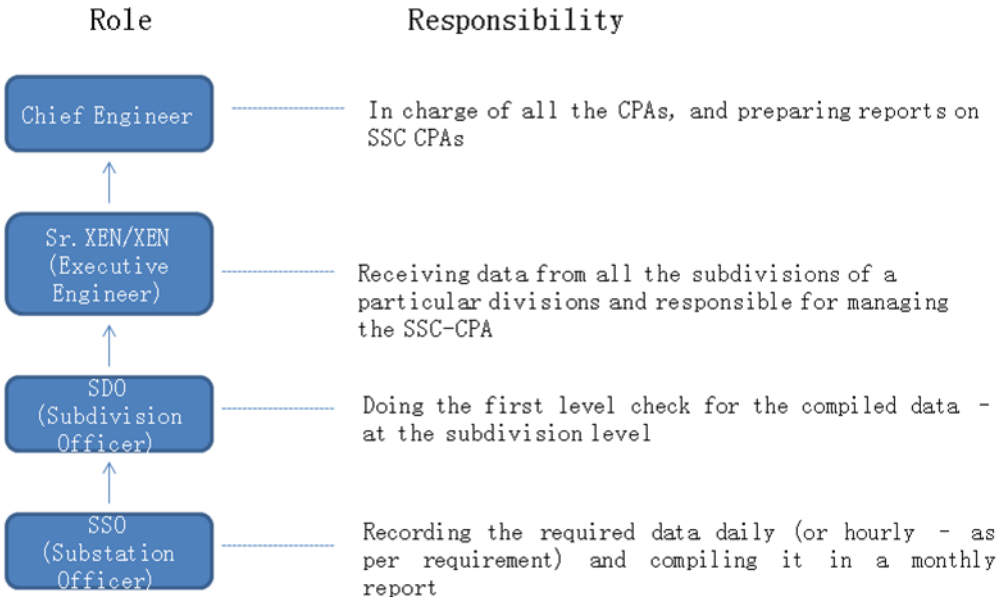
Data / Parameter:	$N_{TF, BL, i}$
Data unit:	kVA
Description:	Number of baseline transformers of category i (i:.25/63/100/200)
Source of data used:	PSPCL internal implementation records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	25 kVA=<value> 63 kVA= <value> 100 kVA= <value> 200 kVA= <value> (Data available in the DPR is used for ex-ante calculations)
Description of measurement methods and procedures to be applied:	PSPCL has an internal system to account dismantling of any old transformers in the network. This accounting will be done till the implementation of the particular SSC-CPA, when the dismantlement of the old transformers will be over. The number of transformers dismantled till the complete implementation will be used for all the subsequent verifications after subjecting to a growth rate corresponding to the increase in number of the project transformers from the last verification. This increase shall be applied because even in the baseline case, the number of installed transformers would have increased as per the growth in demand.
QA/QC procedures to be applied:	This can be cross checked with the information in the work order to the contractors.
Any comment:	Transformers are of varying kVA capacities.

Data / Parameter:	$N_{TF,PE,y,i}$
Data unit:	-
Description:	Number of transformers in all the feeders of a particular SSC-CPA of category i *(i:6.3,10, 16, 25 kVA)*
Source of data to be used:	PSPCL has an internal system to account installation of any new transformer in the SSC- CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	6.3 kVA= <value> 10 kVA= <value> 16 kVA= <value> 25 kVA = <value> (work order values have been used) Values available at the beginning of the monitoring period shall be used for the purpose of emission reduction calculation for the particular monitoring period. However, the value at the time of SSC-CPA inclusion shall be used for the

	purpose of ER estimation in the SSC-CPA DD. For estimating the emission reductions in the SSC-CPA DD, the work order (latest) figures at the time of SSC-CPA inclusion shall be used.
Description of measurement methods and procedures to be applied:	PSPCL has an internal system to account installation of any new transformer whether it is for replacing old transformer with new or for catering to any new demand. The list of no. of transformers with capacities shall be available at the time of verification. The records shall be updated on a regular basis, and the values available at the beginning of the year shall be used for a particular monitoring period. The latest values available at the time of SSC-CPA inclusion shall be used for the purpose of estimation.
QA/QC procedures to be applied:	This can be cross checked with the information in the work order, though over the time, the actual number of transformers in the SSC-CPA will keep increasing due to increasing demand. Thus cross checking may be done with any new work order released for the same.
Any comment:	-

Monitoring Responsibility

The substation officer will be responsible for proper record keeping of the feeders data connected to the particular substation. Log sheets shall be maintained in which all the required data shall be recorded manually. The following data flow diagram shows the direction of information flow and the roles and responsibilities for the manual data recording system:



QA/QC:

The calibration of energy accounting & audit meters is the responsibility of the PSPCL using internal procedures according to the CEA regulations. Calibration and testing of all the meters installed at the sub-stations will be carried out once in three years or immediately after any major fault – whichever is earlier by the PSPCL metering Laboratories accredited from NABL (National Accreditation Board for Testing and Calibration laboratories). The results of the calibration will be included in the SSC-CPA reports. For cross checking of the data provided by the AMR system, records of the manual monitoring system shall be referred , which will be maintained at the substation level. The same shall also be used in case of absence of data from the AMR system.

The transformer data will be cross checked by PSPCL personnel against the installation records submitted by the implementing team/contractors. The transformer data can also be cross checked with the information available in the work orders. Any discrepancy in the data will be rectified and records will be updated appropriately.

Data Management:

The manual as well as AMR based record keeping system has been detailed out in the section A.4.4 above. Any load newly connected to the system is also systematically recorded by the PSPCL and for any particular monitoring period, latest available records would be used for the purpose of emission reduction calculation. Similarly, the number of transformers connected shall be monitored on an annual basis. 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 Chief Engineer's (RE/APDRP) office. 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 AMR equipment is damaged/non-functional and no reliable readings can be recorded using the same, manual recording system shall be relied upon for arriving at the emission reductions. In case of the complete failure or non-function of the metering equipments, no emission reductions shall be claimed for the specific period.

Emergencies:

In the case of emergencies (data is lost/not retrieved through any mode of monitoring), emission reductions will not be claimed for that specific duration. Emergencies cases also 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.

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

The environmental analysis has been conducted at the PoA level.

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.

The stakeholder comments were invited at a PoA level. Since the SSC-CPAs are considered to be identical in the PoA; and since Punjab State Power Corporation Limited is the sole co-ordinating entity, there is no need to have the stakeholders' consultation at the SSC-CPA level.

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:	Punjab State Power Corporation Limited
Street/P.O.Box:	
Building:	-
City:	Patiala
State/Region:	Punjab
Postfix/ZIP:	147001
Country:	India
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	Chief Engineer, PSPCL
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	RE/APDRP
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public funding available to the SSC-CPA.

Annex 3

BASELINE INFORMATION

The emissions baseline is the energy baseline multiplied by an emission factor. If the energy saved by the project is electricity, the factor (in kg CO_2-e/kWh) shall be calculated as per the procedures described in AMS-I.D.

Grid emission factor:

The emission factor, which is multiplied by the baseline kWh to obtain the baseline emissions, is 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 2.2.0 Annex 12 EB 61.
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 SSC-CPA 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 2.2.0 Annex 12 EB 61 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 electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin emission (BM) factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

STEP 1. Identify the relevant electricity systems.

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[10], 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
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. Choose whether to include off-grid power plants in the project electricity system (optional):

For calculating the grid emission factor for the SSC-CPA, PP has chosen not to include off-grid power plants in the project electricity system.

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

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

[10] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf

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.

STEP 4. 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 validation/CPA inclusion shall be considered. The data is published annually by the CEA.

The ex-ante vintage shall be considered in the project activity and cannot be changed during the crediting period.

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

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 latest year has been calculated to be $EF_{grid,BM,y}$ = XXX tCO_2e/MWh

STEP 6. Calculate the combined margin (CM) emissions factor.
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[11].

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

Thus, the CM emissions factor ($EF_{grid,CM,y}$) for the project has been calculated to be $EF_{grid,CM,y}$ = XXX 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.

All the above values shall be taken from the CEA's latest published data

[11] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.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(s) Name	Circle Name	Identification code (REC Scheme code)
1			

Details of Feeders in Division - XXX

SN	Sub-Division	Name of Feeder
1		
2		
<Insert rows as necessary>		