

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT

Version 01 25/12/2011

SGCC In-advance Distribution Transformer Replacement CDM Programme SGCC In-advance Distribution Transformer Replacement CDM Programme CPA-001 CPA 2896-0001

The first monitoring period: 01/01/2011 - 30/11/2011

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

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SGCC In-advance Distribution Transformer Replacement CDM Programme CPA-001 (hereinafter referred to as CPA-001) was the first CDM programme activity (CPA) of SGCC In-advance Distribution Transformer Replacement CDM Programme (hereinafter referred to as SGCC DT PoA) which was implemented by State Grid Corporation of China (hereinafter referred to as SGCC) in the electricity transmission and distribution systems in Liaoning Province, China (hereinafter referred to as the grids) controlled by SGCC. The goal of SGCC DT PoA is to replace low efficiency in-service transformers (hereinafter referred to as baseline transformers) which are Type 7 or Type 8 transformers with high efficiency newly purchased transformers (hereinafter referred to as project transformers) whose no-load losses are compliant with or lower than the same rated capacity Type 11 transformers to reduce the electricity losses caused by no-load losses of transformers during power supply by the grids, in order to reduce CO₂ emissions.

SGCC was responsible for planning, financing arrangement and the detailed implementation of CPA-001. An *in-advance replacement* refers to replacement of a baseline transformer before reaching the end of its lifetime with a project transformer. CPA-001 comprised in-advance replacement of 1,100 baseline transformers. During the implementation of CPA-001, 894 out of the 1,100 baseline transformers completed the replacement. CPA-001 was commissioned on 07/03/2010 considering the first *in-advance replacement* in CPA-001 was completed on 06/03/2010. The starting date of operation of each project transformer has been listed in the emission reduction calculation spreadsheet.

Total emission reductions achieved in this monitoring period are 1,075 tCO₂e.

A.2. Project Participants

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SGCC is the investor and the coordinating entity of SGCC DT PoA. Project participants of SGCC DT PoA are listed in Table 1.

Table 1. Project participants

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
China (host)	State Grid Corporation of China	No
Spain	International Bank for Reconstruction and Development ("IBRD") acting as trustee of the Spanish Carbon Fund (SCF)	Yes

A.3. Location of the project activity:

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The physical boundary of CPA-001 is the grids that are controlled by SGCC in Liaoning Province, China. The geographical boundary of CPA-001 is that of Liaoning Province. The red region in Figure 1 is the geographical boundary of SGCC DT PoA, and the red region with horizontal stripes is the geographical boundary of CPA-001.



GS (2008) 1416 号

Jun. 2008 Produced by State Bureau of Surveying and Mapping

Figure 1. Geographical boundary of CPA-001 within SGCC DT PoA

A.4. Technical description of the project

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Transformers are the equipments that can change the alternating voltage under the theory of electromagnetic induction.

Transformer losses consist of no-load losses and load losses. No-load losses result from the periodical variation of the magnetic flux caused by the field current in the cores of transformers under rated voltage. No-load losses are related to the features, the thickness and the lamination method of core materials and the manufacturing technique and are not related to the load. Load losses are caused in the windings when rated currents flow through the primary and secondary windings under rated load operation. Load losses not only relate to the features of transformers, but also increase as the load rises. No-load losses or core losses are losses due to transformer core magnetizing or energizing. These losses occur whenever a transformer is energized and remain constant regardless of the amount of electricity flowing through it. With the improvement of the manufacturing techniques and materials for transformers, both the no-load losses and load losses of transformers are decreased along with the later manufacture year and the higher performance level.

According to the performance level of transformers, they can be divided into different types as Type 7 transformers, Type 8 transformers, Type 9 transformers ... Type 16 transformers etc. Here, the Arabic numbers are the performance level symbols of transformers. As defined in Table A1 of Annex A of *P.R.China Machine Industry Standard - Naming Rules of Transformer Models* (Document No. JB/T 3837-1996), the greater the numbers of the performance level symbols of transformers with the same capacity are, the more efficient the transformers will be (i.e. the lower the losses will be).

Distribution transformers can be used in the terminals of electric systems. They are the transformers that can transform the high voltages in electric systems into the voltages that are suitable for electrical

equipments. All the relevant transformers in CPAs of SGCC DT PoA are distribution transformers, whose installation position is shown in Figure 2.

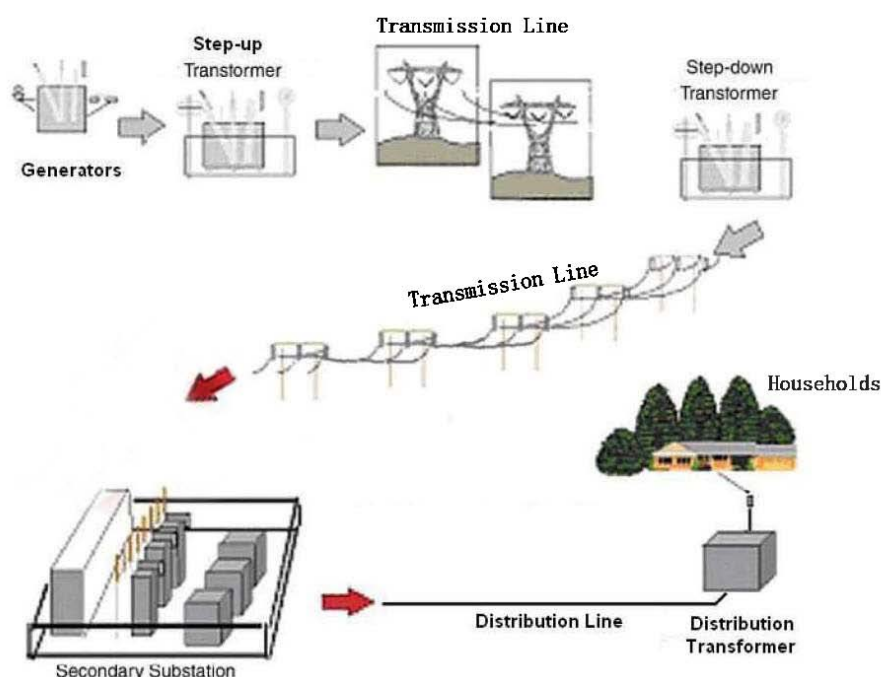


Figure 2. Installation position of distribution transformers

CPA-001 is one of the CPAs of SGCC DT PoA which is implemented by SGCC in the grids controlled by SGCC. The goal of SGCC DT PoA is to replace low efficiency in-service transformers which are Type 7 or Type 8 transformers with high efficiency newly purchased transformers whose no-load losses are compliant with or lower than the same rated capacity Type 11 transformers to reduce the electricity losses caused by no-load losses of transformers during power supply by the grids, in order to reduce CO₂ emissions.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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Approved methodology for small-scale CDM project AMS.II.A.: *Supply Side Energy Efficiency Improvements - Transmission and Distribution* is applied in CPA-001 of SGCC DT PoA. EB has already approved to apply the methodology AMS.II.A. (version 10) to PCDM projects.

As per the methodology AMS.II.A (version 10), CPA-001 also applies the approved methodology for small-scale CDM project AMS.I.D.: *Grid Connected Renewable Electricity Generation* (version 16), *Tool to Determine the Remaining Lifetime of Equipment* (version 01) and *Tool to Calculate the Emission Factor for an Electricity System* (version 02).

For more information regarding the methodology please refer to <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>, and <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>.

A.6. Registration date of the project activity:

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The registration date of SGCC DT PoA is 12/02/2011

The inclusion date of CPA-001 is 12/02/2011.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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01/01/2011 ~ 31/12/2020 (Fixed)

A.8. Name of responsible person(s)/entity(ies):

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Entity	Project participant (Yes/No)
JIANG Shan, PAN Tao Additional Consulting and Engineering Tel: +86-13911049424 Email: James@Additional.cn	No
Carbon Finance Unit The World Bank1818 H. Street, NW Washington, DC 20433 USA Email: IBRD-carbonfinance@worldbank.org	Yes
Liu Guang Power Exchange Center State Grid Corporation of China Tel: +86-10-66597065 Email: zengbin-li@sgcc.com.cn	Yes



SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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SGCC was responsible for planning, financing arrangement and the detailed implementation of CPA-001. CPA-001 comprised in-advance replacement of 1,100 baseline transformers whose capacity is shown in the following table.

Capacity (kVA)	Number of baseline transformers
30	3
50	19
80	2
100	97
160	31
200	152
250	56
315	463
400	56
500	41
630	179
800	1
Total	1,100

During the implementation of CPA-001, 894 out of the 1,100 baseline transformers completed the replacement. CPA-001 was commissioned on 07/03/2010 considering the first *in-advance replacement* in CPA-001 was completed on 06/03/2010. The starting date of operation of each project transformer has been listed in the emission reduction calculation spreadsheet.

During the first monitoring period, all installed project transformers have been operating in line with the requirements defined in the registered PoA (version 05) and included CPA-001 (version 04) approved by CDM EB. In the same period of time, no overhaul was undertaken and there was no downtime or exchange of equipments.

No special event or situation, which may impact the applicability of the methodology, occurred in this monitoring period.

B.2. Revision of the monitoring plan

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There has been no revision of the monitoring plan.

B.3. Request for deviation applied to this monitoring period

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There has been no request for deviation applied to this monitoring period.

B.4. Notification or request of approval of changes

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There has been no notification or request of approval of changes.

SECTION C. Description of the monitoring system

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1. Monitoring points

It can be summarized as two main monitoring points in the CPAs of SGCC DT PoA. One point is SGCC's headquarters which is located in Beijing and the other point is located at SGCC's subsidiaries across SGCC controlled provinces.

SGCC's headquarters:

For $PSL_{z,y}$, the power supply reliability rate of the provincial grid that covers the project transformers, SGCC's headquarters is responsible for collecting relevant information issued by Electric Power Reliability Management Center of State Electricity Regulatory Commission to update it into the MIS System annually.

For n_{new} and n_{old} , the total number of *in-advance replacements* that were actually implemented and the total number of the scrapped transformers in *in-advance replacements* that were actually implemented, SGCC's headquarters monitors them respectively through the MIS System and the scrapping agreements.

SGCC's subsidiaries:

For $NLL_{PJ,z,y}$, $LL_{PJ,z,y}$ and $D_{new,z}$, no-load loss value and the load loss value of project transformers and the date when replacement happens, SGCC's subsidiaries will collect their information when they replace transformers.

2. Data management procedures

SGCC Grid CDM Distribution Transformer Programme Management Information System (hereinafter referred to as the MIS System) is specially designed, developed and managed for SGCC DT PoA by SGCC. One of the key functions of the MIS System is to keep track of detailed information on each *in-advance replacement* in CPA-001, through integrating the whole monitoring process from data generation, aggregation, recording, to calculation and reporting into one system.

Before replacement took place, information of baseline transformers had been submitted into the MIS System, which is ex-ante fixed and will not change throughout the crediting period of CPA-001. After the replacement activities were completed, SGCC's subsidiary as the CPA implementor was responsible to complete and submit the detailed information on each *in-advance replacement*, including the Serial Number of the project transformer, the Operation Number corresponding to the Operation Number of the baseline transformer in the plan, the date of replacement, and the measured values of no-load losses and load losses on the manufacturer test report of the project transformer. Meanwhile, power supply reliability rates were updated in the MIS System as per the most recent publicly available figure sourced from Electric Power Reliability Management Center of State Electricity Regulatory Commission as of the date. If scrapping agreements were signed for baseline transformers, relevant information would be input into the MIS System.

Based on the above data input into the MIS System before and after replacement, the result of emission reductions can be calculated out and reported in the MIS System.

3. Organizational structure and roles and responsibilities

As indicated in Figure 3, SGCC's headquarters is mainly responsible for organizing the implementation of CPAs and SGCC's subsidiaries are the main implementors of the replacement and monitoring activities.

Additionally, SGCC's headquarters is responsible for CDM relevant communication.

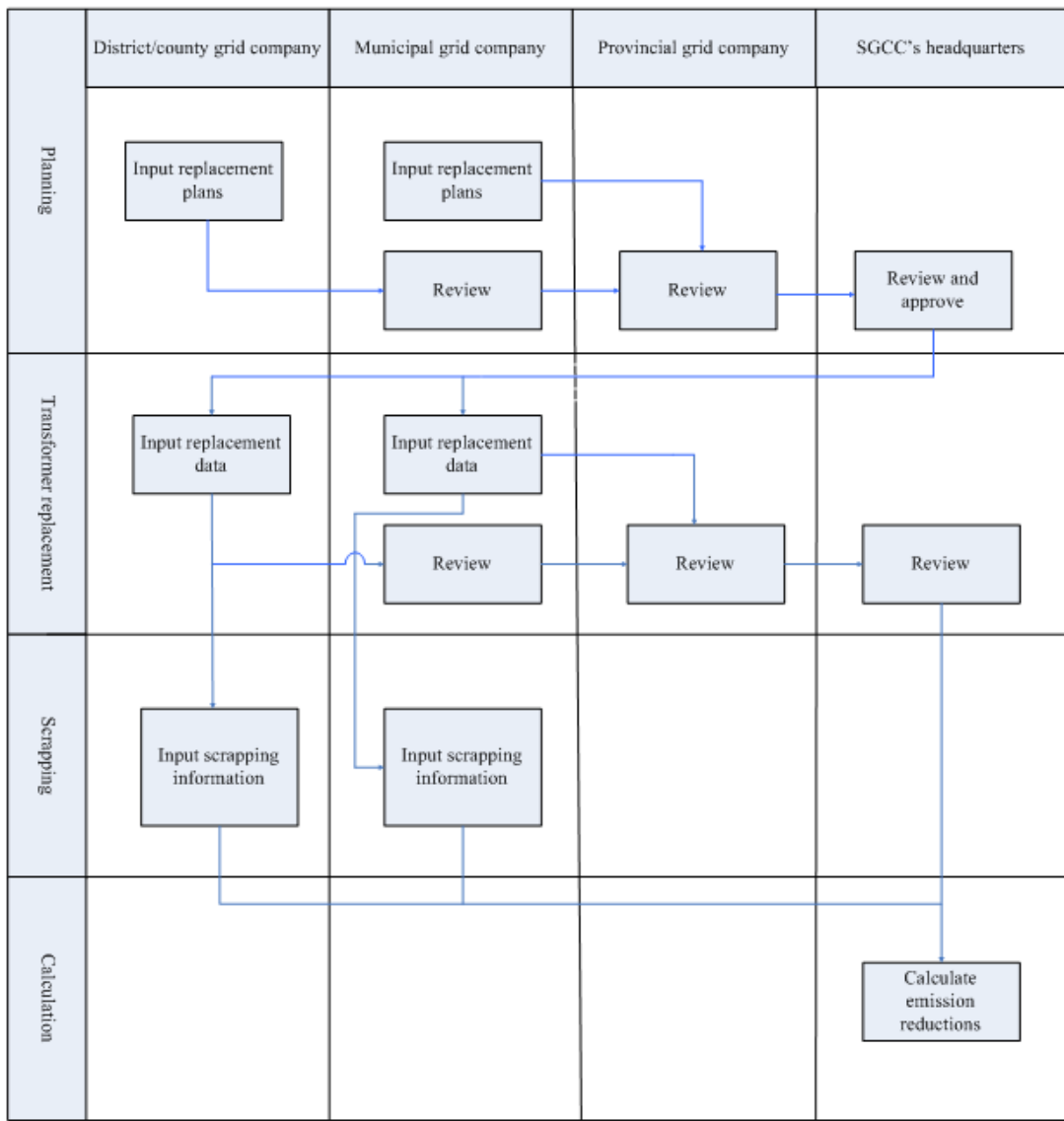


Figure 3. Organizational structure

3. QA/QC procedures

Quality assurance/quality control procedures have been established by SGCC and are enforced along with the implementation of the CPAs involved in SGCC DT PoA.

All transformers to be procured should comply with national/local standards and be provided along with manufacturer test reports. The transformer manufacturers are responsible to provide transformers and the manufacturer test report corresponding to each transformer. The nameplate of each transformer must clearly indicate the information of the type, the Serial Number, the manufacturing time and the capacity. The measured values of no-load losses and load losses should be clearly listed in the manufacturer test report of each transformer.

Implementation of monitoring activities is guaranteed by *SGCC DT PoA Management Measures* and *Operation Manual for Management Information System* issued by SGCC. Detailed QA/QC procedures are established in these documents including: (a) the senior staff in the operation team are responsible for data cross-check in the MIS System regarding parameters $D_{new,z}$ and $PSL_{z,y}$; (b) photographs of nameplates and the key information on manufacturer test reports of transformers are stored in the MIS System for the purpose of cross checking $NLL_{PJ,z,y}$ and $LL_{PJ,z,y}$. Moreover, an independent check on

the correspondence of number of baseline transformers to be scrapped (n_{old}) and the number of project transformers (n_{new}) is conducted before scrapping and independent entities are introduced to monitor the scrapping of the replaced transformers. The scrapping dates of the replaced transformers are documented and independently verified.

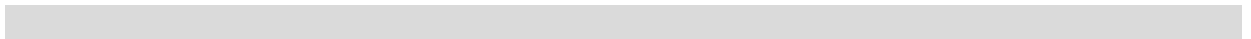
Multiple rounds of training have been organized by SGCC to ensure CPA implementation. The training was conducted at different levels, including introduction of the program mandate and implementation procedure to management teams in subsidiary provincial companies, and instruction of detailed implementation requirements and monitoring steps for operational staff working on the ground, such as submission of replacement plan, storing scrapping records of baseline transformers, and operating of MIS system, etc.

MIS System functions as a record keeping system. Relevant electronic data are kept in the MIS System and regularly backed up. Other documents such as manufacturer test reports of transformers and scrapping agreements are kept by SGCC's subsidiaries. All monitoring data and documents will be kept at least for two years after the end of the last crediting period or two years after the last issuance of CERs, whichever occurs later.

4. Emergency procedures

MIS System is the core of the monitoring activities. Data in the MIS System are periodically backed up in the form of excel sheets for the purpose of operational emergency, such as server breakdown or power outage. Necessary corrective actions and appropriate steps will be taken immediately if problems are found so that the MIS System can be resumed as soon as possible. The whole process from the emergency to the treatment will be recorded in the internal management forms including the time of emergency, the nature of emergency and corrective actions taken.

Moreover, if the emergency is caused by the maintenance team of the MIS System, training courses shall be re-arranged for relevant persons to prevent future mistakes error in the above mentioned procedures. If emergency is caused by hardware failure, a thorough check on relevant hardware will be arranged to prevent potential hardware failure.



SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

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Data/Parameter:	n
Data unit:	-
Description:	The total number of <i>in-advance replacements</i> included in CPA-001
Source of data used:	The MIS System of SGCC DT PoA
Value (s):	1,100
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data/Parameter:	$DATE_{BL,z,produce}$
Data unit:	-
Description:	The manufacturing time (the year; and if more detailed information is available, the month or the date) of the baseline transformer in No. z ^[1] <i>in-advance replacement</i> .
Source of data used:	Information on the nameplate of the baseline transformer
Value (s):	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data/Parameter:	$NLL_{BL,z,reg,y}$
Data unit:	W
Description:	The no-load loss value, which is sourced from standards, of the baseline transformer in No. z <i>in-advance replacement</i> in year y
Source of data used:	The allowable no-load loss value of the same type of transformers defined in transformer standards whose effective date is earlier and most close to the manufacturing date of the baseline transformer is adopted.
Value (s):	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	<p>If the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> is available, then</p> $NLL_{BL,z,y} = \min\{NLL_{BL,z,reg,y}, NLL_{BL,z,act,y}\}$ <p>Where:</p> <p>$NLL_{BL,z,y}$ is the baseline no-load loss value in No. z <i>in-advance replacement</i> in year y (W);</p> <p>$NLL_{BL,z,reg,y}$ is the no-load loss value, which is sourced from standards, of the baseline transformer in No. z <i>in-advance replacement</i> in year y (W);</p>

[1] “z” is the sequential number of an *in-advance replacement* in a CPA.

	<p>$NLL_{BL,z,act,y}$ is the measured no-load loss value on the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> in year y (W).</p> <p>If the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> is not available, then</p> $NLL_{BL,z,y} = NLL_{BL,z,reg,y} \times 95\%$ <p>Where, 95% is a conservative coefficient.</p>
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Data/Parameter:	$NLL_{BL,z,act,y}$
Data unit:	W
Description:	The measured no-load loss value in the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> in year y.
Source of data used:	The measured no-load loss value in the manufacturer test report of the baseline transformer.
Value (s):	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	<p>If the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> is available, then</p> $NLL_{BL,z,y} = \min\{NLL_{BL,z,reg,y}, NLL_{BL,z,act,y}\}$ <p>Where:</p> <p>$NLL_{BL,z,y}$ is the baseline no-load loss value in No. z <i>in-advance replacement</i> in year y (W);</p> <p>$NLL_{BL,z,reg,y}$ is the no-load loss value, which is sourced from standards, of the baseline transformer in No. z <i>in-advance replacement</i> in year y (W);</p> <p>$NLL_{BL,z,act,y}$ is the measured no-load loss value on the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> in year y (W).</p> <p>If the manufacturer test report of the baseline transformer in No. z <i>in-advance replacement</i> is not available, then</p> $NLL_{BL,z,y} = NLL_{BL,z,reg,y} \times 95\%$ <p>Where, 95% is a conservative coefficient.</p>

Data/Parameter:	$LL_{BL,z,y}$
Data unit:	W
Description:	The baseline load loss value of No. z <i>in-advance replacement</i> in year y.
Source of data used:	The allowable load loss value of the same type of transformers defined in transformer standards whose effective date is earlier and most close to the manufacturing date of the baseline transformer is adopted.
Value (s):	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Additional comment:	-

Data/Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO ₂ e/MWh
Description:	The combined margin CO ₂ emission factor for the project electricity system in year y
Source of data used:	<i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i>
Value (s):	0.92675
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and Project emission calculations
Additional comment:	-

Data/Parameter:	$EF_{grid,z,y}$
Data unit:	tCO ₂ e/MWh
Description:	The grid emission factor corresponding to No. z <i>in-advance replacement</i> (tCO ₂ e/MWh), which is equal to the $EF_{grid,CM,y}$ of the regional power grid where the No. z <i>in-advance replacement</i> takes place
Source of data used:	<i>Announcement to Publish 2009 Baseline Emission Factors for Regional Power Grids in China</i>
Value (s):	0.92675
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and Project emission calculations
Additional comment:	-

Data/Parameter:	ARR
Data unit:	%
Description:	The average average replacing rate during 2006~2009 of the provinces covered by CPA-001
Source of data used:	The data are determined based on the survey carried out by SGCC following <i>Proposed Survey Method for Historical Replacing Rate</i> .
Value (s):	0.3
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

D.2. Data and parameters monitored

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Data / Parameter:	$NLL_{PJ,z,y}$
Data unit:	W
Description:	The no-load loss value of the project transformer in No. z <i>in-advance replacement</i> in year y
Measured /Calculated /Default:	Measured by the manufacturers of transformers
Source of data:	The manufacturer test report of the project transformer
Value(s) of monitored parameter:	See the emission reduction calculation spreadsheet for details.
Indicate what the data are	Project emission calculations

used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	The data obtained from manufacturer test reports of transformers are reliable. Relevant documents have been archived for verification.

Data / Parameter:	$LL_{PJ,z,y}$
Data unit:	W
Description:	The load loss value of the project transformer in No. <i>z in-advance replacement</i> in year <i>y</i>
Measured /Calculated /Default:	Measured by the manufacturers of transformers
Source of data:	The manufacturer test report of the project transformer
Value(s) of monitored parameter:	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The parameter is only used for the eligibility criteria analysis.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	The data obtained from manufacturer test reports of transformers are reliable. Relevant documents have been archived for verification.

Data / Parameter:	$D_{new,z}$
Data unit:	-
Description:	The date when No. <i>z in-advance replacement</i> happens
Measured /Calculated /Default:	Measured
Source of data:	Operation Forms
Value(s) of monitored parameter:	See the emission reduction calculation spreadsheet for details.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and Project emission calculations
Monitoring equipment (type, accuracy class, serial	-

number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	Operation Forms have been archived for verification.

Data / Parameter:	$PSL_{z,y}$
Data unit:	-
Description:	The power supply reliability rate of the provincial grid that covers the project transformer in No. z <i>in-advance replacement</i> in year y.
Measured /Calculated /Default:	Default
Source of data:	The 2010 data of the grids in Liaoning Province publicly issued by Electric Power Reliability Management Center of State Electricity Regulatory Commission, which is the latest version.
Value(s) of monitored parameter:	99.932%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	Relevant documents have been archived in the MIS System in electronic format for verification.

Data / Parameter:	n_{new}
Data unit:	-
Description:	The total number of <i>in-advance replacements</i> that are actually implemented in CPA-001
Measured /Calculated /Default:	Calculated
Source of data:	The MIS System
Value(s) of monitored parameter:	894
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-

Measuring/ Reading/ Recording frequency:	Once, at the ending date of the first monitoring period
Calculation method (if applicable):	Count according to data in the MIS System.
QA/QC procedures applied:	Data is crosschecked by two staff in the monitoring team.

Data / Parameter:	n_{old}
Data unit:	-
Description:	The total number of the scrapped transformers in <i>in-advance replacements</i> that are actually implemented in CPA-001
Measured /Calculated /Default:	Calculated
Source of data:	The scrapping agreement
Value(s) of monitored parameter:	894
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Once, at the ending date of the first monitoring period
Calculation method (if applicable):	Count according to data in the scrapping agreement.
QA/QC procedures applied:	The scrapping agreements have been archived for verification. Meanwhile, the number of the project transformers and the number of the baseline transformers that are in advance replaced in CPA-001 have been checked before scrapping to ensure that they correspond with each other.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

>>

As per the methodology AMS.II.A. (version 10), the emissions baseline of each *in-advance replacement* is the baseline energy loss multiplied by an emission factor. Therefore, formulae for the calculation of baseline emissions of CPA-001 are as follows:

$$BE_y = \sum_{z=1}^n BE_{z,y} \quad (1)$$

$$BE_{z,y} = EL_{BL,z,y} \times EF_{grid,z,y} \times (1 - ARR) \quad (2)$$

$$EL_{BL,z,y} = NLL_{BL,z,y} \times H_{z,y} / 10^6 \quad (3)$$

$$H_{z,y} = 8760 \times PSL_{z,y} \quad (3-a)$$

Where:

Parameter	Explanation	Unit
BE_y	The baseline emissions in year y	tCO ₂ e
$BE_{z,y}$	The baseline emissions in No. z <i>in-advance replacement</i> in year y	tCO ₂ e
n	The total number of <i>in-advance replacements</i> included in CPA-001	-
$EL_{BL,z,y}$	The baseline energy loss in No. z <i>in-advance replacement</i>	MWh
ARR	The average replacing rate during 2006~2009 of the provinces covered by CPA-001	%
$EF_{grid,z,y}$	The grid emission factor corresponding to No. z <i>in-advance replacement</i>	tCO ₂ e/MWh
$NLL_{BL,z,y}$	The baseline no-load loss value in No. z <i>in-advance replacement</i> in year y	W
$H_{z,y}$	the operating hours of the project transformer in No. z <i>in-advance replacement</i> in year y	h
10^6	The conversion coefficient from MW to W	W/MW
$PSL_{z,y}$	The power supply reliability rate of the provincial grid that covers the project transformer in No. z <i>in-advance replacement</i> in year y	-

The total baseline emissions in this monitoring period are calculated as $BE_y = 1,401$ tCO₂e. Refer to the emission reduction calculation spreadsheet for actual values and detailed calculation.

E.2. Project emissions calculation

>>

As per the methodology AMS.II.A. (version 10), project emissions of each *in-advance replacement* are no-load losses of the project transformer multiplied by an emission factor. Therefore, the formulae to calculate emissions caused by no-load losses of project transformers in CPA-001 are as follows:

$$PE_y = \sum_{z=1}^n PE_{z,y} \quad (4)$$

$$PE_{z,y} = NLL_{PJ,z,y} \times H_{z,y} \times EF_{grid,z,y} / 10^6 \quad (5)$$

$$H_{z,y} = 8760 \times PSL_{z,y} \quad (5-a)$$

Where:

Parameter	Explanation	Unit
PE_y	The project emissions in year y	tCO ₂ e
$PE_{z,y}$	The emissions caused by no-load losses of the project transformer in No. z <i>in-advance replacement</i> in year y	tCO ₂ e
n	The total number of <i>in-advance replacements</i> included in CPA-001	-
$NLL_{PJ,z,y}$	The no-load loss value of the project transformer in No. z <i>in-advance replacement</i> in year y.	W
$H_{z,y}$	the operating hours of the project transformer in No. z <i>in-advance replacement</i> in year y	h
$EF_{grid,z,y}$	The grid emission factor corresponding to No. z <i>in-advance replacement</i>	tCO ₂ e/MWh
10^6	The conversion coefficient from MW to W	W/MW
$PSL_{z,y}$	The power supply reliability rate of the provincial grid that covers the project transformer in No. z <i>in-advance replacement</i> in year y	-

The total project emissions in this monitoring period are calculated as $PE_y = 326$ tCO₂e. Refer to the emission reduction calculation spreadsheet for actual values and detailed calculation.

E.3. Leakage calculation

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According to the registered PoA-DD, leakage in CPA-001 is not considered, that is, $L_y = 0$ tCO₂e.

E.4. Emission reductions calculation / table

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The formula to calculate emission reductions of CPA-001 is as follows:

$$ER_y = BE_y - PE_y - L_y \quad (6)$$

For the baseline transformer of No. z *in-advance replacement*, the remaining lifetime for emission reduction calculation is calculated as the time difference between the date when No. z *in-advance replacement* happens ($D_{new,z}$) and the date when the baseline transformer in No. z *in-advance replacement* is replaced in the absence of CPA-001 ($DATE_{BL,z,Retrofit}$). Here

$$DATE_{BL,z,Retrofit} = DATE_{BL,z,produce} + 30y \quad (7)$$

Where:

$DATE_{BL,z,Retrofit}$ is the date when the baseline transformer in No. z *in-advance replacement* is replaced in the absence of CPA-001;

$DATE_{BL,z,produce}$ is the manufacturing date of the baseline transformer in No. z *in-advance replacement*.

Calculation of the total emission reductions in this monitoring period is summarized in Table 2.

Table 2. Total emission reductions

	Value	Unit
Total baseline emissions	1,401	tCO ₂ e
Total project emissions	326	tCO ₂ e

Total leakage	0	tCO ₂ e
Total emission reductions	1,075	tCO ₂ e

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Item	Values applied in ex-ante calculation of the registered CPA-DD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	3,263	1,075

The annual average emission reductions estimated in the registered CPA-DD is 4,079 tCO₂e, so the estimated amount of emission reductions for the corresponding 292 days (the duration of the first monitoring period of CPA-001) are $292/365 \times 4,079 = 3,263$ tCO₂e, which is higher than the actual value of 1,075 tCO₂e.

E.6. Remarks on difference from estimated value in the PDD

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The amount of emission reductions achieved in this monitoring period is lower than the estimated value in the registered CPA-DD, so no further remarks are provided here.

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance		