PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD) Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Title: Small-scale Hydropower Programme of Activities in Guizhou Province

Version: 04

Date: 23/04/2013

A.2. Purpose and general description of the PoA

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Policy/measure or stated goal that the PoA seeks to promote

Small-scale Hydropower Programme of Activities in Guizhou Province (hereinafter referred to as the PoA) is a programme of activities that develop the small scale hydropower projects in Guizhou Province and supply electricity to the South China Power Grid (SCPG). The purpose of the PoA is to develop a platform for a series of small scale hydropower plants in Guizhou Province to overcome financial hurdles. It not only helps to solve the electricity shortage problem in these areas, strengthen the rural infrastructure construction, but also promotes the development of renewable energy and facilitates the abatement of greenhouse gas emission through the replacement of fossil fuel-fired power generation in the SCPG as well. There are three possible types of component project activities (CPAs) under the PoA as follows:

Project type	Description of project scenario
Scenario 1	Green-field hydropower project
Scenario 2	Capacity addition of an existing hydropower project
Scenario 3	Retrofit of an existing hydropower project

The above-mentioned 3 scenarios are described by 3 separate generic CPAs in the section of Part II, Part III and Part IV respectively in the PoA-DD.

Each CPA under the PoA will comprise one or more such small hydropower activities which fall into the same scenario and have an installed capacity of no more than 15 MW, namely the threshold for small-scale CDM projects.

General operating and implementing framework of the PoA

Beijing YuanDa Carbon Assets Investment Management Co., Ltd. (hereinafter referred to as "YuanDa Carbon") as the coordinating/management entity (CME) is responsible for proposing and overseeing the PoA as this following:

- Attracting the potential small scale hydropower plants investors to invest this series small scale power plants;

- Communicating with Grid Company and promote the grid company to allow these small scale hydropower plants connect to the grid;
- Communicating with the local government to get some administrative support from the government;
- Communicating with the stakeholders and solve the compensation regard to the land acquisition, and other matters;
- Searching the buyers and DOEs, writing the PoA-DD and CPA-DD, responsible for the validation and verification of the PoA;
- Training the small scale hydropower plants investors to establish a management and monitoring system to ensure the hydropower plants operate safely and efficiently.

The CPA implementer(s) for the PoA is in charge of implementation, operation, management and ex-post monitoring of the corresponding CPA.

The CME will sign agreement with each CPA implementer. The contractual agreement will summarize roles and responsibilities regarding the implementation of the individual project activity as a CDM Programme Activity. The agreement will ensure that the CME will have control of all records and information related to the implementation of individual CPA and will be in a position to ensure that each CPA is being implemented according to the provisions as outlined in the PoA-DD. The agreement will also put in place measures, which avoid double counting of the CPA.

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

The PoA is a voluntary action coordinated and managed by YuanDa Carbon. There are no laws or regulations that require any managing entity to develop a PoA for relevant hydropower projects in China.

Contribution to sustainable development

The PoA will promote local sustainable development by making use of renewable hydropower. Major contributions of the PoA are as follows:

- The implementation of the PoA will alleviate the shortage of electricity supply in local, ensure the electricity use of town enterprises and improve the economical development as well as decrease poverty;
- It will consolidate the achievement of Converting Cropland to Forest, protect forests and improve the ecological environment;
- It will reduce the emissions of pollutants and greenhouse gases which might otherwise be caused by coal-fired generators so as to improve local environment;
- It will create new job opportunities for the local people during the construction phase, and long-term job opportunities will be provided in the operational period.

A.3. CMEs and participants of PoA

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The coordinating/managing entity (CME) of the PoA is Beijing YuanDa Carbon Assets Investment Management Co., Ltd., meanwhile as the project participant of the PoA at the time of validation.

A.4. Party(ies)

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Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Beijing YuanDa Carbon Assets Investment Management Co., Ltd.	Yes

A.5. Physical/ Geographical boundary of the PoA
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The boundary of the PoA in terms of a geographical area is defined as the political boundary of Guizhou Province. Each CPA included in the PoA will be implemented within the geographical boundary of the PoA (i.e.Guizhou Province).

Guizhou Province is located in the southwest of China, the capital is Guiyang. The geographic coordinates of this province is 103.6000°~109.5833° east longitude, and 24.6167°~29.2167° northern latitude. Figure A-1 shows the location of geographical boundary of the PoA.

Figure A-1: Geographical Boundary of the PoA

A.6. Technologies/measures
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A typical CPA under the PoA comprises one or multiple small hydropower plants which fall into the same scenario and have an installed capacity no more than 15MW. The hydropower plants are newly constructed, capacity addition, retrofit of an existing plant. All CPAs of the PoA utilize hydropower for electricity generation and supply the generated electricity to SCPG through Guizhou Power Grid.

Although detailed technical characteristics will differ, the technology adopted by the CPAs will be composed of water retaining structure, diversion tunnel system, powerhouse, substation, transmission line, etc. The water head is formed from the natural drop height between the dam and the power station, and the hydraulics pressure is increased through high pressure pipeline. Then the water flows into the power station and drives the hydro-generators to generate electricity.

All CPAs under the PoA will adopt domestic technology, not involved in international technology transfer.

A.7. Public funding of PoA

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There is no public funding from Annex I parties of the UNFCCC to implement the PoA. Moreover, CME has confirmed that there is indeed no public funding from Annex I parties through a declaration given by CPA implementer to CME.

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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According to the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", (version 02.1 paragraph 7), additionality shall be demonstrated by establishing that in the absence of CDM, none of the implemented CPAs would occur.

The additionality of the PoA is demonstrated following the guidelines of this standard by establishing that the programme is on one hand a voluntary coordinated action and on the other hand none of the implemented CPA would occur in the absence of the CDM.

(i) The PoA is a voluntary coordinated action

The PoA implemented by CME is a voluntary coordinated action, there are no mandatory laws or regulations in China stipulating to develop hydropower facilities; it would not be implemented in the absence of the PoA due to investment barriers, lack of infrastructure construction and so on.

(ii) In the absence of CDM, none of the implemented CPAs would occur

The PoA is developed in line with *Plan on New Rural Hydropower Electrification during China's 12th Five-year Plan Period* and *Plan of Engineering on Substituting Fuel with Small Hydropower Electricity during the Period from 2009 to 2015* issued by the Ministry of Water Resources. Most of hydropower resource in Guizhou is distributed in mountainous and poverty area[1], so the transportation is inconvenient and the infrastructure is poor, the costs for exploiting the water resources in these areas are higher than those in the other areas, what's more, small hydropower plants have to face these following difficulties:

(1) The hydropower generation efficiency is low owing to the water shortage and irregular precipitation[2];

(2) The grid price of small hydropower plant is low, meanwhile, the amount of electricity price increase is less than the rise of power station construction and operation cost[3];

(3) In addition, most of small hydropower living conditions and working conditions are poor; the ability to withstand natural disasters and operation management personnel quality is low[4].

These factors above mentioned will lead to more difficult to get loan from banks for the implementers of these small scale hydropower plants. So most of small scale hydropower plants located are hard to attract investors and not implemented as per the two plan of Ministry of Water Resource yet. Without the income from CERs, the project is not financially viable.

(iii) Demonstration of prior consideration of CDM

The start date of the PoA is 05/02/2013, which is the date of PoA-DD to be first published for global stakeholder consultation in UNFCC website. The start date of the CPA, i.e. the earliest

[1] http://www.gzgtzy.gov.cn/Html/2008/08/05/20080805_8419061_6761.html

[2] http://video.sina.com.cn/p/finance/20120717/215661803235.html

[3] http://news.xinhuanet.com/fortune/2012-08/13/c_123575671.htm
http://blog.sina.com.cn/s/blog_5d55fe3e0102el67.html

[4] http://news.xinhuanet.com/fortune/2012-06/18/c_123298497.htm

date at which either the implementation or construction or real action of a programme activity begins will be after the start date of the PoA. As per paragraph 29 of Clean development mechanism project standard (version 03.0), the prior consideration of CDM does not apply to the PoA, so the CPA is not required to inform the host Party's designated national authority (DNA) and the secretariat of their intention to seek CDM status in accordance with the project cycle procedure.

Nevertheless, the additionality will be demonstrated at the CPA level in details.

Assessment and demonstration of additionality for a typical SSC-CPA:

(i) For those CPAs that are ≤5MW and located in a special underdeveloped zone (SUZ)[5] of the host county, it is demonstrated to be additional as indicated by "*Guideline for Demonstrating Additionality of Micro scale Project Activities*" (EB68, Annex 26, version 04.0).

According to the Para 2 of the "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0": if the geographic location of the CPA with installed capacity below 5 MW satisfied the first condition regard to a special underdeveloped zone (SUZ) of the host country, i.e. the proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%, The CPA will be considered with additionality. And the eligibility will be proved in each CPA.

(ii) For other CPAs with capacity >5 MW and ≤ 15MW, or <5MW but not locate in underdeveloped zone identified by the host country, additionality demonstration is based on "*Guideline for Demonstrating Additionality of Small- scale Project Activities*" (EB68, Annex 27, version 09.0). Investment barrier analysis will be adopted to demonstrate the CPA's additionality.

Benchmark analysis is selected as the appropriate analysis method. as per "Tool for the demonstration and assessment of additionality" (version 07) and the financial indicator identified for a typical CPA is the project Internal Rate of Return (IRR) which is indicator commonly used to determine investment decisions. According to "Economic evaluation code for small hydropower projects" (SL16-20) issued by Ministry of Water Resources of China, the benchmark of this kind of small hydropower project IRR (after-tax) is 10%. The project is considered to be financially unfeasible when the project IRR (after-tax) is lower than the benchmark. Meanwhile, Sensitivity analysis will be demonstrated that the conclusion regarding the financial attractiveness is robust at least a range of +10% and－10% variations of the critical assumptions as per the guidelines on the assessment of investment analysis (version 05).

The CPA is additional if both of the conditions below are satisfied:

1. Without incentive of the CDM, the project IRR (after-tax) of the CPA is lower than the benchmark of 10% of the project IRR (after-tax);

2. A +/- 10% variation in any of the chosen parameters does not lead to the project IRR (after-tax) reaching the benchmark of 10% of the project IRR (after-tax).

B.2. Eligibility criteria for inclusion of a CPA in the PoA
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[5] The definition of a SUZ region in accordance with the Para 2(a) of the "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0" satisfying either of the following conditions: 1) the proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; 2) the GNI per capita in the country is less than USD 5000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures. And relevant evidence shall be provided as well.

The eligibility criteria for inclusion of a CPA are demonstrated in line with the Para 16 of "Demonstration of addtionality, development of eligibility criteria and applicable of multiple methodologies for programme of activities, Version 02.1" in the table below:

No.	Eligibility criteria for inclusion of a CPA in the PoA	Possible documentation to substantiate compliance
(a)	The CPA is located within the boundary of Guizhou Province.	– FSR and its approval, or PDR and its approval; – Evidence of geographical coordinates positioning.
(b)	The CPA has a unique geographic coordinates and it is neither a CPA of another PoA nor registered (incl. application for registration) as a CDM project activity.	– Check with the UNFCCC website CDM pipeline and PoA pipeline; – Declaration from the CPA implementer.
(c)	The CPA is either a green-field hydropower plant, or capacity addition or retrofit of an existing hydropower plant.	– FSR and its approval, or PDR and its approval; – If available, purchase contracts/orders of equipments or retrofit contract.
(d)	The start date of CPA is after 05/02/2013 (i.e. the date of publication of the PoA-DD for global stakeholder consultation and therefore identified as the start date of the PoA).	– Purchase contracts/orders of equipments; – Construction contract/Retrofit contract and other available contracts etc.
(e)	The CPA meets the applicable conditions of AMS-I.D Grid connected renewable electricity generation, Version 17.0	– FSR and its approval, or PDR and its approval; – If applicable, grid connection approval or PPA; – Other relevant available documentation.
(f)	The CPA is demonstrated additional either in line with "Guidelines on the demonstration of additionality of small-scale project activities, Version 09.0" or "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0"	– FSR and its approval, or PDR and its approval for the CPA's financial attractiveness; – If applicable, evidence for local income with proportion of population; – Other relevant available documentation.
(g)	Local stakeholder consultation and environmental impact assessment have been conducted, as a result, no one is	– Questionnaire or meeting records for the stakeholder's consultation;

	against the development of the CPA and the CPA is in line with the relevant environmental regulations.	– Environmental impact assessment (EIA) report and its approval; – Other relevant available documentation.
(h)	The CPA does not involve any public funding from Annex I countries	– Declaration from CPA's implementer; – Other relevant available documentation.
(i)	The CPA supplies electricity to a national or regional grid	– FSR and its approval, or PDR and its approval; – If applicable, grid connection approval or PPA; – Other relevant available documentation.
(j)	Sampling is not required for the CPA	Not applicable
(k)	The CPA (in aggregate if it comprises of independent sub units) meets the small-scale threshold of 15MW or micro-scale threshold of 5MW throughout the crediting period	– FSR and its approval, or PDR and its approval; – If applicable, purchase contract of main equipment; – Other relevant available documentation.
(l)	The CPA is not a de-bundled component of a large scale project activity	– Check with the UNFCCC website, CDM pipeline; – Declaration from the CPA implementer.
(m)	The implementation of the CPA is in line with relevant national and local regulations	– FSR and its approval, or PDR and its approval; – EIA approval; – Construction permission; – Grid connection approval and etc.
(n)	The CPA implementer agrees the inclusion of its CPA in the PoA and follows the monitoring requirements outlined in the PoA-DD	– Agreement between CPA implementer and CME
(o)	The energy generating equipment employed by the CPA is not transferred from/to another activity	– FSR and its approval, or PDR and its approval; – Purchase contract of main equipment; – Other relevant available documentation.

B.3. Application of methodologies

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The methodology applied to the PoA is the approved methodology for small-scale CDM project AMS-I.D: *Grid-connected Renewable Electricity Generation* (version 17). For more information regarding the methodology, please refer to the website:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

Furthermore, the latest approved version of the "*Tool to Calculate the Emission Factor for an Electricity System*" (version 03.0.0) is also adopted. For more information regarding the methodology and tools, please refer to the website:

http:// cdm.unfccc.int/methodologies/PAmethodologies/approved.html**.**

There are three types of component project activities under the PoA as follows: green-field hydropower project, capacity addition of an existing hydropower project, retrofit of an existing hydropower project.

Applicability criteria of Methodology AMS-I.D. (version 17)	**Applicable Analysis of the CPAs under this PoA**
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supply electricity to a national or a regional grid; or (b) Supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	All CPAs comprise renewable energy (hydropower) generation units which supply electricity to a regional grid.
Respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies	All CPAs supplies electricity to a regional grid.
This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of a (an) existing plant(s)	The hydropower project type of CPA under the PoA will belong to: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; or (c) Involve a retrofit of (an) existing plant(s).
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than $4W/m^2$; • The project activity results in new reservoirs	All CPAs comply to one of the following conditions: • The CPA is implemented in an existing reservoir with no change in the volume of reservoir; • The CPA is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than $4\ W/m^2$; • The CPA results in new reservoirs

and the power density of the power plant, as per definitions given in the project emission section, is greater than $4W/m^2$	and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.
If the new unit has both renewable and non-renewable components, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit con-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW	All CPAs will be exclusively hydropower plants without non-renewable components and the new installation capacity of the CPA is less than the eligibility limit of 15MW for a small-scale CDM project activity.
Combined heat and power (co-generation) systems are not eligible under this category	All CPAs will be not co-generation project under this PoA.
In the case of project activities that involve the addition of the renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units	The added capacity in the CPAs under this PoA is lower than 15MW and the added capacity of the CPA will be physically distinct from the existing units.
In case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15MW	The installed capacity of CPAs involving retrofit is lower than 15MW.

SECTION C. Management system

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The role of CME is to assess and review potential CPAs and perform eligibility assessment, complete the CPA-DD, and submit a CPA inclusion request to the DOE; The CME will also interact with the regulatory bodies (e.g. UNFCCC, DOEs and DNAs). The general operating and implementing framework of the PoA is shown in Figure C-1.

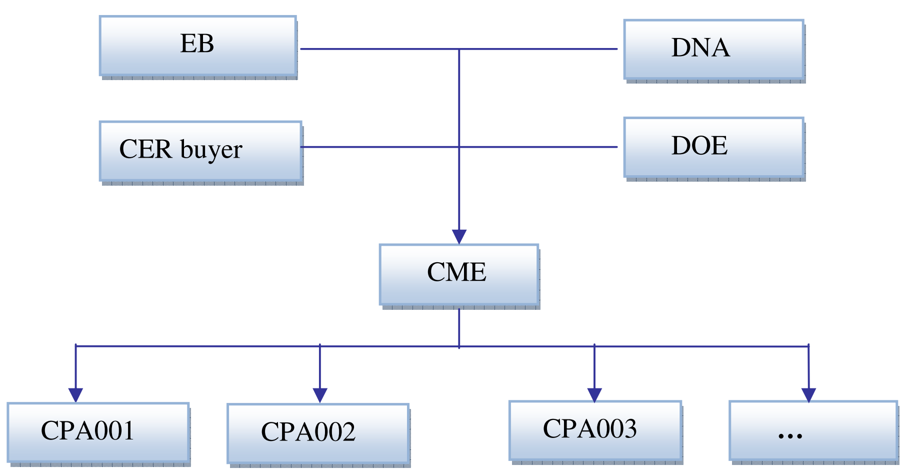

Figure C-1 General Operating and Implementing Framework of the PoA

(a) Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs

The CME should establish the organization system for the PoA management and review the competencies of the relevant personnel of each section on the basis of relevant CDM experience and qualification. The key roles and responsibilities of each section are shown in below Table C-1:

Table C-1 Key Roles and Responsibilities of each section

Section	Roles and Responsibilities
PoA manager	✓ Registration of PoA ✓ Issuance of CPAs in the PoA ✓ Overall management of the PoA
PoA and CPA development group	✓ Listing eligible CPAs ✓ Inclusion of eligible CPAs under the PoA ✓ Writing the PoA-DD and CPA-DD, Monitoring report preparation ✓ Supporting validation/ verification
CPA management group	✓ Collecting all relevant documents and information of CPAs, particularly related to eligibility criteria ✓ Ensuring CPA operation and management is conducted properly as per CDM guidelines. ✓ Guiding CPA site monitoring ✓ Collecting and archiving data records from each CPA ✓ Setting up database of monitoring parameters ✓ Ensuring emergency preplan for data
QA/QC group	✓ Checking documents and information as per eligibility criteria ✓ Checking monitoring data
Finance department	✓ Issuance of CERs and CERs revenue distribution

(b) Records of arrangements for training and capacity development for personnel

The PoA should be implemented by qualified professionals, thus the CME will train the relevant personnel. The training will make sure the relevant personnel to master the necessary knowledge of CDM, such as registration, validation, verification and issuance, expertly use the monitoring system, and the CME will review the competencies of the relevant personnel regularly. If personnel alternation happens, the new staff should be ensured to receive the same training. The PoA Manager will hold the overall responsibility for the implementation process, but as indicated above parts of the process are delegated.

(c) A procedure for technical review of inclusion of CPAs

The CME is responsible for technical review of inclusion of CPAs. The steps for the technical review of CPAs are shown as follows:

- The PoA and CPA development group is responsible for determining the eligibility criteria for inclusion of a CPA into the PoA and the technical documentation requested by the CME to the CPA implementer, such as FSR/PDR, EIA and others documents related to the CPA;
- The CPA management group establishes a record keeping system to record CPA's general information (including CPA name, address, contact information, geographical coordinates, crediting period and the start date, operation and monitoring data). The CPA management

group will maintain close communications with the CPA Implementer and gather information related to the performance of the CPA;

- The PoA and CPA development group prepares project documentation (such as the CPA-DD draft for the initial project eligibility assessment stage) and checks if assumptions and parameters applied and relevant sheets are consistent and justified by sources transparently;
- The QA/QC group does a first quality check of all the documentation of the CPA, if corrections are needed, QA/QC group will coordinates with the CPA management group and the outcome will be submitted to the PoA Manager. If necessary, such cycle might be repeated several times until sufficient quality is met;
- The PoA Manager checks the outcome and agrees with the inclusion.

(d) A procedure to avoid double counting (e.g. to avoid double counting of including a new CPA that has already been registered either as a CDM project activity or as a CPA another PoA.

Each CPA will have a distinct and unique serial number such as CPA001, CPA002…CPAXXX. The CME would have to sign a contract with the CPA implementer and guide training for the CPA implementer in order to let them know enough about the rules of CDM and the PoA. What's more, the contract would include the item that the CPA implementer has aware and agreed that their activity is being subscribed under the PoA. The contract would also require the proponent of CPA to confirm that they have not previously been registered either as a CDM project activity or as a CPA under other PoAs.

The CME will also check with the CDM pipeline, PoA pipeline and UNFCCC website before including any CPA into the PoA to make sure that the CPA has not been already registered either as a CDM project activity or as a CPA of another PoA.

(e) Records and documentation control process for each CPA under the PoA

The CME maintains an electronic database (hereinafter referred as the PoA database) with the following information for each CPA that seeks to be subscribed to the PoA:

For the PoA database, a PoA excel spreadsheet is issued that contains each CPA under the PoA, as follows:

-- Identification number and name of the CPA;

-- Details of contact between the CME and CPA implementer, including contact person, address, telephone and email;

-- Installed capacity of each project activity under the CPA;

-- Annual electricity export (MWh/yr) during the credible period;

-- Location and geographic coordinates of each project activity under the CPA.

Each CPA under this PoA has a separate folder, including:

-- CPA-DD;

-- IRR spreadsheet;

-- Monthly monitoring records from the CPA implementer;

-- PDR/FSR, EIA and others related documents, etc.

The documentation control process is shown as follows:

-- CPA management group collects the basic information, related documents and monitoring record of the CPA from the CPA implementer and establishes and updates the PoA and CPA database;

-- PoA and CPA development group is responsible for finishing the CPA-DD and IRR spreadsheet based on the information from the CPA implementer;

-- QA/QC group checks the PoA database, CPA-DD, IRR spreadsheet, etc, and submits the outcome to the PoA Manager.

The CPA database needs continuous updating as per the progress of the CPA. And the data should be kept for two years after the whole crediting period of the CPA.

(f) Measures for continuous improvements of the PoA management system

The management system is subject to a continuous review of its effectiveness. The aim is to identify any shortcomings and correct them, as well as to seek to continuously improve the PoA's performance on all counts.

The PoA should be reviewed annually, including:

-- Update the PoA as per guidelines of PoA;

-- Keep revising "the guideline on management of the PoA" as per changes related to management of the PoA;

-- Report the process and result to the person who in charge of the PoA.

The continuous improvement process is shown as follows:

-- All those involved are encouraged to raise any issues that they feel need to be corrected and suggest any means of improvement, and to communicate these to the PoA Manager;

-- The PoA manager allocates resources and appoints the relevant staff, ensure that solutions are designed, tested and their effectiveness monitored, prior to being formally adopted;

-- The improvements for the PoA should be checked and approved by the PoA manager.

(g) QA/QC procedures and de-bundling check

The CME will set up the QA/QC group, which is responsible for cross-checking the PoA database, basic information, related documents, IRR spreadsheet and monitor data, etc. of the CPA.

In according with Para 8 of Guidelines on assessment of de-bundling for SSC project activities (Annex 13, EB54 Ver.03), For the purposes of registration of a Programme of Activities (PoA), 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, which satisfies both conditions (a) and (b) below:

(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 technology/measure, and;

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

QA/QC group will check with the UNFCCC website and CDM pipeline before including any CPA into the PoA to make sure that the CPA is not to be de-bundled component of a large-scale activity.

SECTION D. Duration of PoA

D.1. Start date of PoA

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05/02/2013

It is the date on which the PoA-DD is published for global stakeholder consultation in accordance with the relevant CDM rules and requirements.

D.2. Length of the PoA

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28 years

SECTION E. Environmental impacts
E.1. Level at which environmental analysis is undertaken
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1. Environmental Analysis is done at PoA level ☐

2. Environmental Analysis is done at CPA level ☑

The individual nature of each CPA is different from the others, so does the impacts on environment. Therefore, it is reasonable to conduct the environmental analysis at the CPA level.

E.2. Analysis of the environmental impacts
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The analysis of environmental impacts is performed in detail in each CPA-DD.

SECTION F. Local stakeholder comments
F.1. Solicitation of comments from local stakeholders

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1. Local stakeholder consultation is done at PoA level ☐

2. Local stakeholder consultation is done at CPA level ☑

As each hydropower project included in each CPA has different situations (depending on the location, capacity, and the construction impacts etc), hence the local stakeholder consultation is done at CPA level.

Stakeholder consultation meeting and questionnaires are the main methods.

F.2. Summary of comments received

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Since stakeholders and comments received are different, comments received will be described in each CPA-DD.

F.3. Report on consideration of comments received

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This will be described in detail in each CPA-DD.

SECTION G. Approval and authorization

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A LoA from China Designated National Authority (National Development and Reform Commission of the People's Republic of China) for the PoA had been obtained.

PART II. Generic component project activity (CPA)—Scenario 1

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

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[CPAXXX-XXX]Hydropower Project (hereafter referred to as the CPA) is the [XXX] CPA under the PoA, which consist of [XXX] small scale newly built project activity (ies). The newly built project activity is located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province, P.R.China, and invested by [XXX] Co., Ltd.. The total installed capacity of the CPA is [XXX] MW, and the number of estimated annual operation hours is [XXX] h, which results in a plant load factor (PLF) of [XXX], the estimated annual average net electricity delivered to the grid is about [XXX] MWh.

The CPA is aimed at generating electricity by using renewable hydro power, the electricity generated will be delivered to the Southern China Power Grid (SCPG) and replace equivalent electricity generated by fossil fuel-fired power plants connected to the SCPG, therefore greenhouse gas (GHG)emissions will be reduced. The estimated annual GHG emission reductions are [XXX] tCO_2e.

The CPA will not only supply renewable electricity to grid, but also contribute to the sustainable development of the local community and the host country by means of:

- Improvement of global and local air quality by reducing GHG and air pollutants (e.g. SO_2, NOx and particulates) emissions from the combustion of fossil fuels that will be replaced by the hydropower power station which uses clean and renewable energy source;
- Through the Substituting Fuel with Small Hydropower Electricity Project, reduce wood demand from the rural energy, consolidating the achievement of Converting Cropland to Forest, protect forests and improve the ecological environment;
- Creating new short-term and long-term job opportunities for the local residents and increasing their incomes during project construction and operation;
- Improving electricity supply for residential in the project area and promoting local economy development.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The approved baseline and monitoring methodology AMS-I.D. (version 17) *Grid connected Renewable Electricity Generation* is applied to the CPA under the PoA and PoA development.

Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0) are also applied.

More information about the methodology and tools please refer to the following link:

http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

B.2. Application of methodology(ies)

>>

The applicability criteria of the methodology are defined and addressed as follows:

Applicability criteria of Methodology AMS-I.D. (version 17)	Applicable Analysis of the CPAs under this PoA
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.

(a) Supply electricity to a national or a regional grid; or (b) Supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	
Respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies	The small scale hydropower plants under the CPA supply electricity to a regional grid.
This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(S); or (d) Involve a replacement of a (an) existing plant(s)	The small scale hydropower plants under the CPA belong to (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant).
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than $4W/m^2$; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emission section, is greater than $4W/m^2$	The CPA will comply with one of the following conditions: • The CPA is implemented in an existing reservoir with no change in the volume of reservoir; • The CPA is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2. • The CPA results in a new reservoir and the power density of the power plant is [XXX] W/m^2, which is greater than 4 W/m^2.
If the new unit has both renewable and non-renewable components, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit con-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW	The CPA will be exclusively hydropower plants without no-renewable components and the new installation capacity of the CPA is [XXX] MW during every year of the crediting period, which is less than the eligibility limit of 15MW for a small-scale CDM project activity.
Combined heat and power (co-generation) systems are not eligible under this category	The CPA is not co-generation project.
For addition of the installed capacity project activity: In the case of project activities that involve the addition of the renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units	The CPA is consisted of newly built hydropower plants, so it is not applicable to this criterion.
For the retrofit or replacement of the existing plant: In case of retrofit or replacement, to qualify as a small-scale project, the total output of the	The CPA is consisted of newly built hydropower plants, so it is not applicable to this criterion.

retrofitted or replacement unit shall not exceed the limit of 15MW	

B.3. Sources and GHGs

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	Source	Gas	Included	Justification/Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	**CO_2**	**Yes**	Main Emission Source
		CH_4	**No**	Minor emission source
		N_2O	**No**	Minor emission source
Project Activity	Emission caused by the proposed project	**CO_2**	**No**	Minor emission source
		CH_4	**No**	The power density of the project activity is [XXX] W/m^2, which is greater than 10 W/m^2 Minor emission source
			Yes	The power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2 and less than or equal to 10 W/m^2 Main emission source.
		N_2O	**No**	Minor emission source

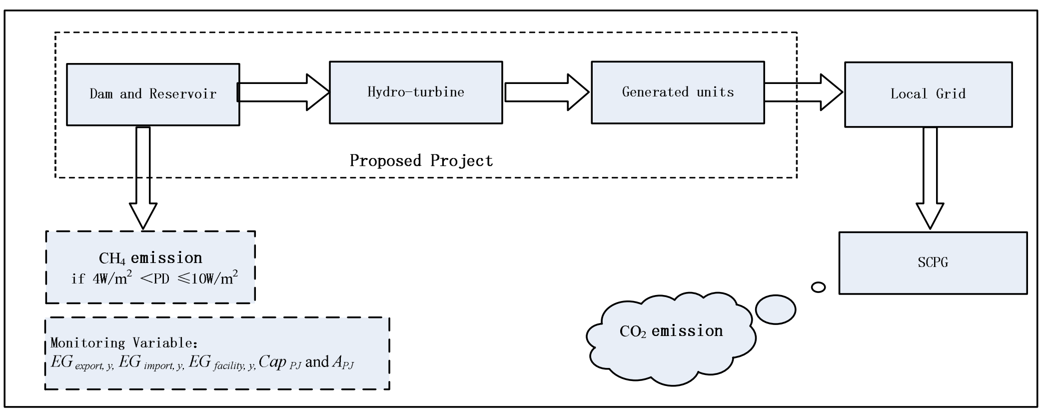

Figure B-1 Project boundary of project activity under the PoA

B.4. Description of baseline scenario

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As per paragraph 10 of methodology AMS-I.D (version 17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

B.5. Demonstration of eligibility for a generic CPA

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Demonstration how each generic CPA meets the eligibility criteria of the PoA:

No.	Eligibility criteria for inclusion of a CPA in the PoA	Situation of CPA	Applicable (Y/N)
(a)	The CPA is located within the boundary of Guizhou Province.	As per approved PDR/FSR, the CPA is located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province	Y
(b)	The CPA has a unique geographic coordinates and it is neither a CPA of another PoA nor registered (incl. application for registration) as a CDM project activity.	Through checking with UNFCCC website CDM pipeline, PoA pipeline and DNA by the CME, the CPA has exclusive ID information. The CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and ensures that the CPA is not and will not be another CDM project or a CPA of another PoA.	Y
(c)	The CPA is either a green-field hydropower plant, or capacity addition or retrofit of an existing hydropower plant.	The CPA is a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant).	Y
(d)	The start date of CPA is after 05/02/2013 (i.e. the date of publication of the PoA-DD for global stakeholder consultation and therefore identified as the start date of the PoA).	The start date of CPA is identified as [dd/mm/yyyy], which is the earliest date at which either the implementation or construction or real action of the CPA begins. This date is after 05/02/2013.	Y
(e)	The CPA meets the applicable conditions of AMS-I.D Grid connected renewable electricity generation, Version 17.0	The CPA meets the applicability criteria of the methodology AMS-I.D. Grid connected renewable electricity generation (version 17). The detailed demonstration is shown in the earlier section B.2. Application of methodology (ies).	Y
(f)	The CPA is demonstrated additional either in line with “Guidelines on the demonstration of additionality of small-scale project activities, Version 09.0” or “Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0”	The CPA with <5 MW installed capacity is located in a special underdeveloped zone of China，so it is deemed to be additional; Otherwise: The investment analysis will be applied to address additionality. And the project IRR (after-tax) is [XXX] lower than the benchmark of 10% of the project IRR (after-tax), therefore	Y

		the project activity is financial unattractive without the CDM revenue. The detailed demonstration is shown right after the table.	
(g)	Local stakeholder consultation and environmental impact assessment have been conducted, as a result, no one is against the development of the CPA and the CPA is in line with the relevant environmental regulations.	The local stakeholder's consultation of the CPA had been carried out and as the information of questionnaire or meeting records, no one objected to implementation of the CPA. The approval of the CPA Environmental Impact Assessment had been obtained.	Y
(h)	The CPA does not involve any public funding from Annex I countries	The declaration from CPA implementer confirmed that the CPA are not sponsored by any funding from Annex I parties.	Y
(i)	The CPA supplies electricity to a national or regional grid	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.	Y
(j)	Sampling is not required for the CPA	Not applicable	
(k)	The CPA (in aggregate if it comprises of independent sub units) meets the small-scale threshold of 15MW or micro-scale threshold of 5MW throughout the crediting period	The installed capacity of the CPA is [XXX] MW as per approved PDR/FVR, which is less than 15MW, and the installed capacity will be continuously monitored throughout the crediting period.	Y
(l)	The CPA is not a de-bundled component of a large scale project activity	Through checking with UNFCCC website, CDM pipeline and the statement from the CPA implementer, it should be confirmed that the CPA is not a de-bundled component of a large scale project activity.	Y
(m)	The implementation of the CPA is in line with relevant national and local regulations	The CPA is a renewable electricity project which is encouraged by the host country for energy saving. Furthermore, PDR/FVR and EIA of the CPA has been approved by local governmental agencies as per national regulations.	Y
(n)	The CPA implementer agrees the inclusion of its CPA in the PoA and follows the monitoring requirements outlined in the PoA-DD	The contract between the CME and the implementer of CPA had been signed, the CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and follows the monitoring requirements outlined in the PoA-DD.	Y

(o)	The energy generating equipment employed by the CPA is not transferred from/to another activity	There is no any energy generating equipment transferred from/to another activity in the CPA as per approved PDR.	Y

Confirmation of additionality of the generic CPA

(1) If the CPA has the installed capacity ≤5MW and located in a special underdeveloped zone (SUZ) of the host county, it is demonstrated to be additional as indicated by "*Guideline for Demonstrating Additionality of Micro scale Project Activities*" (EB68, Annex 26, version 04.0).

The definition of a SUZ region in accordance with the Para 2(a) of the "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0" satisfying either of the following conditions: 1) the proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; 2) the GNI per capita in the country is less than USD 5000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures. If the geographic location of the CPA with installed capacity below 5 MW satisfied the first condition above mentioned The CPA will be considered with additionality. And the eligibility will be proved in each CPA.

(2) If the CPA has the installed capacity>5MW or ≤5MW but not located in the poverty counties, it should be demonstrated according to *Guidelines on the Demonstration of Additionality of Small-scale Project Activities* (EB68 Annex27, version 09.0). Investment barrier analysis will be adopted to demonstrate the CPA's additionality.

The following steps are adopted for the investment analysis:

Step 1. Determine Appropriate Analysis Method

According to the *Tool for Demonstrate and Assessment of Additionality* (version 07), three analysis methods are available to conduct the investment analysis:

Option I: Simple cost analysis;

Option II: Investment comparison analysis; and

Option III: Benchmark analysis;

The simple cost analysis method (Option I) is not appropriate because the proposed project will get the revenues not only from CDM but also from the electricity sales. The investment comparison analysis is also not applicable, as the baseline scenario of the proposed project is the SCPG rather than a similar investment project alternative, the project owner has no investment options to compare with. So investment comparison analysis (Option II) is neither appropriate. As a result, Option III: Benchmark analysis is chosen to demonstrate and assess the additionality, since the data on the total investment IRR of Chinese power industry is available.

Step 2. Option III: Benchmark Analysis Method

The CPA faces a barrier to implement due to poor returns on investment. For this PoA, the financial indicator identified for a typical CPA is the project Internal Rate of Return (after-tax) which is indicator commonly used to determine investment decisions. According to *Economic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources (Document No. SL16-10), the benchmark of this kind of small hydropower project IRR (after-tax) in China is 10%. If the project IRR (after-tax) is lower than 10%, the project is economically unattractive, facing prohibitive investment barrier.

Step 3. Calculation and Comparison of Financial Indicators

Based on the approved feasibility study report or the preliminary design report of the CPA, basic parameters for calculation of financial indicators are as follows:

Table B-1 Basic parameters for calculation of financial indicators

Parameter	Data	Unit	Sources
Installed capacity	[number]	MW	Approved FSR/PDR
Annual power generation	[number]	MWh	Approved FSR/PDR
On-grid power supply	[number]	MWh	Approved FSR/PDR
Project life time	[number]	years	Approved FSR/PDR
Total static investment	[number]	10^4 RMB	Approved FSR/PDR
Loan Ratio of the Total Investment	[number]	%	Approved FSR/PDR
Loan Interest Rate	[number]	%	Approved FSR/PDR
Annual O&M costs	[number]	10^4 RMB	Approved FSR/PDR
Electricity tariff (including VAT)	[number]	RMB/kWh	Approved FSR/PDR
Value added tax	[number]	%	Approved FSR/PDR
Income tax	[number]	%	Approved FSR/PDR
Urban Construction and maintenance tax	[number]	%	Approved FSR/PDR
Educational surtax	[number]	%	Approved FSR/PDR
Depreciation Rate	[number]	%	Approved FSR/PDR
Residual rate	[number]	%	Approved FSR/PDR

Calculation and comparison of the project IRR (after-tax) and the benchmark of the project IRR (after-tax)

Based on the data above, the project IRR (after-tax) without CDM revenues is shown in the following table. It is clear that without CDM revenue, the project IRR (after-tax) is only [number] %, which is lower than the benchmark of 10% of the project IRR (after-tax). Therefore, the project is not financially attractive.

However, the project IRR (after-tax) including expect CDM revenue will be increased to [number] %, which is higher than the benchmark of 10%, and the project is financially feasible.

Item	Without CDM revenues	Benchmark (after-tax)	With CDM revenues
Project IRR (after-tax)	[number] %	10%	[number]%

Step 4 Sensitivity Analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding financial attractiveness is robust to reasonable variation in the critical assumption.

The following key parameters have been selected as sensitive indicators to test the financial attractiveness for the proposed project.

(1) Total static investment

(2) Annual electricity delivered to the grid

(3) Electricity tariff (including VAT) and

(4) Annual O & M cost

As shown in the sensitivity analysis, within a reasonable range of fluctuation, from － 10%~+10%, the project IRR (after-tax) could not reach the benchmark of 10% and the additionality of the project would not be affected.

Table B-2 Sensitivity analysis of the Proposed Project (without CDM revenue)

Range / Parameters	-10.0%	-5.0%	0.0%	5.0%	10.0%
Total static investment	[number]	[number]	[number]	[number]	[number]
Annual electricity delivered to the grid	[number]	[number]	[number]	[number]	[number]
Electricity tariff (including VAT)	[number]	[number]	[number]	[number]	[number]
Annual O & M cost	[number]	[number]	[number]	[number]	[number]

Table B-2 has shown that none of variations can increase the project IRR (after-tax) of the CPA to be higher than the benchmark of 10%. Therefore, the sensitivity analysis strongly and consistently supports the conclusion that the CPA activity is unlikely to be financially attractive and can be considered to be additional.

The IRR could reach to the benchmark of 10% in case the four key parameters could vary in the following extent:

Table B-3 Variations to reach the benchmark (without CDM revenue)

Parameters	Variation	Value	Unit
Total static investment	[number]	[number]	10^4RMB
Electricity tariff (including VAT)	[number]	[number]	RMB/kWh
Annual O & M cost	[number]	-	10^4RMB
Annual electricity delivered to the grid	[number]	[number]	MWh

Total static Investment

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing total static investment.]

Electricity Tariff

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing electricity tariff.]

Annual O&M cost

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing annual O&M cost.]

Annual Electricity Delivered to the grid

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing the amount of annual electricity delivered to the grid.]

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>
1. Project emission (PE_y)

According to AMS.I.D (version 17.0.0), For hydro power project activities that result in new

single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, calculated based on the baseline methodology ACM0002 (version 13.0.0), the specific calculation process is as follows:

(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000} \quad (1)$$

Where:

$PE_{HP,y}$	Project emissions from water reservoirs (tCO_2e/yr)
EF_{Res}	Default emission factor for emissions from reservoirs of hydro power plants in year *y* ($kgCO_2e$/MWh)
TEG_y	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2

$$PE_{HP,y} = 0 \quad (2)$$

The power density (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (3)$$

Where:

PD	Power density of the project activity (W/m^2)
Cap_{PJ}	Installed capacity of the hydropower plant after the implementation of the project activity (W)
Cap_{BL}	Installed capacity of the hydropower plant before the implementation of the project activity (W)
A_{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2)

2. Baseline emission (*BE_y*)

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants within SCPG that are displaced due to the proposed project activity.

If the CPA consists of a newly-built project, then the baseline emission is calculated as follows:

$$BE_y = EG_{BL,y} \times EF_{CO_2,\ grid,y} \quad (4)$$

Where:

BE_y	Baseline emissions in year y (tCO_2/yr).
$EG_{BL,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr).
$EF_{CO_2,\ grid,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh).

For newly built hydropower project: $EG_{BL,y} = EG_{facility,y}$ (5)

Where:

$EG_{facility,y}$ Quantity of net electricity supplied to the grid in year *y* (MWh)

$$EF_{CO_2,\ grid,y} = EF_{grid,CM,\ y} \quad (6)$$

Where:

$EF_{grid,CM,\ y}$ CO_2 emission factor of the grid in year *y* (t CO_2/MWh)

The methodological tool *"Tool to Calculate the Emission Factor for An Electricity System"* (version 03.0.0) determines the CO_2 emission factor for the displacement of electricity generated by power plants in SCPG, by calculating the "combined margin" emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the operating margin (OM) and the build margin (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the project. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed project.

The following steps are applied to calculate the emission factor of SCPG:

Step 1. Identify the relevant electric system

According to the definition of project boundary by AMS-I.D. (Version 17), the spatial extent of the project boundary includes the project and all power plants connected to the project electricity system that the project is connected to.

Based on "Tool to calculate the emission factor for an electricity system" (Version 03.0.0), the "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project and that can be dispatched without significant transmission constraints. Furthermore, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

In this specific case, the project finally displaces the power generated by the South China Power Grid. According to "2012 Baseline Emission Factors for Regional Power Grids in China" from China DNA renewed on 15th Oct 2012[6], the delineation of SCPG covers Yunnan, Guizhou, Guangxi, Guangdong, and Hainan provincial grids. The electricity generated by the project will be transferred to the SCPG. In addition, the SCPG which does not involve generation power output to other grid, but imports electricity from Central China Power Grid (CCPG). Therefore, the CCPG is also identified as the connected electricity system and will be taken into account for calculating OM emission factor of the SCPG. And the CO_2 emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options for the purpose of determining the operating margin emission factor:

(a) 0 t CO_2/MWh; or

(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4, if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or

(c) The simple adjusted operating margin emission rate of the exporting grid; or

(d) The weighted average operating margin (OM) emission rate of the exporting grid.

6 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

According to Chinese DNA's "2012 Baseline Emission Factors for Regional Power Grids in China", Option (b) is selected to determine the CO_2 emission factors for net electricity imports from the CCPG.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, i. e. the SCPG, as there are no recent or likely future additions to transmission capacity that would enable significant increases in imported electricity; the data in Appendix 4 shows that imports are relatively small and have not changed significantly in the period covered. Therefore, the transmission capacity is not considered a build margin source.

The baseline emissions factor ($EF_{grid, CM,y}$) is calculated as the average of the operating margin emissions factor and the build margin emissions factor. The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as China DNA.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

Option II: Both grid power plants and off-grid power plants are included in the calculation

Option I corresponds to the procedure contained in earlier versions of this tool. Option II allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.

Option II requires collecting data on off-grid power generation and can only be used if the conditions outlined therein are met. Option II may be chosen only for the operating margin emission factor or for both the build margin and the operating margin emission factor but not only for the build margin emission factor.

If Option II is chosen, off-grid power plants should be classified as per relevant guidance indifferent classes of off-grid power plants. Each off-grid power plant class should be considered as one power plant j, k, m or n in the following steps, as applicable.

Following the guideline of the DNA, and the statistical data available, Option I is chosen.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM

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

Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. In China, they include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

According to the data from China Power Yearbook 2007~ 2011, the proportion of the low-cost/must run resources in the total grid electricity of SCPG was 29.75%, 29.28%, 36.07%,

32.36% and 28.07% respectively, because the low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years in SCPG, therefore, the simple OM method (option a) is used to calculate OM emission factor for the proposed project.

For the simple OM method, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required 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 preceding 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.

For the CPA, "Ex ante option" is chosen: the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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.

For the calculation of the emission of electricity input from Central China Power Grid (CCPG) to SCPG, the simple OM emission factor of CCPG is applied.

Step 4: Calculate the OM emission factor according to the selected method

The Simple OM emission factor ($EF_{OM, simple}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. As the fuel consumption data for each power plant/unit is not available in China, Option A is not applicable. Total net electricity generation of all power plants serving the Southern China Power Grid and the fuel types and total fuel consumption of the Southern China Power Grid are available from *China electric power yearbook* and *China energy statistical yearbook*, and the following conditions can be satisfied:

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

So, the project uses Option B for calculating the simple OM emission factor as follows:

$$EF_{\text{gird, OM simple,y}} = \frac{\sum_i (FC_{i,y} \times NVC_{i,y} \times EF_{CO_2,i,y})}{EG_y} \quad (7)$$

Where:

$EF_{\text{gird, OM simple,y}}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
$NVC_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO_2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh);
i	All fossil fuel types combusted in power sources in the project electricity system in year *y*;
y	The relevant year as per data vintage chosen in Step 3.

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, one of the following two options can be chosen to calculate the build margin emission factor:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the proposed project, option 1 is chosen to calculate build margin emission factor, and the capacity additions from retrofits of power plants is not be included in the calculation of the build margin emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-5-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEGSET-≥20%, in MWh);

(c) From $SET_{5\text{-units}}$ and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).
Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set

($SET_{sample\text{-}CDM}$->10yrs).

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (8)$$

Where:

$EF_{grid,BM,y}$:	Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EG_{m,y}$:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$FE_{EL,m,y}$:	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
m:	Power units included in the build margin;
y :	Most recent historical year for which power generation data is available

In China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Taking the notice of the

situation, EB accepted the following deviation[7]:

(1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity, i.e. the capacity addition over 1~3 years, whichever results in a capacity addition that is closed to 20% of total installed capacity.

(2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors for commercially available best practice technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

The build margin calculations featured below is derived from "2012 Baseline Emission Factors for Regional Power Grids in China", which has been renewed by the Chinese DNA on 15 Oct, 2012 and accepted by EB.

Therefore for the proposed project: First, calculate the share of different power generation technology in recent capacity additions; second, calculate the weight for capacity additions of each power generation technology; and finally, calculate the emission factor use the efficiency level of the best technology commercially available in China.

Because the generating capacity of the coal-fired, oil-fired and gas-fired technology cannot be separated from the existing statistical data, the BM calculation in this PoA-DD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in the SCPG.

Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the newly installed 20% capacity; the result is BM emission factor.

According to "Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0)" and the clarifications by EB, the main steps for BM calculation are as follows:

Sub-step 1: Calculation of weights of CO_2 emission by coal-fired, oil-fired and gas-fried plants in total CO2 emissions of SCPG.

$$\lambda_{coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (9)$$

$$\lambda_{oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (10)$$

$$\lambda_{gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (11)$$

Where:

$F_{i,j,y}$:	The total amount of fuel *i* (in a mass or volume unit) consumed by Province *j* in SCPG for power generation in year y;
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO2,i,y}$:	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);

[7] http://cdm.unfccc.int/Projects/deviation

Coal, Oil and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step 2: Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of SCPG

The $EF_{thermal,y}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal,y} = \lambda_{coal,y} \times EF_{Coal,Adv,y} + \lambda_{oil,y} \times EF_{Oil,Adv,y} + \lambda_{gas,y} \times EF_{Gas,Adv,y} \quad (12)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Annex 4).

According to the data issued by China DNA, efficiencies of 39.65% for coal power plants and 51.93% for oil or gas power plants are defined as the best technology commercially available in China. The percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as formula (10) (11) (12): $\lambda_{Coal,y}$ =93.59%, $\lambda_{Oil,y}$ =0.84%, $\lambda_{Gas,y}$ =5.57%.

Sub-step 3: Calculation of Build Margin (BM) emission factor of SCPG

Finally, weighted average build margin emission factor ($EF_{grid,BM,y}$) are calculated by multiplying the $EF_{thermal\ power}$ with the weight of new capacity addition by thermal power of total capacity addition in SCPG.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (13)$$

Where:

$CAP_{Total,y}$:	The total capacity addition of SCPG from China Electric Power Yearbook (2009~2011);
$CAP_{Thermal,y}$:	The capacity addition by thermal power of SCPG from China Electric Power Yearbook (2009~2011).

For the detailed information, please see the Appendix 4

The method of OM and BM calculation above refer to official website:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

Step 6. Calculate the Combined Margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The proposed project uses method (a) weighted average CM to calculate the combined margin emission factor, as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (14)$$

Where:

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

The weight W_{OM} and W_{BM} are taken both by 0.5 for the first crediting period of the CPA; and W_{OM} =0.25 and W_{BM} =0.75 for the second and third crediting period of the CPA. For the detailed calculation, please refer to specific CPA-DD.

3. Leakage of the Proposed Project (LE_y)

The energy generating equipment is not transferred from another activity, according to AMS.I.D (version 17), so leakage (LE_y) is not to be considered.

4. Emission Reductions (ER_y)

The emission reductions ER_y by the proposed project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to the leakage (LE_y), as follow:

$$ER_y = BE_y - PE_y - LE_y \qquad (15)$$

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$F_{i,y}/F_{i,j,y}$
Unit	t or m^3
Description	The total amount of fuel *i* (in a mass or volume unit) consumed by Province *j* in SCPG for power generation in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics; publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{j,y}$
Unit	MWh
Description	The electricity output (MWh) supplied to the grid by the Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	NCV_i

Unit	kj/kg or kj/m^3
Description	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data	China Energy Statistical Yearbook 2011
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official data, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EF_{co2,i,y}$
Unit	t CO_2/TJ
Description	CO_2 emission factor per energy unit of fuel *i* in year *y*
Source of data	Table1.3and Table1.4 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	As the national value is unavailable, IPCC default is used.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$Cap_{j,y}$
Unit	MW
Description	The installed capacity of Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook(2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	EF_{Res}
Unit	kgCO_2e/MWh
Description	Default emission factor for emissions from reservoirs
Source of data	Decision by EB23
Value(s) applied	90 kgCO_2e/MWh
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	$\eta_{Adv,i}$
Unit	%

Description	The efficiency level of the best technology for each fuel type commercially available in China.
Source of data	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2551.doc
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	MW
Description	Installed capacity of the hydropower plant before the implementation of the project activity. For new hydropower plants, this value is zero.
Source of data	Project site
Value(s) applied	This value is zero
Choice of data or Measurement methods and procedures	FSR/PDR
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data	Project site
Value(s) applied	-
Choice of data or Measurement methods and procedures	FSR/PDR
Purpose of data	Calculation of project emissions.
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions
>>

Baseline emissions

Based on the Tool to Calculate the Emission Factor for an Electricity System (03.0.0) and data from Section D.6.1, the figures of emission factors of the SCPG are as follows:

- $EF_{grid,OM,y}$=0.9344 tCO_2e/MWh;
- $EF_{grid,BM,y}$ =0.3791 tCO_2e/MWh;
- $EF_{grid,CM,y}$= $EF_{grid,OM,y}$ *W_{OM} + $EF_{grid,BM,y}$ * W_{BM} =0.9344*0.5+0.3791*0.5=0.65675 tCO_2e/MWh.

The amount of the electricity delivered to the SCPG from the CPA ($EG_{export,\ y}$) is estimated to be [XXX] MWh per year. The electricity imported ($EG_{import,\ y}$) from the SCPG to the CPA is expected to be 0.

$$BE_y = EG_y \times EF_{grid,\ CM,\ y} = (EG_{export,\ y} - EG_{import,\ y}) \times EF_{grid,\ CM,\ y}$$

$$= [XXX] \times 0.65675 = [XXX]\ tCO_2e.$$

Project emissions

According to the project type, project emissions will be done in each specific CPA-DD on the basis of the equations in Section B.6.1 above.

Leakage

According to the methodology AMS-I.D. (version 17), the CPA does not refer to leakage emissions, so the leakage emissions are zero, LE_y=0.

Emission reductions

The emission reductions ER_y of the project activity is calculated as the baseline emission (BE_y) minus the emission of the proposed activity (PE_y) and the emission due to leakage (LEy).

So, $ER_y = BE_y - PE_y - LE_y =$ [XXX] tCO_2e.

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	$EG_{export,\ y}$
Unit	MWh
Description	Quantity of electricity supplied to the SCPG by the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording
QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{import,\ y}$
Unit	MWh
Description	Quantity of electricity imported from the SCPG to the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording.

QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{facility,\ y,}$
Unit	MWh
Description	Quantity of net electricity supplied to the grid in year *y* (MWh)
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electric meters
Monitoring frequency	Hourly measurement and at least monthly recording
QA/QC procedures	The calculation will be conducted by the internal verifier at the project site. Data will be cross-checked with receipts from the local power grid on electricity consumption and electricity sales.
Purpose of data	Calculation of baseline emissions.
Additional comments	Calculated as $EG_{facility,y} = EG_{export,y} - EG_{import,y} = EG_{BL,y}$

Data / Parameter	Cap_{PJ}
Unit	MW
Description	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Will be checked by the nameplate
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comments	-

Data / Parameter	A_{PJ}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Measured by the qualified design institute.
Monitoring frequency	yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA
>>
1. Purpose
The monitoring plan is to serve as a guideline for the CPA implementer to monitor and calculate the emission reductions of the project under the CPA. Baseline emission factor of the project is determined ex ante.

For newly built plant, the net electricity delivered by the project to SCPG ($EG_{export, y}$), the net electricity imported from SCPG ($EG_{import, y}$) is defined as the key data to be monitored.

For project activities with reservoir, A_{PJ} and Cap_{PJ} calculated for project emission also will be monitored.

2. Management structure of monitoring

The CPA implementer will organize a monitoring team according to the monitoring manual which provided by the CME, and the detailed responsibility of each section is as below:

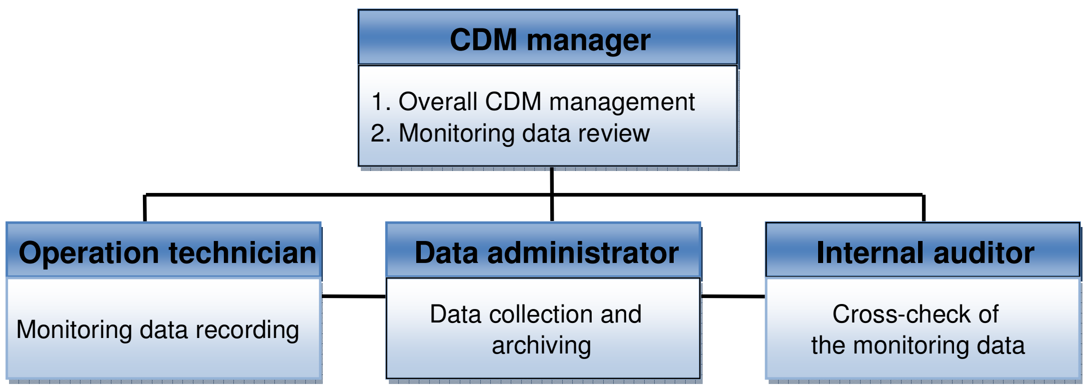

Figure B-2 Monitoring management structure

CDM manager is the team leader and responsible for the overall CDM management and data review;

Operation technician is responsible for monitoring data recording;

Data administrator is responsible for data collection, archiving;

Internal auditor is responsible for cross-check of the submitting monitoring data.

3. Equipment and Installation of Monitoring

Distribution and calibration of electric meter will be implemented according to the technical requirements of Technical administrative code of electric energy metering (DL/T448-2000).

The accuracy of the meters should not be less than 0.5S.

4. Data collection management

The project owner and the local power grid company will read the meters and record the data on a regular basis. The monitored data will be archived electronically each month. The project owner also needs to keep the original and backup copies of electricity sales and purchase receipts provided by the power grid company periodically for cross check.

All written documents such as diagrams, reports should be stored and available to the verifier so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

5. QA/QC

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to relevant national and industrial regulations. After the project operation, the meters should be annually calibrated in accordance with the relevant national and industrial regulations by an independent qualified calibration entity.

Data and records will be checked prior to being recorded and archived, and possible errors would be identified in this step. In case the main meter operates abnormally, the readings from the back up meter will be adopted. If the backup meter is not within acceptable limits of accuracy or performed improperly, the project owner and the grid company shall choose a reasonable reading through negotiation. If both main and back-up meters are out of work, the data monitored within this certain period shall not be counted.

The monitoring equipments are the bidirectional electric meters. $EG_{export,\ y}$ and $EG_{import,\ y}$ of proposed project will be hourly measured and at least monthly recorded.

The installed capacity of the hydropower plant (CAP_{PJ}) after the implementation of the project activity will be monitored based on nameplate or technical agreement of turbine and generator every year.

The surface area of the reservoir measured in the surface of the water (A_{PJ}), after the implementation of the project activity, when the reservoir is full, will be measured regularly every year by a qualified third entity.

The monitoring data will be forwarded to the internal auditor for the cross-check after review of the manager, $EG_{export,\ y}$ and $EG_{import,\ y}$ from meter records will be cross-checked against the electricity sales receipts.

6. Training

The team members of the monitoring team will be trained by CME before the operation of the project as per the monitoring and management manual. If the personnel alternation happens, the new staffs will receive the same training before work.

PART III. Generic component project activity (CPA)—Scenario 2

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

>>

[CPAXXX-XXX] Hydropower Project (hereafter referred to as the CPA) is the [XXX] CPA under the PoA, which consist of [XXX] small scale project activity (ies) located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province, P.R.China, and invested by [XXX] Co., Ltd.. The small scale project activity (ies) under the CPA is (are) involved a capacity addition, the new addition capacity is [XXX] MW and the existing installed capacity of the CPA is [XXX] MW, and the number of estimated annual operation hours is [XXX] h, which results in a plant load factor (PLF) of [XXX], the estimated annual average net electricity delivered to the grid is about [XXX] MWh.

The CPA is aimed at generating electricity by using renewable hydro power, the electricity generated will be delivered to the Southern China Power Grid (SCPG) and replace equivalent electricity generated by fossil fuel-fired power plants connected to the SCPG, therefore greenhouse gas (GHG)emissions will be reduced. The estimated annual GHG emission reductions are [XXX] tCO_2e.

The CPA will not only supply renewable electricity to grid, but also contribute to the sustainable development of the local community and the host country by means of:

- Improvement of global and local air quality by reducing GHG and air pollutants (e.g. SO_2, NOx and particulates) emissions from the combustion of fossil fuels that will be replaced by the hydropower power station which uses clean and renewable energy source;
- Through the Substituting Fuel with Small Hydropower Electricity Project, reduce wood demand from the rural energy, consolidating the achievement of Converting Cropland to Forest, protect forests and improve the ecological environment;
- Creating new short-term and long-term job opportunities for the local residents and increasing their incomes during project construction and operation;
- Improving electricity supply for residential in the project area and promoting local economy development.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

The approved baseline and monitoring methodology AMS-I.D. (version 17) *Grid connected Renewable Electricity Generation* is applied to the CPA under the PoA and PoA development.

Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0) are also applied.

More information about the methodology and tools please refer to the following link:

http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

B.2. Application of methodology(ies)

>>

The applicability criteria of the methodology are defined and addressed as follows:

Applicability criteria of Methodology AMS-I.D. (version 17)	**Applicable Analysis of the CPAs under this PoA**
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supply electricity to a national or a regional grid; or (b) Supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.
Respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies	The small scale hydropower plants under the CPA supply electricity to a regional grid.
This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of a (an) existing plant(s)	The CPA will belong to (b) Involve a capacity addition.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than $4W/m^2$; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emission section, is greater than $4W/m^2$	The CPA will comply with one of the following conditions: • The CPA is implemented in an existing reservoir with no change in the volume of reservoir; • The CPA is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2; • The CPA results in a new reservoir and the power density of the power plant is [XXX] W/m^2, which is greater than 4 W/m^2.
If the new unit has both renewable and non-renewable components, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit con-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW	The CPA will be exclusively hydropower plants without no-renewable components and the total installed capacity of the CPA is [XXX] MW during every year of the crediting period, which is less than the eligibility limit of 15MW for a small-scale CDM project activity.
Combined heat and power (co-generation) systems are not eligible under this category	The CPA is not involved co-generation project.
For addition of the installed capacity project activity: In the case of project activities that involve the addition of the renewable energy generation units at an existing renewable power generation facility,	The added capacity of the project activity under the CPA is [XXX] MW during every year of the crediting period, which is lower than 15MW, and will be physically distinct from the

the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units	existing units.
For the retrofit or replacement of the existing plant: In case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15MW	The CPA is not involved the retrofit or replacement of an existing renewable power generation facility, so it is not applicable to this criterion.

B.3. Sources and GHGs

>>

	Source	Gas	Included	Justification/Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	**CO_2**	**Yes**	Main Emission Source
		CH_4	**No**	Minor emission source
		N_2O	**No**	Minor emission source
Project Activity	Emission caused by the proposed project	**CO_2**	**No**	Minor emission source
		CH_4	**No**	The power density of the project activity is [XXX] W/m^2, which is greater than 10 W/m^2 Minor emission source
			Yes	The power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2 and less than or equal to 10 W/m^2 Main emission source.
		N_2O	**No**	Minor emission source

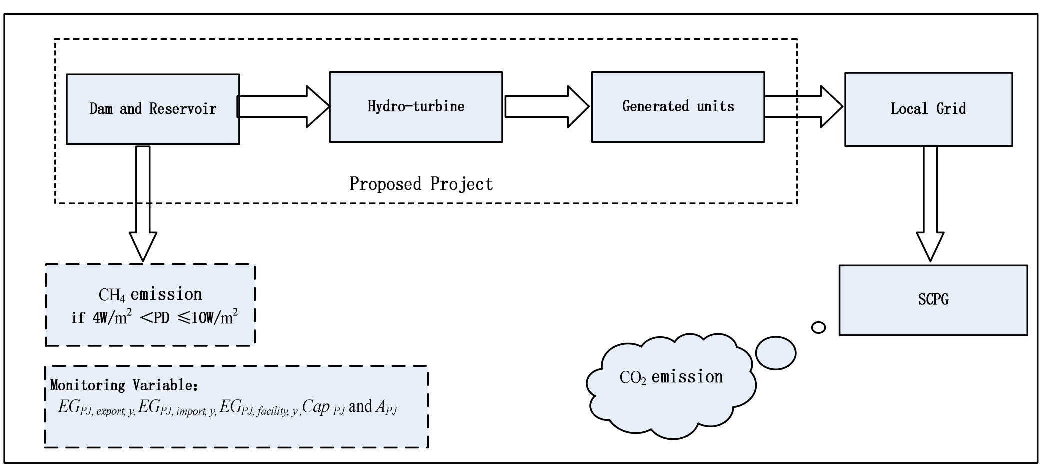

Figure B-1 Project boundary of project activity under the PoA

B.4. Description of baseline scenario

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As per paragraph 10 of the methodology AMS-I.D (version 17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

B.5. Demonstration of eligibility for a generic CPA

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Demonstration how each generic CPA meets the eligibility criteria of the PoA:

No.	Eligibility criteria for inclusion of a CPA in the PoA	Situation of CPA	Applicable (Y/N)
(a)	The CPA is located within the boundary of Guizhou Province.	AS per approved PDR/FVR, the CPA is located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province	Y
(b)	The CPA has a unique geographic coordinates and it is neither a CPA of another PoA nor registered (incl. application for registration) as a CDM project activity.	According to the confirmation by checking with UNFCCC website CDM pipeline, PoA pipeline and DNA by the CME, the CPA has exclusive ID information. The CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and ensures that the CPA is not and will not be another CDM project or a CPA of another PoA.	Y
(c)	The CPA is either a green-field hydropower plant, or capacity addition or retrofit of an existing hydropower plant.	The CPA is involved capacity addition.	Y
(d)	The start date of CPA is after 05/02/2013 (i.e. the date of publication of the PoA-DD for global stakeholder consultation and therefore identified as the start date of the PoA).	The start date of CPA is identified as [dd/mm/yyyy], which is the earliest date at which either the implementation or construction or real action of the CPA begins. This date is after 05/02/2013.	Y
(e)	The CPA meets the applicable conditions of AMS-I.D Grid connected renewable electricity generation, Version 17.0	The CPA meets the applicability criteria of the methodology AMS-I.D Grid connected renewable electricity generation (version 17). The detailed demonstration is shown in the earlier section B.2. Application of methodology (ies).	Y
(f)	The CPA is demonstrated additional either in line with	The CPA with <5 MW installed capacity is located in a special	Y

	"Guidelines on the demonstration of additionality of small-scale project activities, Version 09.0" or "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0"	underdeveloped zone of China，so it is deemed to be additional; Otherwise: The investment analysis will be applied to address additionality. And the project IRR (after-tax) is [XXX] lower than the benchmark of 10% of the project IRR (after-tax), therefore the project activity is financial unattractive without the CDM revenue. The detailed demonstration is shown right after the table.	
(g)	Local stakeholder consultation and environmental impact assessment have been conducted, as a result, no one is against the development of the CPA and the CPA is in line with the relevant environmental regulations.	The local stakeholder's consultation of the CPA had been carried out and as the information of questionnaire or meeting records, no one objected to implementation of the CPA. The approval of the CPA Environmental Impact Assessment had been obtained.	Y
(h)	The CPA does not involve any public funding from Annex I countries	The declaration from CPA implementer confirmed that the CPA are not sponsored by any funding from Annex I parties.	Y
(i)	The CPA supplies electricity to a national or regional grid	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.	Y
(j)	Sampling is not required for the CPA	Not applicable	
(k)	The CPA (in aggregate if it comprises of independent sub units) meets the small-scale threshold of 15MW or micro-scale threshold of 5MW throughout the crediting period	The installed capacity of the CPA is [XXX] MW as per approved PDR, which is less than 15MW/5MW, and the installed capacity will be continuously monitored throughout the crediting period.	Y
(l)	The CPA is not a de-bundled component of a large scale project activity	Through checking with UNFCCC website, CDM pipeline and the statement from the CPA implementer, it should be confirmed that the CPA is not a de-bundled component of a large scale project activity.	Y
(m)	The implementation of the CPA is in line with relevant national and local regulations	The CPA is a renewable electricity project which is encouraged by the host country for energy saving. Furthermore, PDR/FDR and EIA of the CPA will be approved by local governmental agencies as per national regulations.	Y

(n)	The CPA implementer agrees the inclusion of its CPA in the PoA and follows the monitoring requirements outlined in the PoA-DD	The contract between the CME and the implementer of CPA had been signed, the CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and follows the monitoring requirements outlined in the PoA-DD.	Y
(o)	The energy generating equipment employed by the CPA is not transferred from/to another activity	There is no any energy generating equipment transferred from/to another activity in the CPA as per approved PDR.	Y

Confirmation of additionality of the generic CPA

(1) If the CPA has the installed capacity no more than 5MW and located in the special underdeveloped zone of the host country, it can be considered to be additional according to *Guidelines for Demonstrated Additionality of Micro-scale Project Activities* (version 04.0).

The definition of a SUZ region in accordance with the Para 2(a) of the "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0" satisfying either of the following conditions: 1) the proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; 2) the GNI per capita in the country is less than USD 5000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures. If the geographic location of the CPA with installed capacity below 5 MW satisfied the first condition above mentioned The CPA will be considered with additionality. And the eligibility will be proved in each CPA.

(2) If the CPA has the installed capacity>5MW or ≤5MW but not located in the poverty county, it should be demonstrated according to *Guidelines on the Demonstration of Additionality of Small-scale Project Activities* (EB68 Annex27, version 09.0). Investment barrier analysis will be adopted to demonstrate the CPA's additionality.

The following steps are adopted for the investment analysis:

Step 1. Determine Appropriate Analysis Method

According to the *Tool for Demonstrate and Assessment of Additionality* (version 7), three analysis methods are available to conduct the investment analysis:

Option I: Simple cost analysis;

Option II: Investment comparison analysis; and

Option III: Benchmark analysis;

The simple cost analysis method (Option I) is not appropriate because the proposed project will get the revenues not only from CDM but also from the electricity sales. The investment comparison analysis is also not applicable, as the baseline scenario of the proposed project is the SCPG rather than a similar investment project alternative, the project owner has no investment options to compare with. So investment comparison analysis (Option II) is neither appropriate. As a result, Option III: Benchmark analysis is chosen to demonstrate and assess the additionality, since the data on the total investment IRR of Chinese power industry is available.

Step 2. Option III: Benchmark Analysis Method

The CPA faces a barrier to implement due to poor returns on investment. For this PoA, the financial indicator identified for a typical CPA is the project Internal Rate of Return (after-tax) which is indicator commonly used to determine investment decisions. According to *Economic*

Evaluation Code for Small Hydropower Projects issued by the Ministry of Water Resources (Document No. SL16-10), the benchmark of small hydropower project (the installed capacity is under 50MW) IRR (after-tax) in China is 10%. If the project IRR (after-tax) is lower than 10%, the project is economically unattractive, facing prohibitive investment barrier.

Step 3. Calculation and Comparison of Financial Indicators

Based on the approved feasibility study report or the preliminary design report of the CPA, basic parameters for calculation of financial indicators are as follows:

Table B-1 Basic parameters for calculation of financial indicators

Parameter	Data	Unit	Sources
Addition installed capacity	[number]	MW	Approved FSR/PDR
The total installed capacity	[number]	MW	Approved FSR/PDR
Annual power generation	[number]	MWh	Approved FSR/PDR
On-grid power supply	[number]	MWh	Approved FSR/PDR
Project life time	[number]	years	Approved FSR/PDR
Total static investment	[number]	10^4 RMB	Approved FSR/PDR
Loan Ratio of the Total Investment	[number]	%	Approved FSR/PDR
Loan Interest Rate	[number]	%	Approved FSR/PDR
Annual O&M costs	[number]	10^4 RMB	Approved FSR/PDR
Electricity tariff (including VAT)	[number]	RMB/kWh	Approved FSR/PDR
Value added tax	[number]	%	Approved FSR/PDR
Income tax	[number]	%	Approved FSR/PDR
Urban Construction and maintenance tax	[number]	%	Approved FSR/PDR
Educational surtax	[number]	%	Approved FSR/PDR
Depreciation Rate	[number]	%	Approved FSR/PDR
Residual rate	[number]	%	Approved FSR/PDR

Calculation and comparison of the project IRR (after-tax) and the benchmark of the project IRR (after-tax)

Based on the data above, the project IRR (after-tax) without CDM revenues is shown in the following table. It is clear that without CDM revenue, the project IRR (after-tax) is only [number] %, which is lower than the benchmark of 10% of the project IRR (after-tax). Therefore, the project is not financially attractive.

However, the project IRR (after-tax) including CDM revenue will be increased to [number] %, which is higher than the benchmark of 10%, and the project is financially feasible.

Item	Without CDM revenues	Benchmark (after-tax)	With CDM revenues
Project IRR(after-tax)	[number] %	10%	[number] %

Step 4 Sensitivity Analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding financial attractiveness is robust to reasonable variation in the critical assumption.

The following key parameters have been selected as sensitive indicators to test the financial attractiveness for the proposed project.

(1) Total static investment

(2) Annual electricity delivered to the grid

(3) Electricity tariff (including VAT) and

(4) Annual O & M cost

As shown in the sensitivity analysis, within a reasonable range of fluctuation, from -10%~+10%, the project IRR (after-tax) could not reach the benchmark of 10% and the additionality of the project would not be affected.

Table B-2 Sensitivity analysis of the Proposed Project (without CDM revenue)

Range / Parameters	-10.0%	-5.0%	0.0%	5.0%	10.0%
Total static investment	[number]	[number]	[number]	[number]	[number]
Annual electricity delivered to the grid	[number]	[number]	[number]	[number]	[number]
Electricity tariff (including VAT)	[number]	[number]	[number]	[number]	[number]
Annual O & M cost	[number]	[number]	[number]	[number]	[number]

Table B-2 has shown that none of variations can increase the project IRR (after-tax) of the CPA to be higher than the benchmark IRR 10%. Therefore, the sensitivity analysis strongly and consistently supports the conclusion that the CPA activity is unlikely to be financially attractive and can be considered to be additional.

The project IRR (after-tax) could reach to the benchmark of 10% in case the four key parameters could vary in the following extent:

Table B-3 Variations to reach the benchmark (without CDM revenue)

Parameters	Variation	Value	Unit
Total static investment	[number]	[number]	10^4 RMB
Electricity tariff (including VAT)	[number]	[number]	RMB/kWh
Annual O & M cost	[number]	-	10^4 RMB
Annual electricity delivered to the grid	[number]	[number]	MWh

Total static Investment

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing total static investment.]

Electricity Tariff

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing electricity tariff.]

Annual O&M cost

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing annual O&M cost.]

Annual Electricity Delivered to the grid

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing the amount of annual electricity delivered to the grid.]

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>
1. Project emission (PE_y)
According to AMS.I.D (version 17.0.0), For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, calculated based on the baseline methodology ACM0002 (version 13.0.0), the specific calculation process is as follows:

(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000} \quad (1)$$

Where:

$PE_{HP,y}$	Project emissions from water reservoirs (tCO$_2$e/yr)
EF_{Res}	Default emission factor for emissions from reservoirs of hydro power plants in year *y* (kgCO$_2$e/MWh)
TEG_y	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2

$$PE_{HP,y} = 0 \quad (2)$$

The power density (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (3)$$

Where:

PD	Power density of the project activity (W/m^2)
Cap_{PJ}	Installed capacity of the hydropower plant after the implementation of the project activity (W)
Cap_{BL}	Installed capacity of the hydropower plant before the implementation of the project activity (W)
A_{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2)

2. Baseline emission (BE_y)

The CPA involved capacity addition project activities

As per AMS.I.D ver.17, in the specific case of capacity addition in hydro plants where power generation can vary significantly from year to year, due to natural variations in the availability of the renewable source, the use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that

the calculated emission reductions are attributable to the project activity. The baseline emissions ($BE_{capacity\ addition,\ CO2,\ y}$) are thus calculated as follows:

$$BE_{capacity\ addition,\ CO2,\ y} = [EG_{BL,\ capacity\ addition,\ y}] * EF_{CO2} \quad (4)$$

Where:

$$EG_{BL,\ capacity\ addition,\ y} = EG_{PJ,\ facility,\ y} - (EG_{historical} + \sigma_{historical}) \quad (5)$$

$$EG_{BL,\ capacity\ addition,\ y} = 0 \text{ on/after } DATE_{Baseline\ Capacity\ addition} \quad (6)$$

Where:

EGBL, capacity addition, y	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh).
$EG_{PJ,\ facility,y}$	Quantity of net electricity supplied to the grid by the project plant/unit in year y (MWh)
$EG_{historical}$	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh) Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e. by 5% or more), shall be used. To determine $EG_{historical}$, project participants may choose between the following two historical periods (This allows some flexibility; the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years). (a) The three last calendar years (five calendar years for hydro project) prior to the implementation of the project activity; or (b) The time period from the calendar year following DATEhist, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least three calendar years (five calendar years for hydro project), where DATEhist is latest point in time between: (i) The commercial commissioning of the plant/unit; (ii) If applicable: the last capacity addition to the plant/unit; or (iii) If applicable: the last retrofit of the plant/unit
$\sigma_{historical}$	Standard deviation of the annual average historical net electricity supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)
$DATE_{Baseline\ Capacity\ addition}$	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date) $DATE_{Baseline\ Capacity\ addition}$ will be estimated as the following

	approaches: (a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.; (b) The common practices of the responsible company regarding capacity addition schedules may be evaluated and documented, e.g. based on historical capacity addition records for similar equipment. The point in time when the existing equipment would need to be capacity addition in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

Tool to Calculate the Emission Factor for An Electricity System (version 03.0.0) determines the CO_2 emission factor for the displacement of electricity generated by power plants in SCPG, by calculating the "combined margin" emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the operating margin (OM) and the build margin (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the project. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed project.

The following steps are applied to calculate the emission factor of SCPG:

Step 1. Identify the relevant electric system

According to the definition of project boundary by AMS-I.D. (Version 17), the spatial extent of the project boundary includes the project and all power plants connected to the project electricity system that the project is connected to.

Based on "Tool to calculate the emission factor for an electricity system" (Version 03.0.0), the "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project and that can be dispatched without significant transmission constraints. Furthermore, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

In this specific case, the project finally displaces the power generated by the South China Power Grid. According to "2012 Baseline Emission Factors for Regional Power Grids in China" from China DNA renewed on 15th Oct 2012[8], the delineation of SCPG covers Yunnan, Guizhou, Guangxi, Guangdong, and Hainan provincial grids. The electricity generated by the project will be transferred to the SCPG. In addition, the SCPG which does not involve generation power output to other grid, but imports electricity from Central China Power Grid (CCPG). Therefore, the CCPG is also identified as the connected electricity system and will be taken into account for calculating OM emission factor of the SCPG. And the CO_2 emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options for the purpose of determining the operating margin emission factor:

(a) 0 t CO_2/MWh; or

(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4, if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or

[8] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

(c) The simple adjusted operating margin emission rate of the exporting grid; or

(d) The weighted average operating margin (OM) emission rate of the exporting grid.

According to Chinese DNA's "2012 Baseline Emission Factors for Regional Power Grids in China", Option (b) is selected to determine the CO_2 emission factors for net electricity imports from the CCPG.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, i. e. the SCPG, as there are no recent or likely future additions to transmission capacity that would enable significant increases in imported electricity; the data in Appendix 4 shows that imports are relatively small and have not changed significantly in the period covered. Therefore, the transmission capacity is not considered a build margin source.

The baseline emissions factor ($EF_{grid,\ CM,y}$) is calculated as the average of the operating margin emissions factor and the build margin emissions factor. The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as China DNA.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

Option II: Both grid power plants and off-grid power plants are included in the calculation

Option I corresponds to the procedure contained in earlier versions of this tool. Option II allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.

Option II requires collecting data on off-grid power generation and can only be used if the conditions outlined therein are met. Option II may be chosen only for the operating margin emission factor or for both the build margin and the operating margin emission factor but not only for the build margin emission factor.

If Option II is chosen, off-grid power plants should be classified as per relevant guidance indifferent classes of off-grid power plants. Each off-grid power plant class should be considered as one power plant j, k, m or n in the following steps, as applicable.

Following the guideline of the DNA, and the statistical data available, Option I is chosen.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM

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

Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. In China, they include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

According to the data from China Power Yearbook 2007 ~ 2011, the proportion of the low-cost/must run resources in the total grid electricity of SCPG was 29.75%, 29.28%, 36.07%, 32.36% and 28.07% respectively, because the low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years in SCPG, therefore, the simple OM method (option a) is used to calculate OM emission factor for the proposed project.

For the simple OM method, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required 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 preceding 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.

For the CPA, "Ex ante option" is chosen: the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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.

For the calculation of the emission of electricity input from Central China Power Grid (CCPG) to SCPG, the simple OM emission factor of CCPG is applied.

Step 4: Calculate the OM emission factor according to the selected method

The Simple OM emission factor ($EF_{OM,\ simple}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. As the fuel consumption data for each power plant/unit is not available in China, Option A is not applicable. Total net electricity generation of all power plants serving the Southern China Power Grid and the fuel types and total fuel consumption of the Southern China Power Grid are available from *China electric power yearbook* and *China energy statistical yearbook*, and the following conditions can be satisfied:

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

So, the project uses Option B for calculating the simple OM emission factor as follows:

$$EF_{\text{gird, OM simple,y}} = \frac{\sum_i (FC_{i,y} \times NVC_{i,y} \times EF_{CO_2,i,y})}{EG_y} \qquad (7)$$

Where:

$EF_{\text{gird, OM simple,y}}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
$NVC_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO_2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh);
i	All fossil fuel types combusted in power sources in the project electricity system in year *y*;
y	The relevant year as per data vintage chosen in Step 3.

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, one of the following two options can be chosen to calculate the build margin emission factor:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the proposed project, option 1 is chosen to calculate build margin emission factor, and the capacity additions from retrofits of power plants is not be included in the calculation of the build margin emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEGSET-≥20%, in MWh);

(c) From $SET_{5\text{-units}}$ and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricitygeneration of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set

($SET_{sample\text{-}CDM\text{-}>10yrs}$).

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (8)$$

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year y (tCO_2/MWh);

$EG_{m,y}$:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$FE_{EL,m,y}$:	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
m:	Power units included in the build margin;
y :	Most recent historical year for which power generation data is available

In China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Taking the notice of the situation, EB accepted the following deviation[9]:

(1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity, i.e. the capacity addition over 1~3 years, whichever results in a capacity addition that is closed to 20% of total installed capacity.

(2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors for commercially available best practice technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

The build margin calculations featured below is derived from "2012 Baseline Emission Factors for Regional Power Grids in China", which has been renewed by the Chinese DNA on 15 Oct, 2012 and accepted by EB.

Therefore for the proposed project: First, calculate the share of different power generation technology in recent capacity additions; second, calculate the weight for capacity additions of each power generation technology; and finally, calculate the emission factor use the efficiency level of the best technology commercially available in China.

Because the generating capacity of the coal-fired, oil-fired and gas-fired technology cannot be separated from the existing statistical data, the BM calculation in this PoA-DD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in the SCPG.

Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the newly installed 20% capacity; the result is BM emission factor.

According to "Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0)" and the clarifications by EB, the main steps for BM calculation are as follows:

Sub-step 1: Calculation of weights of CO_2 emission by coal-fired, oil-fired and gas-fried plants in total CO2 emissions of SCPG.

$$\lambda_{coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (9)$$

$$\lambda_{oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (10)$$

9 http://cdm.unfccc.int/Projects/deviation

$$\lambda_{gas,y} = \frac{\sum_{i\in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (11)$$

Where:

$F_{i,j,y}$:	The total amount of fuel i (in a mass or volume unit) consumed by Province j in SCPG for power generation in year y;
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit);
$EF_{CO2,i,y}$:	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);

Coal, Oil and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step 2: Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of SCPG

The $EF_{thermal,y}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal,y} = \lambda_{coal,y} \times EF_{Coal,Adv,y} + \lambda_{oil,y} \times EF_{Oil,Adv,y} + \lambda_{gas,y} \times EF_{Gas,Adv,y} \quad (12)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Annex 4).

According to the data issued by China DNA, efficiencies of 39.65% for coal power plants and 51.93% for oil or gas power plants are defined as the best technology commercially available in China. The percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as formula (10) (11) (12): $\lambda_{Coal,y}$ =93.59%，$\lambda_{Oil,y}$ =0.84%，$\lambda_{Gas,y}$ =5.57%.

Sub-step 3: Calculation of Build Margin (BM) emission factor of SCPG

Finally, weighted average build margin emission factor ($EF_{grid,BM,y}$) are calculated by multiplying the $EF_{thermal\ power}$ with the weight of new capacity addition by thermal power of total capacity addition in SCPG.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (13)$$

Where:

$CAP_{Total,y}$:	The total capacity addition of SCPG from China Electric Power Yearbook (2009~2011);
$CAP_{Thermal,y}$:	The capacity addition by thermal power of SCPG from China Electric Power Yearbook (2009~2011).

For the detailed information, please see the Appendix 4

The method of OM and BM calculation above refer to official website:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

Step 6. Calculate the Combined Margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The proposed project uses method (a) weighted average CM to calculate the combined margin emission factor, as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (14)$$

Where:

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

The weight W_{OM} and W_{BM} are taken both by 0.5 for the first crediting period of the CPA; and W_{OM} =0.25 and W_{BM} =0.75 for the second and third crediting period of the CPA. For the detailed calculation, please refer to specific CPA-DD.

3. Leakage of the Proposed Project (LE_y)

The energy generating equipment is not transferred from another activity, according to AMS.I.D (version 17), so leakage (LE_y) is not to be considered.

4. Emission Reductions (ER_y)

The emission reductions ER_y by the proposed project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to the leakage (LE_y), as follow:

$$ER_y = BE_y - PE_y - LE_y \quad (15)$$

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$F_{i,y}/F_{i,j,y}$
Unit	t or m^3
Description	The total amount of fuel *i* (in a mass or volume unit) consumed by Province *j* in SCPG for power generation in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics; publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{historical}$
Unit	MWh
Description	Annual average historical of net electricity generation delivered to the grid by the existing renewable energy plant that was operated

	at the project site prior to the implementation of the project activity. A minimum of 5 years (excluding abnormal years) of historical generation of data is required in the case of hydro facilities.
Source of data	Project activity site (The average of generated electricity exported to the grid by the existing units in the most recent 5 years.
Value(s) applied	-
Choice of data or Measurement methods and procedures	Electricity meters
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$\sigma_{historical}$
Unit	MWh/yr
Description	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.
Source of data	Calculated from data used to establish $EG_{historical}$
Value(s) applied	-
Choice of data or Measurement methods and procedures	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement project activities
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$DATE_{Baseline\ Capacity\ addition}$
Unit	date
Description	The time when the existing equipment would need to be replaced in the absence of the project activity
Source of data	Project activity site
Value(s) applied	-
Choice of data or Measurement methods and procedures	It is determined as the following approaches: (a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.; (b) The common practices of the responsible company regarding replacement/retrofitting schedules may be evaluated and documented, e.g. based on historical capacity addition records for similar equipment. The point in time when the existing equipment would need to be capacity addition in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.
Purpose of data	Calculation of baseline emissions.

Additional comment	-

Data / Parameter	$EG_{j, y}$
Unit	MWh
Description	The electricity output (MWh) supplied to the grid by the Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	NCV_i
Unit	kj/kg or kj/m^3
Description	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data	China Energy Statistical Yearbook 2011
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official data, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EF_{co2, i, y}$
Unit	t CO_2/TJ
Description	CO_2 emission factor per energy unit of fuel *i* in year *y*
Source of data	Table1.3and Table1.4 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	As the national value is unavailable, IPCC default is used.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$Cap_{j, y}$
Unit	MW
Description	The installed capacity of Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook(2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.

Additional comment	-

Data / Parameter	EF_{Res}
Unit	$kgCO_2e/MWh$
Description	Default emission factor for emissions from reservoirs
Source of data	Decision by EB23
Value(s) applied	90 $kgCO_2e/MWh$
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	$\eta_{Adv,\ i}$
Unit	%
Description	The efficiency level of the best technology for each fuel type commercially available in China.
Source of data	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2551.doc
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	MW
Description	Installed capacity of the hydropower plant before the implementation of the project activity.
Source of data	Project site
Value(s) applied	-
Choice of data or Measurement methods and procedures	FSR/PDR
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of project activity, when the reservoir is full (m^2).
Source of data	Project site
Value(s) applied	-
Choice of data or Measurement methods and procedures	FSR/PDR

Purpose of data	Calculation of project emissions.
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions
>>

Baseline emissions

Based on the Tool to Calculate the Emission Factor for an Electricity System (03.0.0) and data from Section D.6.1, the figures of emission factors of the SCPG are as follows:

- $EF_{grid,OM,y}$=0.9344 tCO_2e/MWh;
- $EF_{grid,BM,y}$ =0.3791 tCO_2e/MWh;
- $EF_{grid,CM,y}= EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ =0.9344*0.5+0.3791*0.5=0.65675 tCO_2e/MWh.

The baseline emissions ($BE_{capacity\ addition，CO2，y}$) are calculated as follows:

(1) $EG_{BL,\ capacity\ addition,\ y}= EG_{PJ,\ facility,\ y} - (EG_{historical} + \sigma_{historical})$

$= (EG_{PJ,\ export,\ y} - EG_{PJ,\ import,\ y}) - (EG_{historical} + \sigma_{historical})$

= ([XXX] – [XXX]) – ([XXX] – [XXX]) = [XXX] MWh.

$EG_{BL,\ capacity\ addition,\ y}$ =0 on/after $DATE_{Baseline\ Capacity\ addition}$

(2) $BE_{capacity\ addition,\ CO2,\ y}= [EG_{BL,\ capacity\ addition,\ y}]*EF_{CO2}$

= [XXX] MWh*0.65675 tCO_2e/MWh = [XXX] tCO_2e.

Project emissions

According to the project type, project emissions will be done in each specific CPA-DD on the basis of the equations in Section B.6.1 above.

Leakage

According to the methodology AMS-I.D. (version 17), the CPA does not refer to leakage emissions, so the leakage emissions are zero, LE_y=0.

Emission reductions

The emission reductions ER_y of the project activity is calculated as the baseline emission (BE_y) minus the emission of the proposed activity (PE_y) and the emission due to leakage (LEy).

So, $ER_y = BE_y - PE_y - LE_y$ = [XXX] tCO_2e.

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	$EG_{PJ,\ export,\ y}$
Unit	MWh
Description	Quantity of electricity supplied to the SCPG by the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording

QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{PJ, import, y}$
Unit	MWh
Description	Quantity of electricity imported from the SCPG to the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording.
QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{PJ, facility, y}$
Unit	MWh
Description	Total net generated electricity supplied to SCPG by the existing station and the proposed project to the grid in year y.
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	-
Monitoring frequency	hourly measurement and at least monthly recording
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	Cap_{PJ}
Unit	MW
Description	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Will be checked by the nameplate
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.

Additional comments	-

Data / Parameter	A_{PJ}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Measured by the qualified design institute.
Monitoring frequency	yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA

>>

1. Purpose

The monitoring plan is to serve as a guideline for the CPA implementer to monitor and calculate the emission reductions of the project under the CPA. Baseline emission factor of the project is determined ex ante.

For project activities involved capacity addition: $EG_{PJ,\ import,\ y}$, $EG_{PJ,\ export,,y}$ and $EG_{PJ,\ facility,\ y}$ will be monitored.

For project activities with reservoir, A_{PJ} and Cap_{PJ} calculated for project emission also will be monitored.

2. Management structure of monitoring

The CPA implementer will organize a monitoring team according to the monitoring manual which provided by the CME, and the detailed responsibility of each section is as below:

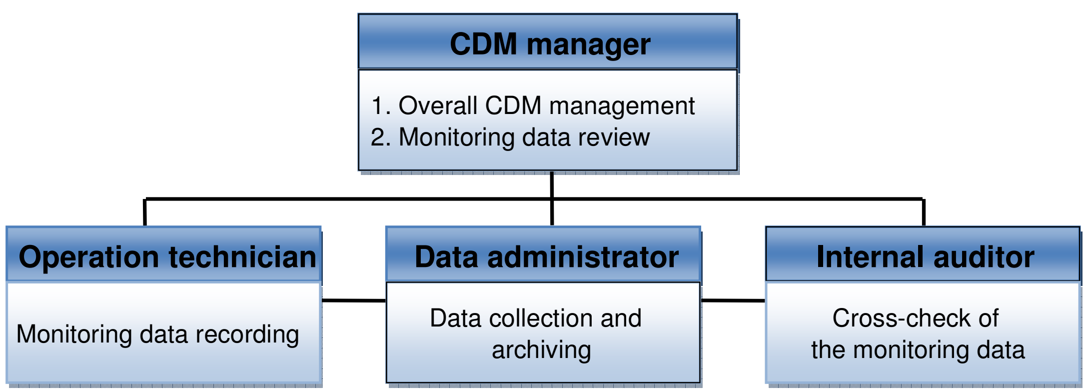

Figure B-2 Monitoring management structure

CDM manager is the team leader and responsible for the overall CDM management and data review;

Operation technician is responsible for monitoring data recording;

Data administrator is responsible for data collection, archiving;

Internal auditor is responsible for cross-check of the submitting monitoring data.

3. Equipment and Installation of Monitoring

Distribution and calibration of electric meter will be implemented according to the technical requirements of Technical administrative code of electric energy metering (DL/T448-2000).

The accuracy of the meters should not be less than 0.5S.

4. Data collection management

The project owner and the local power grid company will read the meters and record the data on a regular basis. The monitored data will be archived electronically each month. The project owner also needs to keep the original and backup copies of electricity sales and purchase receipts provided by the power grid company periodically for cross check.

All written documents such as diagrams, reports should be stored and available to the verifier so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

5. QA/QC

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to relevant national and industrial regulations. After the project operation, the meters should be annually calibrated in accordance with the relevant national and industrial regulations by an independent qualified calibration entity.

Data and records will be checked prior to being recorded and archived, and possible errors would be identified in this step. In case the main meter operates abnormally, the readings from the back up meter will be adopted. If the backup meter is not within acceptable limits of accuracy or performed improperly, the project owner and the grid company shall choose a reasonable reading through negotiation. If both main and back-up meters are out of work, the data monitored within this certain period shall not be counted.

The monitoring equipments are the bidirectional electric meters. $EG_{PJ,\ import,\ y}$, $EG_{PJ,\ export,\ y}$ and $EG_{PJ,\ facility,\ y}$ of proposed project will be hourly measured and at least monthly recorded.

The new addition installed capacity of the hydropower plant (Cap_{PJ}), after the implementation of the project activity, will be monitored based on nameplate or technical agreement of turbine and generator every year.

The surface area of the reservoir measured in the surface of the water (A_{PJ}), after the implementation of the project activity, when the reservoir is full, will be measured regularly every year by a qualified third entity.

The monitoring data will be forwarded to the internal auditor for the cross-check after review of the manager, $EG_{PJ,\ import,\ y}$, $EG_{PJ,\ export,\ y}$ and $EG_{PJ,\ facility,\ y}$ from meter records will be cross-checked against the electricity sales receipts.

6. Training

The team members of the monitoring team will be trained by CME before the operation of the project as per the monitoring and management manual. If the personnel alternation happens, the new staffs will receive the same training before work.

PART IV. Generic component project activity (CPA)—Scenario 3

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

>>

CPA[XXX-XXX] Hydropower Project (hereafter referred to as the CPA) is the [XXX] CPA under the PoA, which consist of [XXX] small scale project activity (ies) located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province, P.R.China, and invested by [XXX] Co., Ltd.. The small scale project activity (ies) is (are) involved retrofit of the existing hydropower plant, The installed capacity of the existing hydropower plant is [XXX] MW and the installed capacity after retrofit of hydropower plant is [XXX] MW. The number of estimated annual operation hours is [XXX] h, which results in a plant load factor (PLF) of [XXX], the estimated annual average net electricity delivered to the grid is about [XXX] MWh.

The CPA is aimed at generating electricity by using renewable hydro power, the electricity generated will be delivered to the Southern China Power Grid (SCPG) and replace equivalent electricity generated by fossil fuel-fired power plants connected to the SCPG, therefore greenhouse gas (GHG)emissions will be reduced. The estimated annual GHG emission reductions are [XXX] tCO_2e.

The CPA will not only supply renewable electricity to grid, but also contribute to the sustainable development of the local community and the host country by means of:

- Improvement of global and local air quality by reducing GHG and air pollutants (e.g. SO_2, NOx and particulates) emissions from the combustion of fossil fuels that will be replaced by the hydropower power station which uses clean and renewable energy source;

- Through the Substituting Fuel with Small Hydropower Electricity Project, reduce wood demand from the rural energy, consolidating the achievement of Converting Cropland to Forest, protect forests and improve the ecological environment;

- Creating new short-term and long-term job opportunities for the local residents and increasing their incomes during project construction and operation;
- Improving electricity supply for residential in the project area and promoting local economy development.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

The approved baseline and monitoring methodology AMS-I.D. (version 17) *Grid connected Renewable Electricity Generation* is applied to for the CPA under the PoA and PoA development.

Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0) are also applied.

More information about the methodology and tools please refer to the following link:

http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

B.2. Application of methodology(ies)

>>

The applicability criteria of the methodology are defined and addressed as follows:

Applicability criteria of Methodology AMS-I.D. (version 17)	Applicable Analysis of the CPAs under this PoA
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supply electricity to a national or a regional grid; or (b) Supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.
Respective situations under which each of the methodology (i.e.AMS-I.D, AMS-I.F and AMS-I.A) applies	The small scale hydropower plants under the CPA supply electricity to a regional grid.
This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of a (an) existing plant(s)	The CPA will belong to (c) Involve a retrofit of (an) existing plant(s).
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emission section, is greater than $4W/m^2$; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emission section, is greater than $4W/m^2$	As per inclusion criteria, The CPA should comply with one of the following conditions: • The CPA is implemented in an existing reservoir with no change in the volume of reservoir; • The CPA is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2; • The CPA results in a new reservoir and the power density of the power plant is [XXX] W/m^2, which is greater than 4 W/m^2.
If the new unit has both renewable and non-renewable components, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit con-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW	The CPA will be exclusively hydropower plants without no-renewable components and the total installation capacity of the CPA is [XXX] MW during every year of the crediting period, which is less than the eligibility limit of 15MW for a small-scale CDM project activity.
Combined heat and power (co-generation) systems are not eligible under this category	The CPA is not co-generation project.
For addition of the installed capacity project activity: In the case of project activities that involve the addition of the renewable energy generation units at an existing renewable power generation facility,	The CPA is not involved the addition of the renewable energy generation units at an existing renewable power generation facility. So it is not applicable to this criterion.

the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units	
For the retrofit or replacement of the existing plant: In case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15MW	The new installed capacity of the hydropower plant under the CPA involved retrofit during every year of the crediting period is lower than 15MW

B.3. Sources and GHGs

>>

	Source	Gas	Included	Justification/Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	**CO_2**	**Yes**	Main Emission Source
		CH_4	**No**	Minor emission source
		N_2O	**No**	Minor emission source
Project Activity	Emission caused by the proposed project	**CO_2**	**No**	Minor emission source
		CH_4	**No**	The power density of the project activity is [XXX] W/m^2, which is greater than 10 W/m^2 Minor emission source
			Yes	The power density of the project activity is [XXX] W/m^2, which is greater than 4 W/m^2 and less than or equal to 10 W/m^2 Main emission source.
		N_2O	**No**	Minor emission source

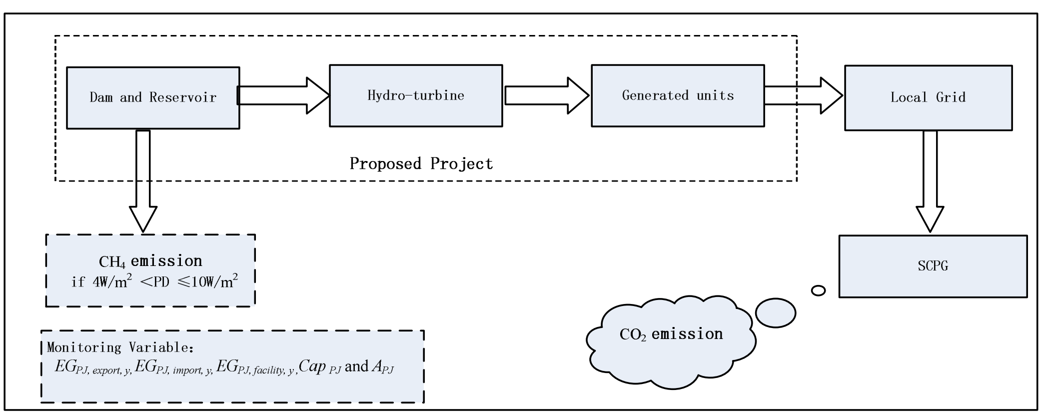

Figure B-1 Project boundary of project activity under the PoA

B.4. Description of baseline scenario
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As per paragraph 10 AMS-I.D. (version 17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

B.5. Demonstration of eligibility for a generic CPA
>>
Demonstration how each generic CPA meets the eligibility criteria of the PoA:

No.	Eligibility criteria for inclusion of a CPA in the PoA	Situation of CPA	Applicable (Y/N)
(a)	The CPA is located within the boundary of Guizhou Province.	As per approved PDR/FSR,The CPA is located in [XXX] Village, [XXX] Township, [XXX] County, Guizhou Province	Y
(b)	The CPA has a unique geographic coordinates and it is neither a CPA of another PoA nor registered (incl. application for registration) as a CDM project activity.	According to the confirmation by checking with UNFCCC website CDM pipeline, PoA pipeline and DNA by the CME, the CPA has exclusive ID information. The CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and ensures that the CPA is not and will not be another CDM project or a CPA of another PoA.	Y
(c)	The CPA is either a green-field hydropower plant, or capacity addition or retrofit of an existing hydropower plant.	The CPA is consisted of involving retrofit of existing plants.	Y
(d)	The start date of CPA is after 05/02/2013 (i.e. the date of publication of the PoA-DD for global stakeholder consultation and therefore identified as the start date of the PoA).	The start date of CPA is identified as [dd/mm/yyyy], which is the earliest date at which either the implementation or construction or real action of the CPA begins. This date is after 05/02/2013.	Y
(e)	The CPA meets the applicable conditions of AMS-I.D Grid connected renewable electricity generation, Version 17.0	The CPA meets the applicability criteria of the methodology AMS-I.D Grid connected renewable electricity generation (version 17). The detailed demonstration is shown in the earlier section B.2. Application of methodology (ies).	Y
(f)	The CPA is demonstrated additional either in line with "Guidelines on the demonstration of additionality of small-scale project activities,	The CPA with <5 MW installed capacity is located in a special underdeveloped zone of China，so it is deemed to be additional; Otherwise:	Y

	Version 09.0" or "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0"	The investment analysis will be applied to address additionality. And the project IRR (after-tax) is [XXX] lower than the benchmark of 10% of the project IRR (after-tax), therefore the project activity is financial unattractive without the CDM revenue. The detailed demonstration is shown right after the table.	
(g)	Local stakeholder consultation and environmental impact assessment have been conducted, as a result, no one is against the development of the CPA and the CPA is in line with the relevant environmental regulations.	The local stakeholder's consultation of the CPA had been carried out and as the information of questionnaire or meeting records, no one objected to implementation of the CPA. The approval of the CPA Environmental Impact Assessment had been obtained.	Y
(h)	The CPA does not involve any public funding from Annex I countries	The declaration from CPA implementer confirmed that the CPA are not sponsored by any funding from Annex I parties.	Y
(i)	The CPA supplies electricity to a national or regional grid	The CPA comprised renewable energy (hydropower) generation units supply generated electricity to SCPG.	Y
(j)	Sampling is not required for the CPA	Not applicable	
(k)	The CPA (in aggregate if it comprises of independent sub units) meets the small-scale threshold of 15MW or micro-scale threshold of 5MW throughout the crediting period	The installed capacity of the CPA is [XXX] MW as per approved PDR, which is less than 15MW/5MW, and the installed capacity will be continuously monitored throughout the crediting period.	Y
(l)	The CPA is not a de-bundled component of a large scale project activity	Through checking with UNFCCC website, CDM pipeline and the statement from the CPA implementer, it should be confirmed that the CPA is not a de-bundled component of a large scale project activity.	Y
(m)	The implementation of the CPA is in line with relevant national and local regulations	The CPA is a renewable electricity project which is encouraged by the host country for energy saving. Furthermore, PDR/FSR and EIA of the CPA has been approved by local governmental agencies as per national regulations.	Y
(n)	The CPA implementer agrees	The contract between the CME and the implementer of CPA had been	Y

	the inclusion of its CPA in the PoA and follows the monitoring requirements outlined in the PoA-DD	signed, the CPA implementer is aware and agrees with the inclusion of the CPA to the PoA and also confirm that they have not previously been a part of any CDM project or under other PoA.	
(o)	The energy generating equipment employed by the CPA is not transferred from/to another activity	There is no any energy generating equipment transferred from/to another activity in the CPA as per approved PDR.	Y

Confirmation of additionality of the generic CPA

(1) If the CPA has the installed capacity no more than 5MW and located in the special underdeveloped zone of the host country, it can be considered to be additional according to *Guidelines for Demonstrated Additionality of Micro-scale Project Activities* (version 04.0).

The definition of a SUZ region in accordance with the Para 2(a) of the "Guidelines for demonstrating additionality of micro-scale project activities, Version 04.0" satisfying either of the following conditions: 1) the proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%; 2) the GNI per capita in the country is less than USD 5000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures. If the geographic location of the CPA with installed capacity below 5 MW satisfied the first condition above mentioned The CPA will be considered with additionality. And the eligibility will be proved in each CPA.

(2) If the CPA has the installed capacity>5MW or ≤5MW but not located in the poverty county, it should be demonstrated according to *Guidelines on the Demonstration of Additionality of Small-scale Project Activities* (EB68 Annex27, version 09.0). Investment barrier analysis will be adopted to demonstrate the CPA's additionality.

The following steps are adopted for the investment analysis:

Step 1. Determine Appropriate Analysis Method

According to the *Tool for Demonstrate and Assessment of Additionality* (version 7), three analysis methods are available to conduct the investment analysis:

Option I: Simple cost analysis;

Option II: Investment comparison analysis; and

Option III: Benchmark analysis;

The simple cost analysis method (Option I) is not appropriate because the proposed project will get the revenues not only from CDM but also from the electricity sales. The investment comparison analysis is also not applicable, as the baseline scenario of the proposed project is the SCPG rather than a similar investment project alternative, the project owner has no investment options to compare with. So investment comparison analysis (Option II) is neither appropriate. As a result, Option III: Benchmark analysis is chosen to demonstrate and assess the additionality, since the data on the total investment IRR of Chinese power industry is available.

Step 2. Option III: Benchmark Analysis Method

The CPA faces a barrier to implement due to poor returns on investment. For this PoA, the financial indicator identified for a typical CPA is the project Internal Rate of Return (after-tax) which is indicator commonly used to determine investment decisions. According to *Economic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources

(Document No. SL16-10), the benchmark of small hydropower project (the installed capacity is under 50MW) IRR (after-tax) in China is 10%. If the project IRR (after-tax) is lower than 10%, the project is economically unattractive, facing prohibitive investment barrier.

Step 3. Calculation and Comparison of Financial Indicators

Based on the approved feasibility study report or the preliminary design report of the CPA, basic parameters for calculation of financial indicators are as follows:

Table B-1 Basic parameters for calculation of financial indicators

Parameter	Data	Unit	Sources
Existing installed capacity	[number]	MW	Approved FSR/PDR
The new installed capacity	[number]	MW	Approved FSR/PDR
Annual power generation	[number]	MWh	Approved FSR/PDR
On-grid power supply	[number]	MWh	Approved FSR/PDR
Project life time	[number]	years	Approved FSR/PDR
Total static investment	[number]	10^4RMB	Approved FSR/PDR
Loan Ratio of the Total Investment	[number]	%	Approved FSR/PDR
Loan Interest Rate	[number]	%	Approved FSR/PDR
Annual O&M costs	[number]	10^4RMB	Approved FSR/PDR
Electricity tariff (including VAT)	[number]	RMB/kWh	Approved FSR/PDR
Value added tax	[number]	%	Approved FSR/PDR
Income tax	[number]	%	Approved FSR/PDR
Urban Construction and maintenance tax	[number]	%	Approved FSR/PDR
Educational surtax	[number]	%	Approved FSR/PDR
Depreciation Rate	[number]	%	Approved FSR/PDR
Residual rate	[number]	%	Approved FSR/PDR

Calculation and comparison of the project IRR (after-tax) and the benchmark of the project IRR (after-tax)

Based on the data above, the project IRR (after-tax) without CDM revenues is shown in the following table. It is clear that without CDM revenue, the project IRR (after-tax) is only [number] %, which is lower than the benchmark of 10% of the project IRR (after-tax). Therefore, the project is not financially attractive.

However, the project IRR (after-tax) including expect CDM revenue will be increased to [number] %, which is higher than the benchmark of 10%, and the project is financially feasible.

Item	Without CDM revenues	Benchmark (after-tax)	With CDM revenues
Project IRR(after-tax)	[number]%	10%	[number] %

Step 4 Sensitivity Analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding financial attractiveness is robust to reasonable variation in the critical assumption.

The following key parameters have been selected as sensitive indicators to test the financial attractiveness for the proposed project.

(1) Total static investment

(2) Annual electricity delivered to the grid

(3) Electricity tariff (including VAT) and

(4) Annual O & M cost

As shown in the sensitivity analysis, within a reasonable range of fluctuation, from -10%~+10%, the project IRR (after-tax) could not reach the benchmark of 10% and the additionality of the project would not be affected.

Table B-2 Sensitivity analysis of the Proposed Project (without CDM revenue)

Range / Parameters	-10.0%	-5.0%	0.0%	5.0%	10.0%
Total static investment	[number]	[number]	[number]	[number]	[number]
Annual electricity delivered to the grid	[number]	[number]	[number]	[number]	[number]
Electricity tariff (including VAT)	[number]	[number]	[number]	[number]	[number]
Annual O & M cost	[number]	[number]	[number]	[number]	[number]

Table B-2 has shown that none of variations can increase the project IRR (after-tax) of the CPA to be higher than the benchmark of 10%. Therefore, the sensitivity analysis strongly and consistently supports the conclusion that the CPA activity is unlikely to be financially attractive and can be considered to be additional.

The project IRR (after-tax) of the project could reach to the benchmark of 10% in case the four key parameters could vary in the following extent:

Table B-3 Variations to reach the benchmark (without CDM revenue)

Parameters	Variation	Value	Unit
Total static investment	[number]	[number]	10^4RMB
Electricity tariff (including VAT)	[number]	[number]	RMB/kWh
Annual O & M cost	[number]	-	10^4RMB
Annual electricity delivered to the grid	[number]	[number]	MWh

Total static Investment

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing total static investment.]

Electricity Tariff

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing electricity tariff.]

Annual O&M cost

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through decreasing annual O&M cost.]

Annual Electricity Delivered to the grid

[This paragraph will demonstrate that it is unlikely to reach the benchmark of 10% through increasing the amount of annual electricity delivered to the grid.]

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>
1. Project emission (PE_y)
According to AMS.I.D (version 17.0.0), For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, calculated based on the baseline methodology ACM0002 (version 13.0.0), the specific calculation process is as follows:

(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000} \quad (1)$$

Where:

$PE_{HP,y}$	Project emissions from water reservoirs (tCO_2e/yr)
EF_{Res}	Default emission factor for emissions from reservoirs of hydro power plants in year *y* (kgCO_2e/MWh)
TEG_y	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (PD) is greater than 10 W/m^2

$$PE_{HP,y} = 0 \quad (2)$$

The power density (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (3)$$

Where:

PD	Power density of the project activity (W/m^2)
Cap_{PJ}	Installed capacity of the hydropower plant after the implementation of the project activity (W)
Cap_{BL}	Installed capacity of the hydropower plant before the implementation of the project activity (W)
A_{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2)

2. Baseline emission (BE_y)

For project activities that involve retrofits of an existing facility the baseline scenario is the continuing operation of the existing plant. The methodology uses historical electricity generation data to determine the electricity generation of the existing plant in the baseline scenario, assuming that the historical situation observed prior to the implementation of the project activity would continue. In the absence of the project activity, the existing facility would continue to provide electricity to the grid $EG_{BL,\ retrofit,\ y}$ at historical average levels $EG_{historical}$ until the time at which the electrical generation facility would be likely to be retrofitted in the absence of the project activity ($DATE_{Baseline\ Retrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity supply

is assumed to equal the project's net electricity supply and no emission reductions are assumed to occur.

If the CPA consists of a retrofit plant, where power generation can vary significantly from year to year, due to natural variations in the availability of the renewable source (e.g. varying rainfall), the use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity. Without this adjustment, the calculated emission reductions could mainly depend on the natural variability observed during the historical period rather than the effects of the project activity. The baseline emissions ($BE_{retrofit,\, CO_2,\, y}$) are thus calculated as follows:

$$BE_{retrofit,CO2,y} = [EG_{BL,retrofit,y}] * \mathrm{EF}_{\mathrm{CO2}} \quad (4)$$

Where:

$$EG_{BL,retrofit,y} = \mathrm{EG}_{\mathrm{PJ,\,facility,y}} - (\mathrm{EG}_{\mathrm{historical}} + \sigma_{\mathrm{historical}}) \quad (5)$$

$$EG_{BL,retrofit,y} = 0\ on/after\ DATE_{BaselineRretrofit} \quad (6)$$

Where:

$EG_{BL,retrofit,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh).
$\mathrm{EG}_{\mathrm{PJ,\,facility,y}}$	Quantity of net electricity supplied to the grid by the project plant/unit in year y (MWh)
$\mathrm{EG}_{\mathrm{historical}}$	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh) Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e. by 5% or more), shall be used. To determine $\mathrm{EG}_{\mathrm{historical}}$, project participants may choose between the following two historical periods (This allows some flexibility; the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years). (a) The three last calendar years (five calendar years for hydro project) prior to the implementation of the project activity; or (b) The time period from the calendar year following DATEhist, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least three calendar years (five calendar years for hydro project), where DATEhist is latest point in time between: (i) The commercial commissioning of the plant/unit; (ii) If applicable: the last capacity addition to the plant/unit; or

	(iii) If applicable: the last retrofit of the plant/unit
$\sigma_{historical}$	Standard deviation of the annual average historical net electricity supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)
$DATE_{Baseline\ Retrofit}$	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date) $DATE_{BaselineRetrofit}$ will be estimated as the following approaches: (a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.; (b) The common practices of the responsible company regarding retrofitting schedules may be evaluated and documented, e.g. based on historical retrofitting records for similar equipment. The point in time when the existing equipment would need to be retrofitted in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

Tool to Calculate the Emission Factor for An Electricity System (version 03.0.0) determines the CO_2 emission factor for the displacement of electricity generated by power plants in SCPG, by calculating the “combined margin” emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the operating margin (OM) and the build margin (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the project. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed project.

The following steps are applied to calculate the emission factor of SCPG:

Step 1. Identify the relevant electric system

According to the definition of project boundary by AMS-I.D. (Version 17), the spatial extent of the project boundary includes the project and all power plants connected to the project electricity system that the project is connected to.

Based on “Tool to calculate the emission factor for an electricity system” (Version 03.0.0), the “project electricity system” is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project and that can be dispatched without significant transmission constraints. Furthermore, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

In this specific case, the project finally displaces the power generated by the South China Power Grid. According to “2012 Baseline Emission Factors for Regional Power Grids in China” from China DNA renewed on 15th Oct 2012[10], the delineation of SCPG covers Yunnan, Guizhou, Guangxi, Guangdong, and Hainan provincial grids. The electricity generated by the project will be transferred to the SCPG. In addition, the SCPG which does not involve generation power

[10] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

output to other grid, but imports electricity from Central China Power Grid (CCPG). Therefore, the CCPG is also identified as the connected electricity system and will be taken into account for calculating OM emission factor of the SCPG. And the CO_2 emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options for the purpose of determining the operating margin emission factor:

(a) 0 t CO_2/MWh; or

(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4, if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or

(c) The simple adjusted operating margin emission rate of the exporting grid; or

(d) The weighted average operating margin (OM) emission rate of the exporting grid.

According to Chinese DNA's "2012 Baseline Emission Factors for Regional Power Grids in China", Option (b) is selected to determine the CO_2 emission factors for net electricity imports from the CCPG.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, i. e. the SCPG, as there are no recent or likely future additions to transmission capacity that would enable significant increases in imported electricity; the data in Appendix 4 shows that imports are relatively small and have not changed significantly in the period covered. Therefore, the transmission capacity is not considered a build margin source.

The baseline emissions factor ($EF_{grid, CM, y}$) is calculated as the average of the operating margin emissions factor and the build margin emissions factor. The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as China DNA.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

Option II: Both grid power plants and off-grid power plants are included in the calculation

Option I corresponds to the procedure contained in earlier versions of this tool. Option II allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.

Option II requires collecting data on off-grid power generation and can only be used if the conditions outlined therein are met. Option II may be chosen only for the operating margin emission factor or for both the build margin and the operating margin emission factor but not only for the build margin emission factor.

If Option II is chosen, off-grid power plants should be classified as per relevant guidance indifferent classes of off-grid power plants. Each off-grid power plant class should be considered as one power plant j, k, m or n in the following steps, as applicable.

Following the guideline of the DNA, and the statistical data available, Option I is chosen.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM

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

Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. In China, they include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

According to the data from China Power Yearbook 2007~ 2011, the proportion of the low-cost/must run resources in the total grid electricity of SCPG was 29.75%, 29.28%, 36.07%, 32.36% and 28.07% respectively, because the low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years in SCPG, therefore, the simple OM method (option a) is used to calculate OM emission factor for the proposed project.

For the simple OM method, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required 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 preceding 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.

For the CPA, "Ex ante option" is chosen: the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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.

For the calculation of the emission of electricity input from Central China Power Grid (CCPG) to SCPG, the simple OM emission factor of CCPG is applied.

Step 4: Calculate the OM emission factor according to the selected method

The Simple OM emission factor ($EF_{OM,\ simple}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. As the fuel consumption data for each power plant/unit is not available in China, Option A is not applicable. Total net electricity generation of all power plants serving the Southern China Power Grid and the fuel types and total fuel consumption of the Southern China Power Grid are available from *China electric power yearbook* and *China energy statistical yearbook*, and the following conditions can be satisfied:

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

So, the project uses Option B for calculating the simple OM emission factor as follows:

$$EF_{\text{gird, OM simple, y}} = \frac{\sum_i (FC_{i,y} \times NVC_{i,y} \times EF_{CO_2,i,y})}{EG_y} \qquad (7)$$

Where:

$EF_{\text{gird, OM simple,y}}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
$NVC_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO_2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh);
i	All fossil fuel types combusted in power sources in the project electricity system in year *y*;
y	The relevant year as per data vintage chosen in Step 3.

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, one of the following two options can be chosen to calculate the build margin emission factor:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up

to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the proposed project, option 1 is chosen to calculate build margin emission factor, and the capacity additions from retrofits of power plants is not be included in the calculation of the build margin emission factor.

The sample group of power unit m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEGSET-≥20%, in MWh);

(c) From $SET_{5\text{-units}}$ and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power unit m used to calculate the build margin is the resulting set

($SET_{sample\text{-}CDM}$->10yrs).

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (8)$$

Where:

$EF_{grid,BM,y}$:	Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EG_{m,y}$:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$FE_{EL,m,y}$:	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
m:	Power units included in the build margin;
y :	Most recent historical year for which power generation data is available

In China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Taking the notice of the situation, EB accepted the following deviation[11]:

(1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity, i.e. the capacity addition over 1~3 years, whichever results in a capacity addition that is closed to 20% of total installed capacity.

(2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors for commercially available best practice technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

The build margin calculations featured below is derived from “2012 Baseline Emission Factors for Regional Power Grids in China”, which has been renewed by the Chinese DNA on 15 Oct, 2012 and accepted by EB.

Therefore for the proposed project: First, calculate the share of different power generation technology in recent capacity additions; second, calculate the weight for capacity additions of each power generation technology; and finally, calculate the emission factor use the efficiency level of the best technology commercially available in China.

Because the generating capacity of the coal-fired, oil-fired and gas-fired technology cannot be separated from the existing statistical data, the BM calculation in this PoA-DD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in the SCPG.

Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the newly installed 20% capacity; the result is BM emission factor.

According to “Tool to Calculate the Emission Factor for an Electricity System (Version 03.0.0)” and the clarifications by EB, the main steps for BM calculation are as follows:

Sub-step 1: Calculation of weights of CO_2 emission by coal-fired, oil-fired and gas-fried plants in total CO2 emissions of SCPG.

[11] http://cdm.unfccc.int/Projects/deviation

$$\lambda_{coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (9)$$

$$\lambda_{oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (10)$$

$$\lambda_{gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (11)$$

Where:

$F_{i,j,y}$:	The total amount of fuel *i* (in a mass or volume unit) consumed by Province *j* in SCPG for power generation in year y;
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO2,i,y}$:	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);

Coal, Oil and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step 2: Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of SCPG

The $EF_{thermal,y}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal,y} = \lambda_{coal,y} \times EF_{Coal,Adv,y} + \lambda_{oil,y} \times EF_{Oil,Adv,y} + \lambda_{gas,y} \times EF_{Gas,Adv,y} \quad (12)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Annex 4).

According to the data issued by China DNA, efficiencies of 39.65% for coal power plants and 51.93% for oil or gas power plants are defined as the best technology commercially available in China. The percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as formula (10) (11) (12): $\lambda_{Coal,y}$ =93.59%， $\lambda_{Oil,y}$ =0.84%， $\lambda_{Gas,y}$ =5.57%.

Sub-step 3: Calculation of Build Margin (BM) emission factor of SCPG

Finally, weighted average build margin emission factor ($EF_{grid,BM,y}$) are calculated by multiplying the $EF_{thermal\ power}$ with the weight of new capacity addition by thermal power of total capacity addition in SCPG.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (13)$$

Where:

$CAP_{Total,y}$:	The total capacity addition of SCPG from China Electric Power Yearbook (2009~2011);
$CAP_{Thermal,y}$:	The capacity addition by thermal power of SCPG from China Electric Power Yearbook (2009~2011).

For the detailed information, please see the Appendix 4

The method of OM and BM calculation above refer to official website:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

Step 6. Calculate the Combined Margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid, CM, y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The proposed project uses method (a) weighted average CM to calculate the combined margin emission factor, as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (14)$$

Where:

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

The weight W_{OM} and W_{BM} are taken both by 0.5 for the first crediting period of the CPA; and W_{OM} =0.25 and W_{BM} =0.75 for the second and third crediting period of the CPA. For the detailed calculation, please refer to specific CPA-DD.

3. Leakage of the Proposed Project (LE_y)

The energy generating equipment is not transferred from another activity, according to AMS.I.D (version 17), so leakage (LE_y) is not to be considered.

4. Emission Reductions (ER_y)

The emission reductions ER_y by the proposed project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to the leakage (LE_y), as follow:

$$ER_y = BE_y - PE_y - LE_y \quad (15)$$

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$F_{i,y}/F_{i,j,y}$
Unit	t or m^3
Description	The total amount of fuel *i* (in a mass or volume unit) consumed by Province *j* in SCPG for power generation in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics; publicly accessible and reliable data source.

Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{historical}$
Unit	MWh
Description	Annual average historical of net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity. A minimum of 5 years (excluding abnormal years) of historical generation of data is required in the case of hydro facilities.
Source of data	Project activity site (The average of generated electricity exported to the grid by the existing units in the most recent 5 years.
Value(s) applied	-
Choice of data or Measurement methods and procedures	Electricity meters
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$\sigma_{historical}$
Unit	MWh/yr
Description	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.
Source of data	Calculated from data used to establish $EG_{historical}$
Value(s) applied	-
Choice of data or Measurement methods and procedures	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement project activities
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$DATE_{Baseline\ Retrofit}$
Unit	date
Description	The time when the existing equipment would need to be replaced in the absence of the project activity
Source of data	Project activity site
Value(s) applied	-
Choice of data or Measurement methods and procedures	It is determined as the following approaches: (a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.; (b) The common practices of the responsible company regarding replacement/retrofitting schedules may be evaluated and

	documented, e.g. based on historical replacement/retrofitting records for similar equipment. The point in time when the existing equipment would need to be retrofitted in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{j,\ y}$
Unit	MWh
Description	The electricity output (MWh) supplied to the grid by the Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook (2009~2011)
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	NCV_i
Unit	kj/kg or kj/m^3
Description	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data	China Energy Statistical Yearbook 2011
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Official data, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EF_{co2,\ i,\ y}$
Unit	t CO_2/TJ
Description	CO_2 emission factor per energy unit of fuel *i* in year *y*
Source of data	Table1.3and Table1.4 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	As the national value is unavailable, IPCC default is used.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$Cap_{j,\ y}$
Unit	MW

Description	The installed capacity of Province *j* in SCPG in year y.
Source of data	China Electric Power Yearbook(2009~2011)
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics, publicly accessible and reliable data source.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	EF_{Res}
Unit	$kgCO_2e/MWh$
Description	Default emission factor for emissions from reservoirs
Source of data	Decision by EB23
Value(s) applied	90 $kgCO_2e/MWh$
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	$\eta_{Adv,i}$
Unit	%
Description	The efficiency level of the best technology for each fuel type commercially available in China.
Source of data	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2551.doc
Value(s) applied	See Appendix 4.
Choice of data or Measurement methods and procedures	Official statistics
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	MW
Description	Installed capacity of the hydropower plant before the implementation of the project activity. For new hydropower plants, this value is zero.
Source of data	Project site
Value(s) applied	-
Choice of data or Measurement methods and procedures	FSR/PDR
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2

Description	Area of the reservoir measured in the surface of the water, before the implementation of project activity, when the reservoir is full (m^2).
Source of data	Project site
Value(s) applied	-
Choice of data or Measurement methods and procedures	FSR/PDR
Purpose of data	Calculation of project emissions.
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions
>>

Baseline emissions

Based on the Tool to Calculate the Emission Factor for an Electricity System (03.0.0) and data from Section D.6.1, the figures of emission factors of the SCPG are as follows:

- $EF_{grid,OM,y}$=0.9344 tCO_2e/MWh;
- $EF_{grid,BM,y}$ =0.3791 tCO_2e/MWh;
- $EF_{grid,CM,y}$= $EF_{grid,OM,y}$ $*W_{OM}$ + $EF_{grid,BM,y}$ * W_{BM} =0.9344*0.5+0.3791*0.5=0.65675 tCO_2e/MWh.

The baseline emissions ($BE_{retrofit, CO2, y}$) are calculated as follows:

(1) $EG_{BL, retrofit, y} = EG_{PJ, facility, y} - (EG_{historical} + \sigma_{historical})$

$= (EG_{PJ, export, y} - EG_{PJ, import, y}) - (EG_{historical} + \sigma_{historical})$

= ([XXX] – [XXX]) – ([XXX] – [XXX]) = [XXX] MWh.

$EG_{BL, retrofit, y}$ =0 on/after $DATE_{Baseline Retrofit}$

(2) $BE_{retrofit, CO2, y} = [EG_{BL, retrofit, y}] * EF_{CO2}$

= [XXX] MWh*0.65675 tCO_2e/MWh = [XXX] tCO_2e.

Project emissions

According to the project type, project emissions will be done in each specific CPA-DD on the basis of the equations in Section B.6.1 above.

Leakage

According to the methodology AMS-I.D. (version 17), the CPA does not refer to leakage emissions, so the leakage emissions are zero, LE_y=0.

Emission reductions

The emission reductions ER_y of the project activity is calculated as the baseline emission (BE_y) minus the emission of the proposed activity (PE_y) and the emission due to leakage (LEy).

So, $ER_y = BE_y - PE_y - LE_y$ = [XXX] tCO_2e.

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	$EG_{PJ, export, y}$

Unit	MWh
Description	Quantity of electricity supplied to the SCPG by the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording
QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{PJ, import, y}$
Unit	MWh
Description	Quantity of electricity imported from the SCPG to the proposed project in year y
Source of data	Measured on the project site
Value(s) applied	-
Measurement methods and procedures	Continuously measured by the electricity meters
Monitoring frequency	Hourly measurement and at least monthly recording.
QA/QC procedures	The meter will be calibrated annually based on the relevant national and industrial standards. The accuracy of the meter will be no less than 0.5. This parameter will be cross-checked with receipts from the local power grid on electricity consumption.
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	$EG_{PJ, facility, y}$
Unit	MWh
Description	Total net generated electricity supplied to SCPG by the existing station and the proposed project to the grid in year y.
Source of data	Measured on project site
Value(s) applied	-
Measurement methods and procedures	-
Monitoring frequency	Hourly measurement and at least monthly recording
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comments	-

Data / Parameter	Cap_{PJ}
Unit	MW

Description	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data	Measured on project site
Value(s) applied	-
Measurement methods and procedures	Will be checked by the nameplate
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comments	

Data / Parameter	A_{PJ}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Measured on project site
Value(s) applied	-
Measurement methods and procedures	Measured by the qualified design institute.
Monitoring frequency	yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA
>>

1. Purpose

The monitoring plan is to serve as a guideline for the CPA implementer to monitor and calculate the emission reductions of the project under the CPA. Baseline emission factor of the project is determined ex ante.

For project activities involved retrofitting: $EG_{PJ, import, y}$, $EG_{PJ, export, y}$ *and* $EG_{PJ, facility, y}$ will be monitored.

For project activities with reservoir, A_{PJ} and Cap_{PJ} calculated for project emission also will be monitored.

2. Management structure of monitoring

The CPA implementer will organize a monitoring team according to the monitoring manual which provided by the CME, and the detailed responsibility of each section is as below:

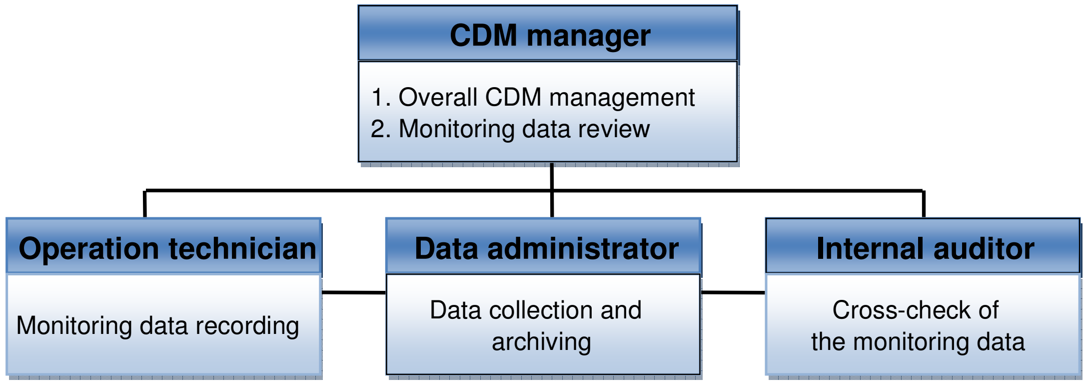

Figure B-2 Monitoring management structure

CDM manager is the team leader and responsible for the overall CDM management and data review;

Operation technician is responsible for monitoring data recording;

Data administrator is responsible for data collection, archiving;

Internal auditor is responsible for cross-check of the submitting monitoring data.

3. Equipment and Installation of Monitoring

Distribution and calibration of electric meter will be implemented according to the technical requirements of Technical administrative code of electric energy metering (DL/T448-2000).

The accuracy of the meters should not be less than 0.5S.

4. Data collection management

The project owner and the local power grid company will read the meters and record the data on a regular basis. The monitored data will be archived electronically each month. The project owner also needs to keep the original and backup copies of electricity sales and purchase receipts provided by the power grid company periodically for cross check.

All written documents such as diagrams, reports should be stored and available to the verifier so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

5. QA/QC

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to relevant national and industrial regulations. After the project operation, the meters should be annually calibrated in accordance with the relevant national and industrial regulations by an independent qualified calibration entity.

Data and records will be checked prior to being recorded and archived, and possible errors would be identified in this step. In case the main meter operates abnormally, the readings from the back up meter will be adopted. If the backup meter is not within acceptable limits of accuracy or performed improperly, the project owner and the grid company shall choose a reasonable reading through negotiation. If both main and back-up meters are out of work, the data monitored within this certain period shall not be counted.

The monitoring equipments are the bidirectional electric meters. $EG_{PJ,\ import,\ y}$ $EG_{PJ,\ export,\ y}$ and $EG_{PJ,\ facility,\ y}$ of proposed project will be continuously measured and at least monthly recorded.

The new installed capacity of the hydropower plant Cap_{PJ} after the implementation of the project activity, will be monitored based on nameplate or technical agreement of turbine and generator every year.

The surface area of the reservoir measured in the surface of the water (A_{PJ}), after the implementation of the project activity, when the reservoir is full, will be measured regularly every year by a qualified third entity.

The monitoring data will be forwarded to the internal auditor for the cross-check after review of the manager, $EG_{PJ,\ import,\ y}$ $EG_{PJ,\ export,\ y}$ and $EG_{PJ,\ facility,\ y}$ from meter records will be cross-checked against the electricity sales receipts.

6. Training

The team members of the monitoring team will be trained by CME before the operation of the project as per the monitoring and management manual. If the personnel alternation happens, the new staffs will receive the same training before work.

- - - -

Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	Beijing YuanDa Carbon Assets Investment Management Co., Ltd.
Street/P.O. Box	Henghui West Street
Building	Room 1502, Building 13, West Jianwai SOHO
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Website	-
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Title	General Manager
Salutation	Mr.
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Middle name	-
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Organization	National Development and Reform Commission of the People's Republic of China
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E-mail	qhs@ndrc.gov.cn
Website	http://qhs.ndrc.gov.cn
Contact person	Sun Cuihua
Title	Vice Director
Salutation	Ms.
Last name	Sun
Middle name	-
First name	Cuihua
Department	Climate Change Department
Mobile	-
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Appendix 2: Affirmation regarding public funding

There is no public funding.

Appendix 3: Application of methodologies

Please refer to Section B.3 of PoA-DD.

Appendix 4: Further background information on ex ante calculation of emission reductions

The baseline information for calculation of *OM*, *BM,* and *CM* emission factors of the Southern China Power Grid is shown in the *Report on 2012 Baseline Emission Factors for Regional Power Grids in China* released by the Chinese DNA on 15 October 2012 (http://cdm.ccchina.gov.cn). The concrete processes are shown in the following tables.

Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

Table 4.1 Low calorific values, CO_2 emission factor and oxidation factors of fuels

Fuel Type	Default Carbon Content	OXID	IPCC CO_2 Emission Factor	Low Calorific Value
	（tc/TJ）	（%）	The Lower Limits of the 95% Confidence Intervals	（MJ/t,km^3）
	H	I	(kgCO_2/TJ)	
Raw Coal	25.8	100	87,300	20908
Cleaned Coal	25.8	100	87,300	26344
Other Washed Coal	25.8	100	87,300	8363
Briquette	26.6	100	87,300	20908
Coke	29.2	100	95,700	28435
Coal Gangue	25.8	100	87,300	8363*
Coke Oven Gas	12.1	100	37,300	16726*
Blast Furnace Gas	70.8	100	219,000	3763*
Other Gas	12.1	100	37,300	5227
Crude Oil	20	100	71,100	41816
Gasoline	18.9	100	67,500	43070
Diesel Oil	20.2	100	72,600	42652
Fuel Oil	21.1	100	75,500	41816
Petroleum Coke	26.6	100	82,900	31947*
Liquefied Petroleum Gas	17.2	100	61,600	50179

Liquefied Natural Gas	15.3	100	54,300	51434*
Refinery Gas	15.7	100	48,200	46055
Natural Gas	15.3	100	54,300	38931
Other Petroleum Products	20	100	72,200	41816
Other Coke Oven Products	25.8	100	95,700	28435
Other Energies	0	0	0	0

Data Source: The emission factors and oxidation factors are from *2006 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1.3 and Table 1.4, Pages 1.21-1.24, Chapter I, Volume 2 Energy). The net calorific values are quoted from China Energy Statistical Yearbook 2009.*

*Data Source: Public Institutions Energy Consumption Statistical System Formulated by Government offices administration of the State Council, Approved by National Bureau of Statistics of China in July 2011.

1. **Calculation of Simple *OM* emission Factor of the SCPG for Year 2008**

Table 4.2 CO_2 Emission Data of SCPG in Year 2008

Fuel Type	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Sub-total	Default Carbon Content	OXID	CO_2 Emission Factor of fossil fuel	Average Low Calorific Value	CO_2 Emission（tCO_2 e）
							（tc/TJ）	（%）	($kgCO_2/TJ$)	（$MJ/t,km^3$）	J=E*H*I/100000 (for mass unit)
		A	B	C	D	E=A+B+C+D	F	G	H	I	J=E*H*I/10000 (for volume unit)
Raw Coal	10^4t	8,001.54	1,513.1	4,117.45	2,766.85	**16,398.94**	25.8	100	87,300	20,908	299,324,670
Cleaned Coal	10^4t	2.31				**2.31**	25.8	100	87,300	26,344	53,126
Other Washed Coal	10^4t		0.08	13.38	57.11	**70.57**	25.8	100	87,300	8,363	515,224
Briquette	10^4t	297.43				**297.43**	26.6	100	87,300	20,908	5,428,896
Coke	10^4t	3.24	1.73		2.74	**7.71**	29.2	100	95,700	28,435	209,807
Coke Oven Gas	10^8m^3		1.55	3.92	2.17	**7.64**	12.1	100	37,300	16,726	476,644
Other Gas	10^8m^3	1.09	29.6		35.71	**66.4**	12.1	100	37,300	5,227	1,294,582
Raw Oil	10^4t					**0**	20	100	71,100	41,816	0
Gasoline	10^4t	0.01				**0.01**	18.9	100	67,500	43,070	291
Diesel Oil	10^4t	10.46	0.97		2.28	**13.71**	20.2	100	72,600	42,652	424,535
Fuel Oil	10^4t	344,59	0.24			**344.83**	21.1	100	75,500	41,816	10,886,656
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	0.76				**0.76**	15.7	100	48,200	46,055	16,871
Natural Gas	10^8m^3	35.6				**35.6**	15.3	100	54,300	38,931	7,525,674
Other Petroleum Products	10^4t	7.3				**7.3**	20	100	72,200	41,816	220,395
Other Coke Oven Gas	10^4t					**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	120.17	103.26	89.44	42.63	**355.5**	0	0	0	0	0
										Subtotal	**326,377,370**

Data Source: China Energy Statistical Yearbook 2009

Table 4.3 SCPG Fuel-fired Electricity Generation and *OM* EF in Year 2008

Province	Total Generation (10^8^kWh)	Total Generation (MWh)	Self-consumption electricity (%)	Total Supply (MWh)		
					The net electricity generation supplied to SCPG from CCPG in 2008 Year (MWh)	22,342,090
Guangdong	2,107	210,700,000	6.18	197,678,740	CCPG Simple OM	1.042085
Guangxi	342	34,200,000	7.14	31,758,120		
Guizhou	813	81,300,000	7.04	75,576,480	Total Emission (tCO_2)	349,658,904
Yunnan	418	41,800,000	7.29	38,752,780	Total Power Supply (MWh)	366,108,210
Total				343,766,120	EF_{OM}	0.95507

Data Source: China Electric Power Yearbook 2009

2. **Calculation of Simple *OM* emission Factor of the SCPG for Year 2009**

Table 4.4 CO_2 Emission Data in Year 2009

Fuel Type	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Sub-total	Default Carbon Content	OXID	CO_2 Emission Factor of fossil fuel	Average Low Calorific Value	CO_2 Emission (tCO_2e)
								(tc/TJ)	(%)	($kgCO_2/TJ$)	($MJ/t,km^3$)	K=F*I*J/100000 (for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J /10000 (for volume unit)
Raw Coal	10^4t	8011.98	1815.41	4925.23	3311.44	376.59	**18440.65**	25.8	100	87,300	20,908	336,591,357
Cleaned Coal	10^4t	1.8					**1.8**	25.8	100	87,300	26,344	41,397
Other Washed Coal	10^4t			11.67	44.92		**56.59**	25.8	100	87,300	8,363	413,158
Briquette	10^4t	195.86					**195.86**	26.6	100	87,300	20,908	3,574,971
Coke	10^4t	4.9	1.6		1.63		**8.13**	29.2	100	95,700	28,435	221,236
Coke Oven Gas	10^8m^3		2.89	2.02	2.48		**7.39**	12.1	100	37,300	16,726	461,047
Other Gas	10^8m^3	1.11	20.88		48.61		**70.6**	12.1	100	37,300	5,227	1,376,468
Raw Oil	10^4t						**0**	20	100	71,100	41,816	0
Gasoline	10^4t						**0**	18.9	100	67,500	43,070	0

Diesel Oil	10^4t	6.46	0.52		0.49	0.12	**7.59**	20.2	100	72,600	42,652	235,027
Fuel Oil	10^4t	157.37	0.09				**157.46**	21.1	100	75,500	41,816	4,971,182
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	0.51					**0.51**	15.7	100	48,200	46,055	11,321
Natural Gas	10^8m^3	47.21				6.19	**53.4**	15.3	100	54,300	38,931	11,288,511
Other Petroleum Products	10^4t	45.31				0.83	**46.14**	20	100	72,200	41,816	1,393,020
Other Coke Oven Gas	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	152.99	98.56	23.01	49.01	20	**343.57**	0	0	0	0	0
											Subtotal	**360,578,694**

Data Source: China Energy Statistical Yearbook 2010

Table 4.5 SCPG Fuel-fired Electricity Generation and *OM* EF in Year 2009

Province	Total Generation	Total Generation	Self-consumption electricity	Total Supply		
	（10^8kWh）	（MWh）	（%）	（MWh）	The net electivity generation supplied to SCPG from CCPG in 2009 year (MWh)	21,852,270
Guangdong	2143	214,300,000	6.16	201,099,120	CCPG simple OM	0.95455
Guangxi	428	42,800,000	6.69	39,936,680		
Guizhou	978	97,800,000	6.68	91,266,960		
Yunnan	548	54,800,000	6.52	51,227,040	Total Emission (tCO_2)	381,437,884
Hainan	114	11,400,000	8.17	10,468,620	Total Power Supply (MWh)	415,850,690
Total				393,998,420	EF_{OM}	0.91725

Data Source: China Electricity Power Yearbook 2010

3. **Calculation of Simple *OM* emission Factor of the SCPG for Year 2010**

Table 4.6 CO_2 Emission Data of SCPG in Year 2010

Fuel type	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Sub-total	Default carbon content	OXID	CO_2 Emission Factor of fossil fuel	Average Low Calorific Value	CO_2 Emission（tCO_2e）
								（tc/TJ）	（%）	($kgCO_2/TJ$)	（$MJ/t,km^3$）	K=F*I*J/100000 (for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J /10000 (for volume unit)
Raw Coal	10^4t	9758.45	2330.59	4876.8	3345.11	471.84	**20782.79**	25.8	100	87,300	20,908	379,341,699
Cleaned Coal	10^4t	1.03	0.39				**1.42**	25.8	100	87,300	26,344	32,658
Other Washed Coal	10^4t			11.24	39.08		**50.32**	25.8	100	87,300	8,363	367,381
Briquette	10^4t	179.27					**179.27**	26.6	100	87,300	20,908	3,272,159
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coal Gangue	10^4t	301.69		26.13	62.95		**390.77**	25.8	100	87,300	8,363	2,852,972
Coke Oven Gas	10^8m^3		2.82	2.02	3.25		**8.09**	12.1	100	37,300	16,726	504,719
Blast Furnace Gas	10^8m^3	0.79	42.32	9.32	48.03		**100.46**	70.8	100	219,000	3,763	8,278,878
Converter Gas	10^8m^3	0.33	4.25		1.8		**6.38**	46.9	100	145,000	7,945	734,992
Other Gas	10^8m^3						**0**	12.1	100	37,300	5,227	0
Raw Oil	10^4t						**0**	20	100	71,100	41,816	0
Gasoline	10^4t						**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4t	4.65	0.41	2.29	0.76	0.08	**8.19**	20.2	100	72,600	42,652	253,606
Fuel Oil	10^4t	83.39	0.1				**83.49**	21.1	100	75,500	41,816	2,635,869
Naphtha	10^4t						**0**	20.2	100	72,600	43,906	0
Lubricating Oil	10^4t						**0**	20	100	71,900	41,398	0
Paraffin	10^4t						**0**	20	100	72,200	39,934	0

Solvent Naphtha	10^4t						**0**	20	100	72,200	42,945	0
Petroleum Asphalt	10^4t						**0**	21	100	69,300	28,931	0
Petroleum Coke	10^4t	20.4					**20.4**	26.6	100	82,900	31,947	540,275
Liquefied Petoleum Gas	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	0.56					**0.56**	15.7	100	48,200	46,055	12,431
Liquefied Natural Gas	10^4t	164.94					**164.94**	15.3	100	54,300	51,434	4,606,554
Natural Gas	10^8m^3	34.04				7.62	**41.66**	15.3	100	54,300	38,931	8,806,729
Other Petroleum Products	10^4t	0.63				0.47	**1.1**	20	100	72,200	41,816	33,210
Other Coke Oven Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	163.95	77.36		26.02	23.47	**290.8**	0	0	0	0	0
											Subtotal	**412,274,132**

Data Source: China Energy Statistical Yearbook 2011

Table 4.7 SCPG Fuel-fired Electricity Generation and *OM* EF in Year 2010

Province	**Total Generation**	**Total Generation**	**Self-consumption electricity**	**Total Supply**		
	(10^8kWh)	**(MWh)**	**(%)**	**(MWh)**	The net electricity generation supplied to SCPG from CCPG in 2010 year (MWh)	23,423,940
Guangdong	2535	253,500,000	5.97	238,366,050	CCPG simple OM	0.99213
Guangxi	557	55,700,000	6.55	52,051,650		
Guizhou	956	95,600,000	6.85	89,051,400		
Yunnan	546	54,600,000	6.93	50,816,220	Total Emission (tCO_2)	435,513,799
Hainan	139	13,900,000	7.57	12,847,770	Total Power Supply (MWh)	466,557,030
Total				443,133,090	EF_{OM}	0.93346

Data Source: China Electricity Power Yearbook 2011

4. Calculation of Simple OM Emission Factor of SCPG

Table 4.8 Calculation of Simple OM Emission Factor of SCPG

	Total Power Supply (MWh)	Total CO_2 Emission (tCO_2)	OM Emission Factor (tCO_2/ MWh)
2008	366,108,210	349,658,904	0.95507
2009	415,850,690	381,437,884	0.91725
2010	466,557,030	435,513,799	0.93346
The weighted average OM Emission Factor (tCO_2/ MWh)			**0.93440**

The Operating Margin (*OM*) emission factor is the weighted average emission factor of year 2008-2010, as follows: $\boldsymbol{EF_{OM}}$ **= 0.93440** tCO_2/MWh

Calculation of the Build Margin emission factor ($EF_{BM,y}$)

Table 4.9 Low calorific values, CO_2 emission factor and oxidation factors of fuels

Fuel type	Low Calorific Value	Emission Factor (kgCO_2/TJ)	OXID
Raw Coal	20,908 kJ/kg	87,300	1
Cleaned Coal	26,344 kJ/kg	87,300	1
Other Washed Coal	8,363 kJ/kg	87,300	1
Briquette	20,908 kJ/kg	87,300	1
Coal Gangue	8,363 kJ/kg	87,300	1
Coke	28,435 kJ/kg	95,700	1
Other Coke Products	28,435 kJ/kg	95,700	1
Raw Oil	41,816 kJ/kg	71,100	1

Gasoline	43,070 kJ/kg	67,500	1
Diesel Oil	42,652 kJ/kg	72,600	1
Fuel Oil	41,816 kJ/kg	75,500	1
Petroleum Coke	31,947 kJ/kg	82,900	1
Other Petroleum Products	41,816 kJ/kg	75,500	1
Natural Gas	38,931 kJ/m^3	54,300	1
Liquefied Natural Gas	51,434 kJ/m^3	54,300	1
Coke Oven Gas	16,726 kJ/m^3	37,300	1
Blast Furnace Gas	219,000 kJ/m^3	3,763	1
Converter Gas	145,000 kJ/m^3	7,945	1
Other Gas	5,227 kJ/m^3	37,300	1
Liquefied Petroleum Gas	50,179 kJ/kg	61,600	1
Refinery Gas	46,055 kJ/kg	48,200	1

Data Source：

（1）The low calorific value of fuels are from *China Energy Statistical Yearbook 2010, p285*.

（2）The Emission Factor are quoted from “2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume 2 Energy.

（3）The low calorific value of Coal gangue, Petroleum coke,、LNG, Blast Furnace gas, Converter gas are from Public Institutions Energy Consumption Statistical System Formulated by Government offices administration of the State Council, Approved by National Bureau of Statistics of China in July 2011.

1. Calculation of percentages of CO_2 emissions from the coal-fired, gas-fired and oil fire power plants in total fuel-fired CO_2 emissions

Table 4.10 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil fire power plants in total fuel-fired CO_2 emissions in SCPG

Fuel type	Unit	Guangdong	Guangxin	Guizhou	Yunnan	Hainan	Sub-total	Low Calorific Value	Emission Factor	OXID	CO_2 Emission
								(MJ/t or 1000m^3)	(tC/TJ)	(%)	(tCO_2e)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J=F*G*H*I/100,00
Raw Coal	10^4t	9758.45	2330.59	4876.8	3345.11	471.84	**20782.79**	20,908	87,300	1	379,341,699
Cleaned Coal	10^4t	1.03	0.39	0	0	0	**1.42**	26,344	87,300	1	32,658
Other Washed Coal	10^4t	0	0	11.24	39.08	0	**50.32**	8,363	87,300	1	367,381
Briquette	10^4t	179.27	0			0	**179.27**	20,908	87,300	1	3,272,159
Coal Gangue	10^4t	301.69	0	26.13	62.95	0	**390.77**	8,363	87,300	1	2,852,972
Coke	10^4t	0	0	0	0	0	**0**	28,435	95,700	1	0
Other Coke Products	10^4t	0	0	0	0	0	**0**	28,435	95,700	1	0
Subtotal											**385,866,868**
Raw Oil	10^4t	0	0	0	0	0	**0**	41,816	71,100	1	0
Gasoline	10^4t	0	0	0	0	0	**0**	43,070	67,500	1	0
Diesel Oil	10^4t	4.65	0.41	2.29	0.76	0.08	**8.19**	42,652	72,600	1	253,606
Fuel Oil	10^4t	83.99	0.1	0	0	0	**83.49**	41,816	75,500	1	2,654,812
Petroleum Coke	10^4t	20.4	0	0	0	0	**20.4**	31,947	82,900	1	540,275
Other Petroleum Products	10^4t	0.63	0	0	0	0.47	**1.1**	41,816	75,500	1	34,728
Subtotal											**3,483,421**
Natural Gas	10^7m^3	340.4	0	0	0	76.2	**416.6**	38,931	54,300	1	8,806,729
Liquefied Natural Gas	10^7m^3	164.94	0	0	0	0	**164.94**	51,434	54,300	1	4,606,554
Coke Oven Gas	10^7m^3	0	28.2	20.2	32.5	0	**80.9**	16,726	37,300	1	504,719

Blast Furnace Gas	10^7m^3	7.9	423.2	93.2	480.3	0	**1004.6**	3,763	219,000	1	8,278,878
Converter Gas	10^7m^3	3.3	42.5	0	18	0	**63.8**	7,945	145,000	1	734,992
Other Gas	10^7m^3	0	0	0	0	0	**0**	5,227	37,300	1	0
Liquefied Petroleum Gas	10^4t	0	0	0	0	0	**0**	50,179	61,600	1	0
Refinery Gas	10^4t	0.56	0	0	0	0	**0.56**	46,055	48,200	1	12,431
Subtotal											**22,944,303**
Other Energies	10^4t Ce	163.95	77.36	0	26.02	23.47	290.8	0	0	0	0
Total											**412,294,593**

Data Source: China Energy Statistical Yearbook 2011

According to Table 4.10 and formula (10) (11) (12) in Section B.6.1, Part II, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal,y} = 93.59\%,\ \lambda_{Oil,y} = 0.84\%,\ \lambda_{Gas,y} = 5.57\%.$$

2. Calculating the fuel-fired emission factor ($EF_{Thermal}$)

Table 4.11 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply（%）	Emission Factor of Fuel ($kgCO_2/TJ$)	Oxidation Factor	Emission Factor (tCO_2/MWh)
		A	**B**	**C**	**D=3.6/A/1,000,000*B*C**
Coal-fired Power Plant	$EF_{Coal,Adv,y}$	39.65	87,300	1	0.7927
Oil-fired Power Plant	$EF_{Oil,Adv,y}$	51.93	75,500	1	0.5234
Gas-fired Power Plant	$EF_{Gas,Adv,y}$	51.93	54,300	1	0.3765

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.76723\ tCO_2e/MWh.$$

3. Calculating the Build Margin (*BM*) emission factor ($EF_{BM,y}$)

Table 4.12 Installed Capacity data of SCPG in Year 2010

Installed Capacity	Unit	Guangdong	Guangxi	Yunnan	Guizhou	Hainan	Total
Thermal power	MW	52,870	10,390	11,330	17,530	2,970	95,090
Hydro power	MW	12,600	14,940	24,350	16,550	750	69,190
Nuclear power	MW	5,030	0	0	0	0	5,030
Wind power and other	MW	620	0	360	0	210	1,190
Total	MW	71,120	25,330	36,040	34,080	3,930	170,500

Data Source: China Electricity Power Yearbook 2011

Table 4.13 Installed Capacity data of SCPG in Year 2009

Installed Capacity	Unit	Guangdong	Guangxi	Yunnan	Guizhou	Hainan	Total
Thermal power	MW	48,300	10,770	10,710	17,310	3,090	90,180
Hydro power	MW	11,260	14,750	20,900	13,610	700	61,220
Nuclear power	MW	3,950	0	0	0	0	3,950
Wind power and other	MW	560	0	80	0	60	700
Total	MW	64,070	25,520	31,690	30,920	3,850	156,050

Data Source: China Electricity Power Yearbook 2010

Table 4.14 Installed Capacity data of SCPG in Year 2008

Installed Capacity	Unit	Guangdong	Guangxi	Yunnan	Guizhou	Hainan	Total
Thermal power	MW	45,730	10,270	10,030	17,170	2,370	85,570
Hydro power	MW	10,280	13,970	15,740	9,470	410	49,870
Nuclear power	MW	3,780	0	0	0	0	3,780
Wind power and other	MW	290	0	80	0	10	380
Total	MW	60,080	24,240	25,850	26,640	2,790	139,600

Data Source: China Electricity Power Yearbook 2009

Table 4.15 Calculation of BM Emission Factor of SCPG

	Installed Capacity in 2008	Installed Capacity in 2009	Installed Capacity in 2010	Newly added capacity from 2008 to 2009 [1]	Newly added capacity from 2009 to 2010 [2]	Share in total capacity additions of 2008-2010
	(MW)	(MW)	(MW)	(MW)	(MW)	(%)
	A	B	C	D	E	F
Thermal power	85,570	90,180	95,090	18,830	11,030	49.41
Hydro power	49,870	61,220	69,190	17,720	5,870	45.18
Nuclear power	3,780	3,950	5,030	1,250	1,080	3.28
Wind power and Other	380	700	1,190	810	490	2.13
Total	**139,600**	**156,050**	**170,500**	**38,110**	**18,470**	**100.00**
Share in total installed capacity of 2010	81.88%	91.53%	100%	22.35%	10.83%	

1,2 with consideration of installed capacity, capacity of units under shutdown power generating capacity

$$\boldsymbol{EF}_{\mathrm{BM,y}}=0.76723\times 49.41\%=\mathbf{0.3791}\ \mathrm{tCO_2/MWh}$$

Calculating the baseline emission factor (EF_y)

$$EF_{grid,CM,y}=0.5\times 0.9344+0.5\times 0.3791=\mathbf{0.65675}\ (\mathrm{tCO_2e/MWh})$$

Appendix 5： Further background information on the monitoring plan

No further information about the monitoring plan.