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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Programme for SSC Hydropower Plants in rural areas

Version: 2.0

Date: 14/11/2012

A.2. Purpose and general description of the PoA

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General operating and implementing framework of PoA

Programme for SSC Hydropower Plants in rural areas (later on referred as "the PoA") will support the development of greenfield small scale hydropower projects in rural areas[1] of Sichuan Province that supply electricity to the Central China Power Grid (CCPG). Under the proposed PoA, implementers will be coordinated by Zhongtannengtou Tech Co., Ltd. (hereinafter referred to as ZTC), which is the Coordinating/Managing Entity (CME) for the PoA.

The PoA not only aims at newly built hydropower projects in rural areas of Sichuan Province that supply electricity to CCPG, but also contributes to the development and promotion of Renewable Energy by building a framework to secure carbon revenue for hydropower implementers to overcome the financial and technical barriers. Each small-scale CDM Program Activity (referred to later on as CPA) under this PoA will comprise one or more such hydropower plants in rural areas of Sichuan Province and have a combined installed capacity of no more than 15MW, namely the threshold for small-scale CDM projects.

Policy/measure or stated goal of the PoA

The PoA will contribute to sustainable development and the objective of the PoA is shown as follows:

1) Promote the development of hydropower and facilitate the abatement of greenhouse gas (GHG) emissions through the replacement of fossil fuel-fired power generation in the CCPG as well.

   - The PoA encourages hydropower utilization to generate electricity, which otherwise would have been generated through alternate fuels (most likely fossil fuels) based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions.

2) Apply carbon finance for newly-built grid-connected hydropower projects in the area where the CPA are located, to promote the development of hydropower application.

   - The CME will coordinate and conduct the inclusion of the CPA under the PoA, provide monitoring and verification services to all CPAs, and support the effective commercialization of CERs.

[1] The definition of "rural areas" is in county or village area, please see http://www.stats.gov.cn/tjzd/tjzbjs/t20020327_14300.htm

- The PoA encourages in promoting local products developed in the region when spare parts replacement is needed to support the hydropower technology which are available and made by local companies.

3) Helps to solve the electricity shortage problem[2], increase local revenues and promote local economy, improve the living condition of the local residence and increase employment opportunities in local community.

- The PoA will support CPAs that contribute directly towards balancing the supply and demand gap, especially in rural areas of Sichuan Province.

- Facilitate the rural electrification process through the provision of electricity power and enhance the local living environment and thereby improve the local economy.

In conclusion the PoA will contribute positively towards sustainable development and be consistent with the energy policies set by the Government of China[3]. Therefore, it satisfies the sustainable development criteria for CDM projects set by the DNA of China.

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

The PoA is a voluntary action being coordinated and managed by ZTC and no CPA will be implemented in the absence of the PoA. There are no mandatory laws or regulations in place in China that require hydropower projects to seek CDM services. Likewise, no mandatory laws or regulations exist requiring the managing entity or any other party to develop a PoA for hydropower projects in rural areas of Sichuan province.

A.3. CMEs and participants of PoA

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The Coordinating/Managing Entity (CME) of the PoA is Zhongtannengtou Tech Co., Ltd. It is responsible for coordinating with all the entities involved in the PoA. The CME will sign contracts with each CPA implementers and responsible for filtrating qualified CPAs and requesting a DOE to include those CPAs into the PoA. The project participant in the PoA at the time of validation is the CME of this PoA.

A.4. Party(ies)

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)
China (host)	Zhongtannengtou Tech Co., Ltd.	Yes

Please refer to Annex 1 for detailed contact information.

A.5. Physical/ Geographical boundary of the PoA

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The geographical boundary of the PoA is identified as the Sichuan Province covered by the Central China Power Grid. The covering areas of the PoA are listed in Table A.1 and shown in Figure A.1. The location of each CPA will be in rural areas of Sichuan Province and checked as per the eligibility criteria No.1 of this PoA.

[2] http://news.cntv.cn/20110509/101882.shtml
http://www.sc.chinanews.com.cn/news/2011/0914/092743740.html
[3] http://business.sohu.com/20121025/n355657455.shtml

Table A.1 The covering areas of regional grids

Regional Grid	Covering Areas
Central China Power Grid(CCPG)[4]	Sichuan Province

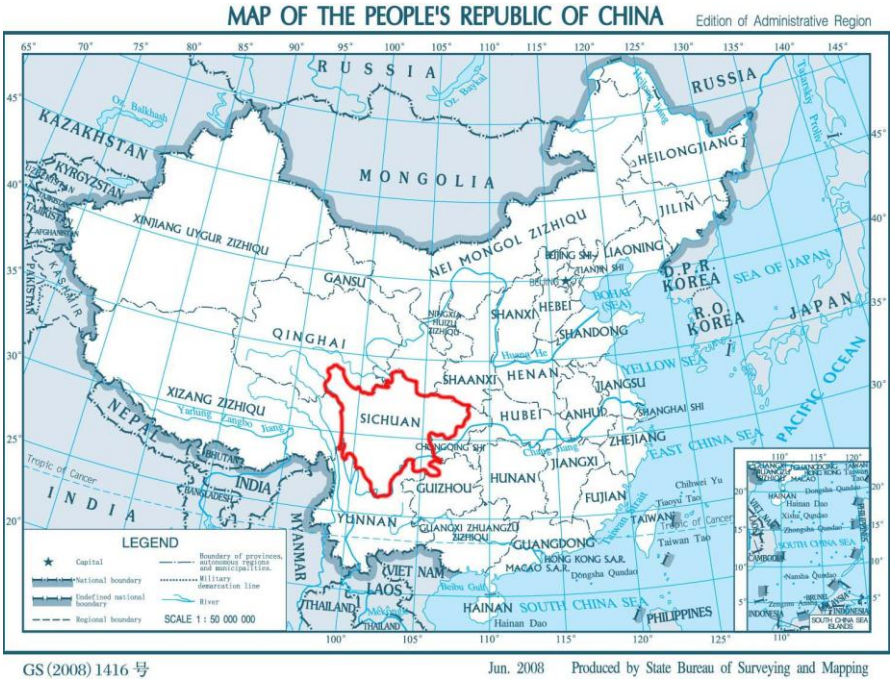

Figure A.1 Geographical Boundary of the PoA

A.6. Technologies/measures

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A typical CPA under this PoA comprises one or more hydropower plants with an installed capacity no more than 15MW, which will supply electricity to the CCPG. All CPAs in this PoA should apply AMS-I.D. (Version 17.0) as the applicable baseline and monitoring methodology. The hydropower plants are newly constructed and generate electricity from hydropower resource. New renewable power plant will be run-of-river hydropower plant and/or hydropower plant with new reservoir.

Although detailed technical characteristics will differ, the following general conditions will apply for all CPAs. Each CPA under the PoA will use local hydro power resources to generate electricity that will be delivered to the CCPG to displace part of the fossil fuel-fired electricity. The proposed CPA is composed of water-retaining structure, turbines and generators and powerhouse, etc. It converts potential energy of water into mechanical energy and generates electricity.

A.7. Public funding of PoA

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There is no public funding from Annex I countries of the UNFCCC to be diverted for the implementation of the PoA and the CPAs included, which is guaranteed by the eligibility criteria.

[4] Sichuan Province is covered by the CCPG according to Notice 2011 Baseline Emission Factors for Regional Power Grids in China.
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

SECTION B. Demonstration of additionality and development of eligibility criteria
B.1. Demonstration of additionality for PoA
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(a) The proposed PoA is a voluntary coordinated action:

The proposed PoA is a voluntary and coordinated action, which will promote the development of small scale hydroelectric power plants by facilitating access to CER-based funding and facilities, encouraging renewable energy electricity generation in the country. There are no mandatory laws or regulations in the host countries stipulating to have recourse to CDM to develop hydropower facilities.

(b) If the PoA is implementing a voluntary coordinated action, no CPA will be implemented in the absence of the PoA;

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

i) For the CPA up to 5 MW that employ renewable energy technology are additional if the geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country defined as per the guidelines for demonstrating additionality of microscale project activities (Version 4.0);

ii) For the CPA >5 MW and ≤15MW or CPA<5MW but not in SUZ identified as per the guidelines for demonstrating additionality of microscale project activities (version 04.0), additionality demonstration should base on the latest guidelines on the demonstration of additionality of small-scale project activities, and investment barrier analysis should be adopted to demonstrate the CPA's additionality as per the latest guidelines on the assessment of investment analysis and any other relevant guidance from the board pertaining to investment analysis.

The following steps are adopted for the investment analysis.

Step 1: Determine appropriate analysis method

The analysis will be conducted through Option III of the additionality tool, i.e. benchmark analysis. This method is applicable because:

· Option I: Simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.

· Option II: Investment comparison analysis is not used as the project entity is not considering investing in the construction of one of the other identified alternatives.

· Option III: Benchmark analysis is used as the return on investment relative to the industry benchmark was crucial for the decision to go ahead with the project.

Step 2: Option III: Apply benchmark analysis

Each CPA faces a barrier to implement due to the poor returns on investment. For this PoA, the financial indicator identified for a typical CPA is the post-tax Internal Rate of Return (IRR) which is indicator commonly used to determine investment decisions. According to "Economic evaluation code for small hydropower projects", issued by Ministry of Water Resources of China, the benchmark of this kind of small hydropower project post-tax IRR is 10%.

Step 3: Calculation and comparison of financial indicators and benchmark calculation

As the analysis above, the benchmark of the project post-tax IRR is 10%. The project is considered to be financially unfeasible when the CPA post-tax IRR is lower than the benchmark.

Step 4: Sensitivity analysis

The objective of this step is to show that the conclusion regarding the financial attractiveness is robust under reasonable variations of the critical assumptions.

Four factors are considered in the following sensitivity analysis:

1) Static total investment;

2) Annual operation and maintenance (O&M) cost;

3) Electricity tariff;

4) Annual electricity output.

The typical range of sensitivity analysis is normally chosen to be –10%～+10% in investment analysis, which has been defined by project decision analysis and evaluation. Therefore, the range of the CPA sensitivity analysis is chosen to be -10%～+10% as per the guidelines on the assessment of investment analysis (version 05).

Assuming the above four factors vary in the range of -10% to 10%, the project IRR of the proposed project (without CERs) varies to different extent, as shown in Table B. 1:

Table B.1 Sensitivity analysis of the CPA

	-10%	-5%	0%	5%	10%
Static total investment	[number]	[number]	[number]	[number]	[number]
Annual O&M Cost	[number]	[number]	[number]	[number]	[number]
Electricity tariff	[number]	[number]	[number]	[number]	[number]
Annual electricity output	[number]	[number]	[number]	[number]	[number]

[If the sensitivity analysis shows that the post-tax project IRR of the CPA is lower than the benchmark in all cases, then the results of the investment analysis are deemed robust.

If the post-tax project IRR exceeds the benchmark, the CPA implementer should provide evidences that this is unlikely to happen.

If such demonstration cannot be substantiated with sufficient evidence, the CPA will be considered as non-additional.]

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

1. Without income from selling CERs, the project post-tax IRR of the project is lower than the benchmark IRR;
2. A +/- 10% variation in any of the 4 parameters does not lead to the IRR reaching the benchmark.

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

There are no mandatory requirements in China requiring the use of hydro power as for electricity generation. Although the Renewable Energy Law has been in effect since 01/01/2006, which is aimed at making the plan and industry guidance and promotion measures for the development of all renewable energy(including hydro, wind, solar, geothermal and biomass etc.), detailed promotion measures for hydro power are not issued yet.

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

existing mandatory policy/regulation.
Not applicable (the PoA is not implementing a mandatory policy/regulation)

B.2. Eligibility criteria for inclusion of a CPA in the PoA
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A CPA to be included in the present PoA shall:

The required eligibility criteria	Eligibility criteria of the PoA	Procedure (evidence)
(A) The geographical boundary of the CPA including any time-induced boundary [5] consistent with the geographical boundary set in the PoA;	No.1 The geographical boundary of each CPA is Sichuan Province covered by the CCPG, and the CPA shall be located in county or village area of Sichuan Province, which can be identified as "rural area" as per "The definition of statistical index" issued by State Statistics Bureau of China[6].	Check whether the CPA complies with all requirements listed in criteria No.1 against each evidence listed as follows : - The geographical coordinate's description of the CPA location, maintenance and construction tax rate* in Feasibility Study Report or Preliminary Design Report developed by an independent third party (i.e. the approved FSR or PDR); - The river basin planning map issued by an independent third party, or the river basin planning approval issued by the relevant government authority; - Or other available documents. *The value of maintenance and construction tax rate of the CPA is used to crosscheck the rural area definition as per "The Interim Regulations of the People's Republic of China on the Maintenance and Construction Tax".
(B) Conditions that avoid double counting of emission reductions like unique identifications of product and end-user	No.2 The inclusion of the CPA in the PoA should not lead to double counting of the emissions reduction by confirming that the CPA should be neither a	Check whether the CPA complies with all requirements listed in criteria No.2 against each evidence listed as

[5] For example, an emission factor for electricity generation is dependent on the boundaries of regional or state or sub-regional grids.
[6] http://www.stats.gov.cn/tjzd/tjzbjs/t20020327_14300.htm

locations (e.g. programme logo);		registered CDM project activity nor a CPA of other registered PoAs.	follows: - Unique geographical coordinates and project description as per the approved FSR/PDR; - Available information on the UNFCCC website; - Or other available documents.
(C) The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	No.3 No.4 No.5 No.6	Each CPA should be a hydropower project with the installed capacity no more than 15MW (run-of-river hydropower plant or reservoir hydropower plant) in rural areas of Sichuan Province that supply electricity to CCPG. The CPA shall use newly built equipment to generate electricity from hydro power. The Power Density of the CPA shall be greater than $4W/m^2$. For reservoirs power plants, new reservoir should be applied, i.e. the project using existing reservoir should be excluded.	Check whether the CPA complies with all requirements listed in criteria No.3~No.6 against each evidence listed as follows: - The approved FSR or PDR; - Relevant approval issued by the government authority; - Or other available documents.
(D) Conditions to check the start date of the CPA through documentary evidence;	No.7	The start date of the CPA[7] should be on or after the start date of the PoA, which is the date that the PoA-DD first published for global stakeholder consultation.	Check the earliest date at which either the implementation or construction or real action of CPA against each evidence listed as follows: - The signing date of Construction Contract(s); - The signing date of Equipment Purchase Contract(s); - Construction Start Permission issued by the supervision company; - Or other available documents.

[7] As per the CDM Glossary of Terms (version 7.0), the start date of a CPA is defined as the earliest date at which either the implementation or construction or real action of a CDM project activity.

(E) Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs;	No.8 Applicable for the methodology of AMS-I.D. (version 17.0) and its tool "Tool to calculate the emission factor for an electricity system (version 02.2.1)" No.9 Each CPA shall be a greenfield plant. No.10 Each CPA shall apply renewable components only and the capacity shall not exceed the limit of 15MW. No.11 All CPAs to be included in the PoA shall not involve in retrofitting or modifying an existing facility for renewable energy generation. No.5* The power density of the CPA shall be greater than $4W/m^2$. No.6* For reservoirs power plants, new reservoir should be applied, i.e. the project using existing reservoir should be excluded. * The criteria No.5 and No.6 are applicable as per the require eligibility criteria (E), thus both of them are listed again.	Check whether the CPA complies with all requirements listed in criteria No.5,No.6 and No.8~No.10 against each evidence listed as follows: - The approved FSR or PDR; - Related documents (e.g. river basin planning map or approval) ensuring that there was no power plant existing at the site before; - Related evidence issued by the third party to confirming installed capacity and surface area of the CPA; - The project description in approved FSR or PDR; - Or other available documents.
(F) The conditions that ensure that the CPA meets the requirements pertaining to the demonstration of additionality as specified in Section 3.1 of "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities"(version 02.1);	No.12 All Projects must comply with one of the additionality tests explained in the PoA-DD: a) For the CPA up to five megawatts that employ renewable energy technology are additional if the geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country as per 'Guidelines for demonstrating additionality of microscale project	Check whether the CPA complies with all requirements listed in criteria No.12 against each evidence listed as follows: - The approved FSR or PDR; - A traceable investment analysis spreadsheet (including the sensitive analysis); - The board meeting minute for investment analysis and decision; - Policies to substantiate the electricity tariff applied; - Regulations to substantiate the tax rates, depreciation and other accounting practices, etc.;

		activities (Version 4.0) b) For installed capacity of CPA >5MW and ≤15MW or CPA <5MW but not in SUZ identified as per the guidelines for demonstrating additionality of microscale project activities (version 04.0), additionality demonstration should base on the latest guidelines on the demonstration of additionality of small-scale project activities, and investment barrier analysis should be adopted to demonstrate the CPA's additionality as per the latest guidelines on the assessment of investment analysis and any other relevant guidance from the board pertaining to investment analysis.	- Or other available documents.
(G) The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	No.13 No.14 No.15	The information of local stakeholders' consultation and the environmental impact analysis should be conducted at CPA level. The local stakeholder consultations meeting and stakeholder questionnaires for the CPA should be carried out for collecting the comments from local stakeholders. Assessment of Impact on air, water, acoustic and solid environment should be carried out to complete the environmental impact analysis (EIA) of the CPA as per the requirements of environmental impact analysis of the host country.	Check whether the CPA complies with all requirements listed in criteria No.13~ No.15 against each evidence listed as follows: - Questionnaires of stakeholders survey; - The local stakeholder consultations meeting minute by the CPA implementer; - The EIA report developed by the independent third party; - The EIA report approval issued by the related government authority; - Or other available documents.
(H) Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a	No.16	The CPA should have no public funding from Annex I countries and should not result into the diversion of official	Check whether the CPA complies with all requirements listed in criteria No.16 against each evidence listed as

diversion of official development assistance;		development assistance.	follows: - The declaration from the CPA implementer affirming no funding from Annex I parties is used in the CPA; - Loan contract (if available); - Or other available documents.
(I) Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/ off-grid) and distribution mechanisms (e.g. direct installation);	No.17 No.18	The CPA should be a grid-connected renewable small scale hydropower project in rural areas of Sichuan Province. The CPA implementer shall be a registered company.	Check whether the CPA complies with all requirements listed in criteria No.17 and No.18 against each evidence listed as follows: - The approved FSR or PDR; - Business licence of the CPA implementer; - Power Purchase Agreement (PPA) or grid connection agreement (if available); - Or other available documents.
(J) Where applicable, the conditions related to sampling requirements for the PoA in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities";	No.19	Each CPA should be verified individually. Thus not applicable for the sampling and surveys.	N/A
(K) Where applicable, the conditions that ensure that every CPA (in aggregate if it comprises of independent sub units) meets the small-scale or micro-scale threshold and remains within those thresholds throughout the crediting period of the CPA;	No.20	As the definition in the latest glossary of CDM terms, the CPA should meet the small-scale (installed capacity over 5MW but up to 15 MW) or micro-scale (installed capacity up to 5MW) threshold criteria and remains within those thresholds throughout the crediting period of the CPA.	Check whether the CPA complies with all requirements listed in criteriaNo.20 against each evidence listed as follows: - The approved FSR or PDR; - Operation and maintenance log or name plate of turbines and generators (if available); - Or other available documents.
(L) Where applicable, the requirements for the debundling check, in case the CPA belongs to small-scale or micro-scale project categories.	No.21	The CPA shall be neither a debundled SSC nor a de-bundled micro-scale project as per latest guidelines on assessment of debundling for SSC Project Activities.	Check whether the CPA complies with all requirements listed in criteria No.21 and No.22 against each evidence listed as follows:

	No.22 There is no an already activity, which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity, 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.	- Declaration from CPA implementer on non-debundling; - The approved FSR or PDR; - Available information on all registered activities on the CDM website; - Or other available documents.

CPAs under the PoA are required to fulfil all of the eligibility criteria (No.1~No.22).

B.3. Application of methodologies

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AMS-I.D. "Grid connected renewable electricity generation" (version 17) should be applicable for each CPA. More details of the comparison of the project characteristics and the applicability criteria as specified in of AMS-I.D.(version 17) are given in the next Table.

The applicability criteria of AMS.I.D. version 17 are the following:	**Methodology AMS.I.D. version 17 is applicable to an CPA under the proposed PoA because:**
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a)Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	As per the eligibility criteria, each CPA shall be a greenfield small-scale hydropower project in rural areas of Sichuan Province, which applies renewable energy generation units (hydro) and connects to CCPG.
2. 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	As per the eligibility criteria, each CPA should be 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).

plant(s); or (d) Involve a replacement of (an) existing plant(s).	
3. 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 Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than $4W/m^2$.	As per the eligibility criteria, each CPA shall be a greenfield hydropower plant that will have a power density greater than $4W/m^2$.
4. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel the capacity of the entire unit shall not exceed the limit of 15MW.	As per the eligibility criteria, each CPA shall apply renewable components only and the capacity shall not exceed the limit of 15MW.
5. Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable, the proposed PoA shall not include combined heat and power systems.
6. In the case of project activities that involve the addition of 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 15 MW and should be physically distinct from the existing units.	Not applicable, each CPA should be a greenfield small scale hydropower project in rural areas of Sichuan Province that supply electricity to the Central China Power Grid (CCPG).
7. In the 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 15 MW.	Not applicable, each CPA should be a greenfield small scale hydropower project in rural areas of Sichuan Province that supply electricity to the Central China Power Grid (CCPG).

SECTION C. Management system
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The CME shall develop and implement a management system for operation, management and monitoring. Details are as follows:

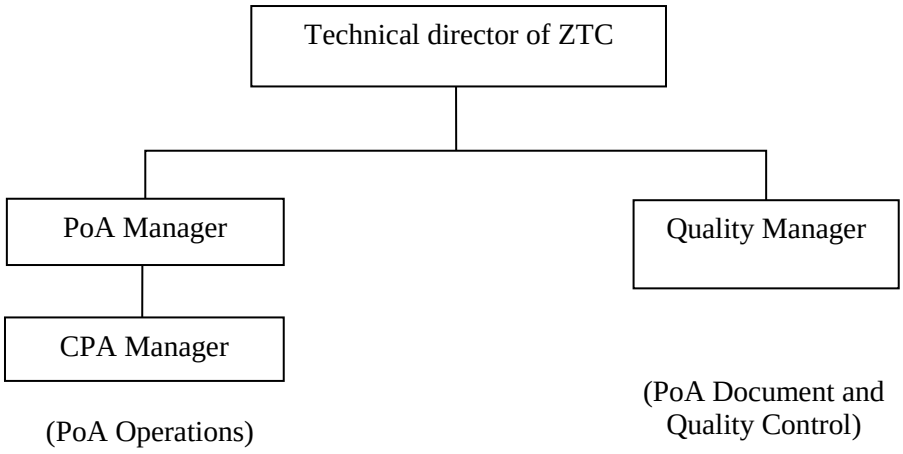

Figure C.1 - CME organisation chart for PoA Management and development

(i) A clear definition of roles and responsibilities of personnel involved

Based on the above defined chart the roles and responsibilities can be defined as shown in the following table C.1

Table C.1- The roles and responsibilities of the CME

Position	Competency requirement	Management Responsibilities and Arrangements
Technical Director	At least 5 years' experience working on the carbon market, including manage and conduct technical review of documentation during each stage of CDM project.	• Application for PoA Registration • Implementation of the Program objectives • Ensuring proper overall management of the PoA • Application for CER issuance • Ensuring proper CDM project operation and management as per required guidelines throughout the crediting period.
PoA Manager	At least 2 years' experience working in validation and verification of the CDM hydropower projects.	• CPAs contracting; • Preliminary Emissions reductions and carbon revenue estimation; • Inclusion of CPA under the PoA; • Review of CPA compliance as per guidelines; • Ensure verification of CPAs;

		● Initial CPA Eligibility Criteria compliance check; ● PoA-DD Development; ● Keep updated the PoA CPA Record; ● Quality control of implementation work. If necessary, reviews work of CPA Manager before submission to Quality Manager; ● Review and improvement suggestions of monitoring system and plan.
CPA Manager	At least 1 years' experience working in validation and verification of the CDM hydropower projects.	● Inclusion of the CPA; ● Focal point for CPA Implementers; ● Collecting of necessary statutory approvals from CPA implementers; ● Writing the CPA-DD; ● Compiles from the CPA Implementer the monitoring information and develops the monitoring report; ● Deployment of any improvements and monitoring of their impact; ● Ensure that the CPA inclusion and implementation phases are adequately resourced; ● Validation and verification support to CPA implementer throughout the crediting period.
Quality Manager	At least 3 years' experience working in validation and verification of the CDM hydropower projects.	Quality Manager is responsible for all quality checks of the PoA and its associated CPAs, including: ● Check information and documentation of the CPA; ● Check and scrutiny of all documents related to the eligibility criteria of CPA inclusion; ● Check of necessary statutory approvals from CPA implementers; ● Process and continuous improvement proposal reporting to stakeholders and management; ● Quality control of supporting documents and site information; ● Technical review of the CPA-DD documentation; ● Records of arrangements for training and capacity development.

In addition to the above management tasks, the CME should implement the following operational elements to ensure proper management and oversight of the proposed PoA.

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

Training and capacity development activities for the CPA Implementer should be carried-out with the purpose of ensuring correct monitoring as established in the CPA-DD. Training specific content and specific material (if applicable) will be adapted to each specific CPA, according to the technical specifications of each CPA, and to the characteristics of the equipment installed at each facility. It may be carried-out by the staff actively involved in this PoA, or by the CPA Manager.

Training and capacity development activities should be carried out annually by the CME. It includes (but is not limited to) the following aspects:

- CDM general information
- Eligibility criteria for inclusion of a CPA in the PoA
- Importance of monitoring in the context of a CPA/PoA
- Data recording
- Meter/instrument calibration
- Recording events
- Reporting monitoring deficiencies and communication to the CME

The records of arrangements for training and capacity development for personnel are kept by CME.

(iii) Procedures for technical review of inclusion of CPAs

The CME is responsible for technical review of inclusion of CPAs. The following technical documentation should be requested by the CME to the CPA Implementer:

- FSR/PDR
- Environmental Impact Assessment Report (EIAR)
- others documents related to the CPA

The CME should maintain close communications with the CPA Implementer before the CPA is included in the registered PoA to ensure that the CPA is eligible under the PoA. Upon inclusion, the CME should remain in communication with the CPA Implementer, and gather information related to the performance of the project activity.

The steps for the technical review of CPAs are shown as follows:

- CPA Manager 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 PoA Manager does a first quality check of all the documentation submitted by the CPA Manager. If corrections are needed, the PoA Manager coordinates with the CPA Manager to take action before submission to the Technical Director.
- Quality Manager checks deliverables and comment on open issues. Commented documents are sent back to the PoA Manager and to the CPA Manager if necessary. Such cycle might be repeated several times until sufficient quality is met.
- The Technical Director checks the outcome and agrees with PoA Manager and Quality Manager.

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

The CME should establish an electronic database (hereinafter referred as the CDM database) to perform a double counting check.

For the CDM database:

- A CDM excel spreadsheet is recorded by CME.

  It includes two tables. Table-A is shown all registered and requesting registration PoAs in China and

Table-B is shown the CDM hydropower projects in Sichuan Province.

- Each project listed in the excel spreadsheet has a separate folder.

  The folder includes the documents downloaded from the UNFCCC website, such as PDD, FVR etc.

The Quality Manager is responsible for continuous updating the CDM database based on the information from the UNFCCC website. The Technical Director will crosscheck the CDM database regularly.

The relevant parameters (such as installed capacity, geographic coordinates, etc.) of each new CPA should be compared with the already existing CDM excel spreadsheet of project activities that are registered at the UNFCCC.

Step 1: The Quality Manager checks the Table-A to avoid the case of including a new CPA that has been already registered as a CPA of another PoA. The PoA-DD/CPA-DD of the registered PoA can be checked if necessary.

Step 2: The Quality Manager checks the Table-B to avoid the case of including a new CPA that has been already registered as CDM project activity. The PDD of the CDM project can be checked if necessary.

Moreover as shown below, the CPA implementers should be made aware of the double counting principle and certify whether the proposed CPA is registered under the Clean Development Mechanism of the UNFCCC. If such a case occurs, then the coordinating entity would not proceed with inclusion of the corresponding CPA in the PoA.

The CME also need coordinate with the DOE the necessary information and documents for validation and inclusion of CPAs in the PoA and forward the completed CDM-CPA-DD form to any DOE for consistency checking after ensuring all the requirements determined in the PoA and its specific CDM-CPA-DD are met.

(v) 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, including:

  a. Identification number and name of the CPA;

  b. Contact details of the implementing entity, including contact person, address, telephone and email;

  c. Installed capacity of each activity under the CPA;

  d. Annual electricity output (MWh/yr) during the credible period;

  e. Location and geographic coordinates of each activity under the CPA.

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

  a. CPA-DD

  b. IRR spreadsheet

  c. Monthly monitoring records from the CPA implementer.

  d. Others related documents, etc.

The documentation control process is shown as follows:

- CPA Manager collects the basic information of the CPA from the CPA implementer.
- CPA Manager is responsible for finishing the CPA-DD and IRR spreadsheet based on the information from the CPA implementer.

- PoA Manager is responsible for updating the PoA excel spreadsheet based on the information of each CPA from the CPA implementer(s) and check CPA-DD, IRR spreadsheet, etc.
- CPA Manager is responsible for collecting the monthly monitoring record and others related documents from the CPA implementer(s).
- Quality Manager checks the PoA database annually and submits the outcome to the Technical Director.
- The Technical Director checks the outcome and agrees with PoA Manager and Quality 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.

(vi) 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, bearing in mind the nature of issued raised, to 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 Technical Director.

SECTION D. Duration of PoA
D.1. Start date of PoA
>>

11/06/2012 (the date of publishing of the PoA for global stakeholders comment)

D.2. Length of the PoA
>>

28 years

SECTION E. Environmental impacts
E.1. Level at which environmental analysis is undertaken
>>

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level ☑

The individual nature of each hydropower project (geography, capacity, with or without dam etc.) justifies a separate environmental assessment for each CPA. Environmental analysis will therefore be conducted for each hydropower project included in a CPA according to the applicable environmental

policies.

E.2. Analysis of the environmental impacts
>>

The environmental impacts analysis will be done at CPA level.

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

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.

The CME will mainly adopt one of the following methods for inviting stakeholder comments: newspaper announcement, the Internet announcement, stakeholder consultation meeting, questionnaires and on-site interview.

F.2. Summary of comments received
>>

Local stakeholders' comments will be described in specific CDM-CPA-DD, as each CPA concerns different stakeholders.

F.3. Report on consideration of comments received
>>

It will explain in each specific CDM-CPA-DD.

SECTION G. Approval and authorization
>>

This is a unilateral project.

For the PoA, the letter of approval from China DNA was obtained on 07 Sep. 2012.

As per the letter of approval of the PoA, Zhongtannengtou Tech Co., Ltd. is authorized as China's participant to voluntarily participate in and carry out the PoA as the CME.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA
A.1. Purpose and general description of generic CPAs
>>

[CPA Name] consists in the construction and operation of [describe if project is run-of-river or reservoir type] hydropower project, with a total installed capacity of [number] MW. The purpose of the Project is to generate electricity using renewable energy sources to be supplied to Sichuan province covered by CCPG, and it is expected to generate [number] MWh/yr electricity to the grid (average annual generation). This CPA is developed by [CPA Implementer].

The project will be located in [community, region], Sichuan province. The CPA will help reduce greenhouse gas (GHG) emissions generated from the high-growth, fossil fuel-dominated power generation in the CCPG. When the proposed project is operated, the electricity generated by the CPA will

displace part of the electricity from the CCPG, and thus GHG (CO_2) generated by fossil fuel-fired power plants could be reduced.

During the crediting period this CPA will reduce [number] tCO_2e/yr, leading to [number] tCO_2e over the crediting period. The Combined Margin emission factor of CCPG is 0.7244 tCO_2/MWh.

Table [number]: Main technical parameters of the turbine and generator

	Turbine
Type	
Quantity	
Capacity	
	Generator
Type	
Quantity	
Rated capacity	

[Data source]

Monitoring equipment and location

The CPA has [number] sets of turbines and generators with a total installed capacity of [number] MW. [Number] bidirectional meter $M_{[x]}$[8] with the accuracy of [number] as well as its backup one $M_{[x]}$' will be installed in the main line at the project site to monitor the electricity delivered to and imported from the grid. The meter M_{backup} installed at the project site will monitor the electricity imported from CCPG through the backup line in emergency.

There is [no] technology(ies) transfer from Annex I countries.
[Add more detailed information if there is technology(ies) transfer]

No public funds from countries in Annex I is involved in the proposed project.

SECTION B. Application of a baseline and monitoring methodology
B.1. Reference of the approved baseline and monitoring methodology(ies) selected
>>

1. The approved SSC baseline and monitoring methodology applied to a CPA:
   AMS-I.D. "Grid connected renewable electricity generation" (Version 17).
2. "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).
3. "Standard: Demonstration of additionality, development of eligibility criteria and application of multiples methodologies for programme of activities", Version 02.1.

Please click following link for more information about the methodology and tool:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

B.2. Application of methodology(ies)
>>
AMS-I.D. "Grid connected renewable electricity generation" (version 17) is applicable for the CPA.
More details of the comparison of the project characteristics and the applicability criteria as specified in of AMS-I.D.(version 17) are given in the next Table.

[8] X represents a variadic parameter, which can be equal to an integral number from 1 to 9.

The applicability criteria of AMS.I.D. version 17 are the following:	Methodology AMS.I.D. version 17 is applicable to an CPA under the proposed PoA because:
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a)Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The CPA is a greenfield small-scale hydropower project in rural areas of Sichuan Province, which applies renewable energy generation units (hydro) and connects to CCPG.
2. 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 (an) existing plant(s).	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).
3. 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 Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than $4W/m^2$.	Each CPA is a greenfield hydropower plant that will have a power density greater than $4W/m^2$.
4. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW	The CPA applies renewable components and the capacity shall not exceed the limit of 15MW.

	for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel the capacity of the entire unit shall not exceed the limit of 15MW.	
5.	Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable, the proposed PoA does not include combined heat and power systems.
6.	In the case of project activities that involve the addition of 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 15 MW and should be physically distinct from the existing units.	Not applicable, the CPA is a greenfield small scale hydropower project in rural areas of Sichuan Province that supply electricity to the Central China Power Grid (CCPG).
7.	In the 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 15 MW.	Not applicable, the CPA is a greenfield small scale hydropower project in rural areas of Sichuan Province that supply electricity to the Central China Power Grid (CCPG).

B.3. Sources and GHGs

>>

According to the methodology AMS.I.D, the spatial extent of the CPA boundary includes the project site and all power plants connected physically to CCPG which the CPA will be connected to.

The project boundary of a typical CPA is shown in Figure II B.1.

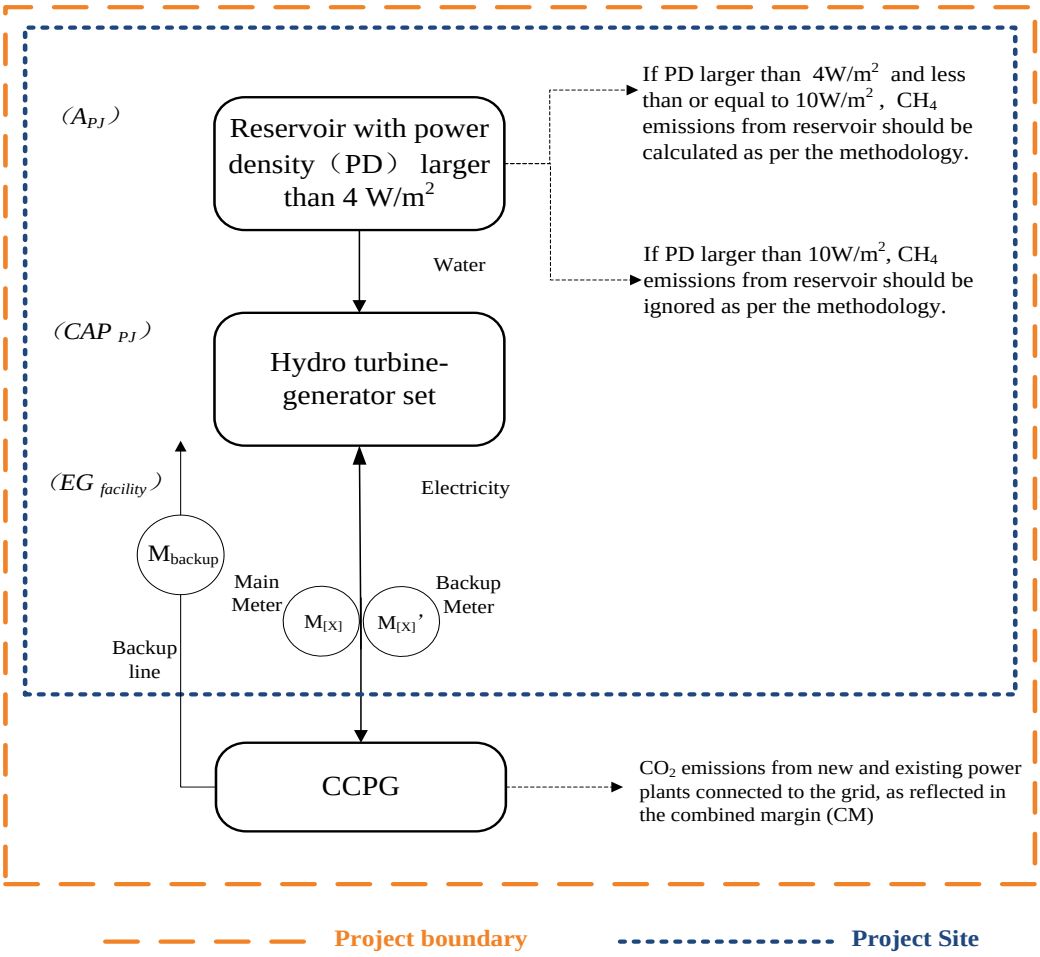

Figure II B.1 Project Boundary of a typical CPA

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table and the figure below.

Source		GHGs	Included?	Justification / Explanation
Baseline scenario	CO_2 emissions 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	Emissions caused by the proposed project activity	CO_2	No	Minor emission source
		CH_4	Yes	Main emission source
		N_2O	No	Minor emission source

B.4. Description of baseline scenario

>>

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

The emission factor of the gird that the CPA connects is used as the baseline emission factor for emission reduction calculation.

B.5. Demonstration of eligibility for a generic CPA

>>

- **Demonstration of why the CPA is eligible to be included in the PoA**

Eligibility criteria of the PoA	Procedure (evidence)	Conclusion
No.1 The geographical boundary of each CPA is Sichuan Province covered by the CCPG, and the CPA shall be located in county or village of Sichuan Province, which can be identified as "rural area" as per "The definition of statistical index " issued by State Statistics Bureau of China.	Check whether the CPA complies with all requirements listed in criteria No.1 against: -[evidence] The value of maintenance and construction tax rate of the CPA is used to crosscheck the rural area definition as per "The Interim Regulations of the People's Republic of China on the Maintenance and Construction Tax"	[conclusion]
No.2 The inclusion of the CPA in the PoA should not lead to double counting of the emissions reduction by confirming that the CPA should be neither a registered CDM project activity nor a CPA of other registered PoAs.	Check whether the CPA complies with all requirements listed in criteria No.2 against: -[evidence]	[conclusion]
No.3 Each CPA should be a hydropower project with the installed capacity no more than 15MW (run-of-river hydropower plant or reservoir hydropower plant) in rural areas of Sichuan Province that supply electricity to CCPG. No.4 The CPA shall use newly built equipment to generate electricity from hydro power. No.5 The Power Density of the CPA shall be greater than $4W/m^2$. No.6 For reservoirs power plants, new reservoir should be applied, i.e.	Check whether the CPA complies with all requirements listed in criteria No.3~No.6 against: -[evidence]	[conclusion]

the project using existing reservoir should be excluded.		
No.7 The start date of the CPA[7] should be on or after the start date of the PoA, which is the date that the PoA-DD first published for global stakeholder consultation.	Check the earliest date at which either the implementation or construction or real action of CPA against: -[evidence]	[conclusion]
No.8 Applicable for the methodology of AMS-I.D. (version 17.0) and its tool "Tool to calculate the emission factor for an electricity system (version 02.2.1)". No.9 Each CPA shall be a greenfield plant. No.10 Each CPA shall apply renewable components and the capacity shall not exceed the limit of 15MW. No.11 All CPAs to be included in the PoA shall not involve in retrofitting or modifying an existing facility for renewable energy generation. And for reservoirs power plants, new reservoir should be applied. No.5* The power density of the CPA shall be greater than $4W/m^2$. No.6* For reservoirs power plants, new reservoir should be applied, i.e. the project using existing reservoir should be excluded. * The criteria No.5 and No.6 are applicable as per the require eligibility criteria (E), thus both of them are listed again.	Check whether the CPA complies with all requirements listed in section No.5, No.6 and No.8~No.11 against: -[evidence]	[conclusion]
No.12 All Projects must comply with one of the additionality tests explained in the PoA-DD. a) For the CPA up to five megawatts that employ renewable energy technology are additional if the geographic	Check whether the CPA complies with all requirements listed in criteria No.12 against: -[evidence]	[conclusion]

location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country as per 'Guidelines for demonstrating additionality of microscale project activities (Version 4.0); b) For installed capacity of CPA >5MW and ≤15MW or CPA<5MW but not in SUZ identified as per the guidelines for demonstrating additionality of microscale project activities (version 04.0), additionality demonstration should base on the latest guidelines on the demonstration of additionality of small-scale project activities, and investment barrier analysis should be adopted to demonstrate the CPA's additionality as per the latest guidelines on the assessment of investment analysis and any other relevant guidance from the board pertaining to investment analysis.		
No.13 The information of local stakeholders' consultation and the environmental impact analysis should be conducted at CPA level. No.14 The local stakeholder consultations meeting and stakeholder questionnaires for the CPA should be carried out for collecting the comments from local stakeholders. No.15 Assessment of Impact on air, water, acoustic and solid environment should be carried out to complete the environmental impact analysis (EIA) of the CPA as per the requirements of environmental impact analysis of the host	Check whether the CPA complies with all requirements listed in criteria No.13~ No.15 against: -[evidence]	[conclusion]

	country.		
No.16	The CPA should have no public funding from Annex I countries and should not result into the diversion of official development assistance.	Check whether the CPA complies with all requirements listed in criteria No.16 against: -[evidence]	[conclusion]
No.17 No.18	The CPA should be a grid-connected renewable small scale hydropower project in rural areas of Sichuan Province. The CPA implementer shall be registered companies.	Check whether the CPA complies with all requirements listed in criteria No.17 and No.18 against: -[evidence]	[conclusion]
No.19	Each CPA should be verified individually. Thus not applicable for the sampling and surveys.	N/A	N/A
No.20	As the definition in the latest glossary of CDM terms, the CPA meets the small-scale (installed capacity over 5MW but up to 15 MW) or microscale (installed capacity up to 5MW) threshold criteria and remains within those thresholds throughout the crediting period of the CPA.	Check whether the CPA complies with all requirements listed in criteria No.20 against: -[evidence]	[conclusion]
No.21 No.22	The CPA shall be neither a de-bundled SSC nor a de-bundled micro-scale project as per latest guidelines on assessment of debundling for SSC Project Activities. There is no an already activity, which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity, 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	Check whether the CPA complies with all requirements listed in criteria No.21 and No.22 against: -[evidence]	[conclusion]

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.		

[If a CPA is fulfil with all of the eligibility criteria (No.1~No.22), the CPA can be included in the PoA.**]**

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

  The PoA is a voluntary action and no CPA will be implemented in the absence of the PoA.

i) For the CPA up to five megawatts that employ renewable energy technology are additional if the geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country defined as per the guidelines for demonstrating additionality of microscale project activities (Version 4.0);

ii) For the CPA >5 MW and ≤15MW or CPA<5MW but not in SUZ identified as per the guidelines for demonstrating additionality of microscale project activities (version 04.0), additionality demonstration should base on the latest guidelines on the demonstration of additionality of small-scale project activities, and investment barrier analysis should be adopted to demonstrate the CPA's additionality as per the guidelines on the assessment of investment analysis and any other relevant guidance from the board pertaining to investment analysis.

Step 1: Determine appropriate analysis method

The analysis will be conducted through Option III of the additionality tool, i.e. benchmark analysis. This method is applicable because:

· Option I: Simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.

· Option II: Investment comparison analysis is not used as the project entity is not considering investing in the construction of one of the other identified alternatives.

· Option III: Benchmark analysis is used as the return on investment relative to the industry benchmark was crucial for the decision to go ahead with the project.

Step 2: Option III: Apply benchmark analysis

The CPA faces a barrier to implement due to the poor returns on investment. For this PoA, the financial indicator identified for a typical CPA is the Internal Rate of Return (IRR) which is indicator commonly used to determine investment decisions. According to "Economic evaluation code for small hydropower projects", issued by Ministry of Water Resources of the People's Republic of China, the benchmark of this kind of small hydropower project post-tax IRR is 10%.

Step 3a): Calculation and comparison of financial indicators

As the analysis above, the benchmark of the project post-tax IRR is 10%. The project is considered to be financially unfeasible when the CPA post-tax IRR is lower than the benchmark.

Table II B. 1 shows the typical input data that is required to calculate the project IRR for each activity under the CPA.

Table II B. 1: Input data to calculate project IRR after tax for each activity under the CPA

Item	Unit	Amount	Source

Installed capacity	MW	[number]	FSR/PDR
Annual electricity output	MWh	[number]	FSR/PDR
Static total investment	Million RMB	[number]	FSR/PDR
Average annual O&M cost	Million RMB	[number]	FSR/PDR
Electricity tariff (Including VAT)	RMB/kWh	[number]	FSR/PDR
VAT rate	%	[number]	FSR/PDR
Long-term loan interest rate	%	[number]	FSR/PDR
Residual value rate	%	[number]	FSR/PDR
Maintenance and construction tax rate[9]	%	[number]	FSR/PDR
Operation Life	Years	[number]	FSR/PDR

A standardized excel worksheet will be used to calculate the project IRR.

Step 3b): Benchmark calculation

The investment analysis compares the post-tax IRR of the project with the benchmark 10%. The IRR with and without CDM revenue are listed in Table II B.2. If the post-tax IRR of the proposed project, without the income from CERs, the IRR of the proposed project is lower than the benchmark, the project is not considered financially viable.

Table II B. 2 Financial Indicators of the CPA

Item	Without CERs Revenue	Benchmark
CPA IRR	[number]	10%

Step 4: Sensitivity analysis

The objective of this sub-step is to show that the conclusion regarding the financial attractiveness is robust under reasonable variations of the critical assumptions.

Four factors are considered in the following sensitivity analysis:

1) Static total investment;
2) Annual operation and maintenance (O&M) cost;
3) Electricity tariff;
4) Annual electricity output.

In China, the typical range of sensitivity analysis is normally chosen to be –10%～+10% in investment analysis, which has been defined by Project decision analysis and evaluation[10]. Therefore, the range of the CPA sensitivity analysis is chosen to be -10%～10%.

Assuming the above four factors vary in the range of -10% to 10%, the project IRR of the proposed project (without CERs) varies to different extent, as shown in Table II B. 3:

Table II B.3 Sensitivity analysis of the project

	-10%	-5%	0%	5%	10%
Static total investment	[number]	[number]	[number]	[number]	[number]
Annual O&M Cost	[number]	[number]	[number]	[number]	[number]

[9] The value of this parameter can be used to check whether the CPA is located in the rural area.
[10] Project decision analysis and evaluation, 2008 version, China Plan Press, p393.

Electricity tariff	[number]	[number]	[number]	[number]	[number]
Annual electricity output	[number]	[number]	[number]	[number]	[number]

[If the sensitivity analysis shows that the post-tax project IRR of the CPA is lower than the benchmark in all cases, then the results of the investment analysis are deemed robust.

If the post-tax project IRR exceeds the benchmark, the CPA implementer should provide evidences that this is unlikely to happen.

If such demonstration cannot be substantiated with sufficient evidence, the CPA will be considered as non-additional.]

[Conclusion]

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

According to paragraph 20 of AMS.I.D (Version 17), "for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002. The typical CPA is a hydro power generation project connected to the national grid. Emission reductions by the CPA can be calculated as per ACM0002 (Version 13.0.0) and the methodological tool "Tool to calculate the emission factor for an electricity system" (version 02.2.1).

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

All following listed parameters are determined at PoA level:

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated by power plant in year y
Source of data	China Electric Power Yearbook (2008-2010)
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	Official and authoritative statistics
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2/ MWh
Description	Operating Margin Emission Factor.
Source of data	From the Report on Determination of 2011 Baseline Grid Emission Factor by China DNA
Value(s) applied	1.0297

Choice of data or Measurement methods and procedures	Official and authoritative statistics
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/ MWh
Description	Build Margin Emission Factor.
Source of data	From the Report on Determination of 2011 Baseline Grid Emission Factor by China DNA
Value(s) applied	0.4191
Choice of data or Measurement methods and procedures	Official and authoritative statistics
Purpose of data	
Additional comment	-

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/ MWh
Description	CM emission factor, the weighted average of OM and BM, ex-ante calculation and determination
Source of data	From the Report on Determination of 2011 Baseline Grid Emission Factor by China DNA.
Value(s) applied	0.7244
Choice of data or Measurement methods and procedures	Official and authoritative statistics
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	China Energy Statistical Yearbook (2008-2010)
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	Official data
Purpose of data	Calculation of baseline emissions

Additional comment	-

Data / Parameter	$FC_{i,y}$
Unit	Mass or volume unit
Description	The amount of fuel i (in a mass or volume unit) consumed by relevant power sources m in year(s) y
Source of data	China Energy Statistical Yearbook (2008-2010)
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	Official data
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type i used in power unit m in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	IPCC Default Value
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{Total,y}$
Unit	MW
Description	Total capacity addition exceeding 20% of existing capacity in year y
Source of data	China Electric Power Yearbook (2008-2010)
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	China Electric Power Yearbook (2008-2010)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{Thermal,y}$
Unit	MW
Description	Capacity addition of thermal power in year y
Source of data	China Electric Power Yearbook (2008-2010)
Value(s) applied	See PoA-DD Annex 4
Choice of data or Measurement methods and procedures	China Electric Power Yearbook (2008-2010)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{Coal,Adv,y}$
Unit	tCO_2/ MWh
Description	Emission factor proxies of efficiency level of the best coal-fired power generation technology commercially available in China
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	0.7967
Choice of data or Measurement methods and procedures	Notification on Determining Baseline Emission Factor of China's Grid
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{Oil,Adv,y}$
Unit	tCO_2/ MWh
Description	Emission factor proxies of efficiency level of the best oil-based power generation technology commercially available in China
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	0.5250
Choice of data or Measurement methods and procedures	Notice on Determining Baseline Emission Factor of China's Grid
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{Gas,Adv,y}$
Unit	tCO_2/ MWh
Description	Emission factor proxies of efficiency level of the best gas-based power generation technology commercially available in China
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China
Value(s) applied	0.3776
Choice of data or Measurement methods and procedures	Notice on Determining Baseline Emission Factor of China's Grid
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 if the Power Density of the CPA is greater than 4 W/m^2 and less than or equal to 10 W/m^2
Source of data	Decision by EB23
Value(s) applied	90 $kgCO_2e$/MWh
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. Given that all qualified CPAs would be new hydro power plants as per the eligibility criteria, this value is zero for all CPAs
Source of data	Project site
Value(s) applied	0
Choice of data or Measurement methods and procedures	Determine the installed capacity based on recognized standards
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 the project activity, when the reservoir is full (m^2). Given that all qualified CPAs would apply new reservoirs as per the eligibility criteria, this value is zero for all CPAs.
Source of data	Project site
Value(s) applied	0
Choice of data or Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data	Calculation of project emissions
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

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1. Project emissions (PE_y)

According to paragraph 20 of AMS.I.D (Version 17), "for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002. As per ACM0002, for hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir.

- 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

$$PE_{HP,y} = \frac{EF_{Res} * TEG_y}{1000}$$

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)

- If the power density of the project activity (PD) is greater than 10W/m^2, $PE_{HP,y} = 0$.

The power density of the project activity (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD = Power density of the project activity (W/m^2)

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). Given that all qualified CPAs would be new hydro power plants as per the eligibility criteria, this value is zero for all CPAs.

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). Given that all qualified CPAs would apply new reservoirs as per the eligibility criteria, this value is zero for all CPAs.

Since the parameters Cap_{PJ} and A_{PJ} vary at the CPA level, the project emission for each CPA would be determined at the CPA level.

2. Baseline emissions (BE_y)

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. AMS-I.D assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \qquad (1)$$

Where:

BE_y = Baseline emissions in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CPA in year y (MWh/yr)

$EF_{grid,CM,y}$ = 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" (Version 02.2.1) (tCO_2/ MWh)

The CPA will be an installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the CPA project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \qquad (2)$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CPA in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

For this PoA, the emission factor will be determined in the PoA level.

The methodological tool "Tool to calculate the emission factor for an electricity system" (version 02.2.1) determines the CO_2 emission factor for the displacement of electricity generated by power plants in the grid which the PoA connected to, by calculating the "combined margin" emission factor (CM) of the grid. The CM is the result of a weighted average of two emission factors pertaining to the grid: 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 PoA. 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 PoA.

The following six steps are applied to calculate the emission factor for an electricity system:

- Step 1: Identify the relevant electricity systems.
- Step 2: Choose whether to include off-grid power plants in the project electricity system (optional).
- Step 3: Select a method to determine the operating margin (OM).

- Step 4: Calculate the operating margin emission factor according to the selected method.
- Step 5: Calculate the build margin (BM) emission factor.
- Step 6: Calculate the combined margin (CM) emission factor.

Step1: Identify the relevant electricity systems

Identify the electricity system and its covered areas that the PoA connects to, according to the "Tool to calculate the emission factor for an electricity system" and latest delineation of electricity system given by Chinese DNA.

In this specific case, the project finally displaces the power generated by the Central China Power Grid (CCPG). The CCPG is selected as the project electricity system, as there is guidance available from Chinese DNA's "2011 Baseline Emission Factors for Regional Power Grids in China"[11] issued on 20/10/2011.

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.

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

Step3: Select a method to determine the operating margin (O M)

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

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

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. They typically include hydro, geothermal, hydro, low-cost biomass, nuclear and solar generation.

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 PoA-DD 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 PoA-DD 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 to calculate the emission factor for year y is usually

[11] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

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

Ex ante option was chosen to calculate the OM emission factor for all CPAs under this PoA.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated with the following two options:

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

Option B: Based on net electricity generation, the average efficiency of each power unit and the fuel type 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).

As the data of fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable in China, thus option A cannot be used. Nevertheless, the data of 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 are available, and, 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, therefore, Option B is chosen for the proposed project.

Under Option B, the simple OM emission factor of the regional grid is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y} \right)}{EG_y} \qquad (3)$$

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2e/MWh)
$FC_{i,y}$	= Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	= 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 three most recent years for which data is available at the time of submission of the PoA-DD to the DOE for validation (ex ante option)

With above option, the simple operating margin CO_2 emission factor ($EF_{grid,OMsimple,y}$) of CCPG is calculated as 1.0297 tCO_2/MWh. The detailed data is listed in the Annex 4.

$EF_{grid,OMsimple,y}$ =1.0297 tCO_2/MWh

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 F-CDM-SSC-PoA-DD 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 (BM) emission factor. And the capacity additions from retrofits of power plants are not included in the calculation of the build margin emission factor.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (4)$$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year y (tCO_2e/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2e/MWh)
m	= Power units included in the build margin
y	= Most recent historical year for which power generation data is available

The build margin calculations featured below is derived from the "Notification on Determining Baseline Emission Factor of China's Grid", which has been renewed by the Chinese DNA on 20 Oct., 2011 and accepted by EB[12].

[12] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/deviations.

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.

According to "Tool to calculate the emission factor for an electricity system" and EB accepts, the main steps related formulas for BM calculation are as follows:

Sub-step 5-1: Calculation of weights of CO_2 emissions by coal-fired, oil-fired and gas-fired plants in total CO_2 emissions

$$\lambda_{Coal,\,y} = \frac{\sum_{i \in COAL,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}} \qquad (5)$$

$$\lambda_{Oil,\,y} = \frac{\sum_{i \in OIL,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}} \qquad (6)$$

$$\lambda_{Gas,\,y} = \frac{\sum_{i \in GAS,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}}{\sum_{i,\,j} F_{i,\,j,\,y} \times NCV_{i,\,y} \times EF_{CO_2,\,i,\,j,\,y}} \qquad (7)$$

Where:

$F_{i,\,j,\,y}$	= The amount of fuel i (in a mass or volume unit) consumed by province j in year y
$NCV_{i,\,y}$	= The net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO_2,\,i,\,j,\,y}$	= The CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
$COAL$, OIL and GAS	= The aggregation of various kinds of coal, oil, and gas as fossil fuels

COAL, OIL, and GAS is the aggregation of various kinds of coal, oil, and gas as fossil fuels

Sub-step 5-2: Calculate the emission factor of thermal power generation

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

$$EF_{Thermal,\,y} = \lambda_{Coal,\,y} \times EF_{Coal,\,Adv,\,y} + \lambda_{Oil,\,y} \times EF_{Oil,\,Adv,\,y} + \lambda_{Gas,\,y} \times EF_{Gas,\,Adv,\,y} \qquad (8)$$

Where:

$EF_{Coal,\,Adv,\,y}$, $EF_{Oil,\,Adv,\,y}$ and $EF_{Gas,\,Adv,\,y}$ are the emission factor proxies of efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

Sub-step 5-3: Calculation of Build Margin (BM) emission factor

$$EF_{grid,\,BM,\,y} = \frac{CAP_{Thermal,\,y}}{CAP_{Total,\,y}} \times EF_{Thermal,\,y} \qquad (9)$$

Where:

$CAP_{Total,\,y}$	= The total amount of newly added installed capacity
$CAP_{Thermal,\,y}$	= The increased installed capacity of the thermal power generation

Base on the formulas above, the result is:

$EF_{grid,BM,y}$ =0.4191 tCO_2/MWh

For the detailed information, please see the Annex 4.

Step 6: Calculate the combined margin 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:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM} \qquad (10)$$

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)
ω_{OM}	= Weighting of operating margin emission factor (%)
ω_{BM}	= Weighting of build margin emission factor (%)

The following default values should be used for w_{OM} and w_{BM}:

w_{OM} and w_{BM} are the weightings of operating margin emissions factor and build margin emissions factor. For hydro project activities, w_{OM} = 0.5, w_{BM} = 0.5.

Applying the default weights for the proposed project, we calculate a Baseline Emission Factor used in the PoA as follows:

$EF_{grid,CM,y}$ =1.0297 tCO_2/MWh *0.5+0.4191 tCO_2/MWh *0.5=0.7244 tCO_2/MWh (The parameter will be applied to each CPA under the PoA)

3. Leakage

According to AMS.I.D version 17, if the energy generating equipment is transferred from another activity, leakage is to be considered. Otherwise, it will be neglected. For project activity under a Programme of Activities, in case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented.

As per eligibility criteria for this PoA, only CPA that employ new equipment are eligible to be included.

Therefore, for all qualified CPAs, LE_y = 0.

4. Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad (11)$$

Where:

ER_y = Emission reductions in year y (tCO_2e/yr)

BE_y = Baseline emissions in year y (tCO_2/yr)

PE_y = Project emissions in year y (tCO_2e/yr)

LE_y = Leakage emissions in year y (tCO_2/yr)

The power density is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Therefore, the Power Density of the CPA is [number] W/m^2.

- *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*

$$PE_{HP,y} = \frac{EF_{Res} * TEG_y}{1000}$$

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

$PE_{HP,y} = 0$

According to the analysis above, leakage of the CPA is 0, then L_y=0 tCO_2.

The baseline emissions are the product of the baseline emission factor ($EF_{grid,CM,y}$ in tCO_2/MWh) times the electricity supplied by the proposed project ($EG_{PJ,y}$ in MWh). The annual electricity delivered by the CPA is estimated as [number] MWh/yr and will be monitored ex-post.

Then the baseline emissions are:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ (3)

The emission reduction is:

$ER_y = BE_y - PE_y$ (13)

Summary of the ex-ante estimates of emission reduction

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year A	[number]	[number]	[number]	[number]
Year B	[number]	[number]	[number]	[number]
Year C	[number]	[number]	[number]	[number]
Year D	[number]	[number]	[number]	[number]
….	[number]	[number]	[number]	[number]
Total	[number]	[number]	[number]	[number]
Total number of crediting years	[number]			
Annual average over the crediting period	[number]	[number]	[number]	[number]

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	$EG_{facility, y}$
Unit	MWh/yr
Description	Quantity of net electricity supplied by the project plant to the grid in year y
Source of data	Electricity meter(s)
Value(s) applied	To be specified by each CPA
Measurement methods and procedures	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid This parameter will be calculated as $EG_{facility,y} = EG_{PJ\ to\ CCPG,\ y} - EG_{CCPG\ to\ PJ,\ y} - EG_{backup\ ,\ y}$.
Monitoring frequency	This parameter will be continuously measured and monthly recorded. The data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
QA/QC procedures	Cross check measurement results with records for sold electricity. The accuracy of the meter will be no lower than 0.5 as per DL/T448-2000.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{PJ\ to\ CCPG,\ y}$
Unit	MWh/yr
Description	Quantity of electricity supplied by the project plant to the CCPG through the main line in year *y*
Source of data	Electricity meter(s)
Value(s) applied	To be specified in each CPA. (ex-ante estimated data)
Measurement methods and procedures	This parameter will be measured by electric energy meter.
Monitoring frequency	This parameter will be continuously measured and monthly recorded. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. The electricity meter will be operated by the project sponsor according to relevant industrial standard.
QA/QC procedures	The data is monitored through the meter and checked by electricity sales receipts. The accuracy of the meter is no lower than 0.5 as per DL/T448-2000.
Purpose of data	Calculation of baseline emissions
Additional comments	As the construction of project is not completed, the value indicated here is estimated.

Data / Parameter	$EG_{backup,\ y}$
Unit	MWh/yr
Description	Quantity of electricity delivered to the project plant from the CCPG through the backup line in emergency.
Source of data	Electricity meter(s)
Value(s) applied	To be specified in each CPA. (ex-ante estimated data)
Measurement methods and procedures	This parameter will be measured by electric energy meter.
Monitoring frequency	This parameter will be continuously measured and monthly recorded. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. The electricity meter will be operated by the project sponsor according to relevant industrial standard.
QA/QC procedures	The data is monitored through the meter and checked by electricity sales receipts. The accuracy of the meter is no lower than 0.5 as per DL/T448-2000.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	$EG_{CCPG\ to\ PJ,\ y}$
Unit	MWh/yr
Description	Quantity of electricity supplied to the project plant from the CCPG through the main line in year *y*.
Source of data	Electricity meter(s)
Value(s) applied	To be specified in each CPA. (ex-ante estimated data)
Measurement methods and procedures	This parameter will be measured by electric energy meter.
Monitoring frequency	This parameter will be continuously measured and monthly recorded. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. The electricity meter will be operated by the project sponsor according to relevant industrial standard.
QA/QC procedures	The data is monitored through the meter and checked by electricity sales receipts. The accuracy of the meter is no lower than 0.5 as per DL/T448-2000.
Purpose of data	Calculation of baseline emissions
Additional comments	-

Data / Parameter	TEG_y
Unit	MWh/yr
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*
Source of data	Project activity site
Value(s) applied	To be specified in each CPA.
Measurement methods and procedures	Electricity meters
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comments	Applicable to hydro power project activities with a power density of the project activity (PD) greater than $4W/m^2$ and less than or equal to $10W/m^2$.

Data / Parameter	Cap_{PJ}
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity.

Source of data	Project Site
Value(s) applied	To be specified in each CPA.
Measurement methods and procedures	Determine the installed capacity based on recognized standards
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	Project Site
Value(s) applied	To be specified in each CPA.
Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
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

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The monitoring plan is designed to calculate the GHG emission reductions at the CPA level. The following procedures shall be applied to the monitoring:

1. Monitoring Framework

The CME will act as the overall supervisor of the PoA, preparing the operation and monitoring manual for CPAs, calculating emission reductions and preparing monitoring reports periodically to the DOE.

The CPA implementers will undertake the monitoring of CPA operations including employee training, data collection and report to the CME periodically.

Moreover, the CPA implementers will also supply the monthly minoring records to the CPA Manager.

The monitoring framework at the CPA level conducted by the CPA implementer is shown as follows:

- Monitoring organization of the CPA implementer

Prior to the start of the crediting period, the organization of the monitoring team will be established by the CPA implementer. Clear roles and responsibilities will be assigned to all staff involved in the CDM project and a single CDM Manager will be nominated. The CDM Manager of the CPA implementer has the overall responsibility of the monitoring system on this CPA.

The structure of the monitoring group is shown as follows:

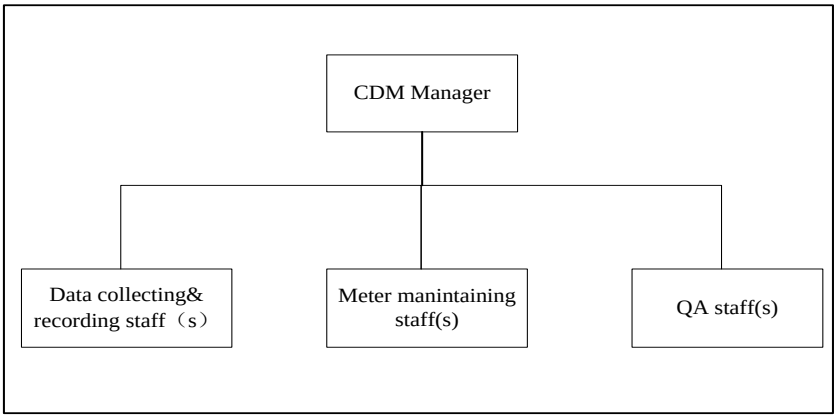

Figure II B.1 CDM management structure of the CPA implementer

The CDM Manager of the CPA implementer will have the overall responsibility for the monitoring system on this project, including:

- Setting up a series of procedure in order to provide detailed arrangements of data collecting and keeping, and ensure that complete and accurate records are retained within the quality control system.
- Ensuring that the procedures are followed on site and for continuously improving the procedures to ensure a reliable monitoring system is established.
- Administer staff, including training new staff, supervising the performance of the monitoring plan, and when the trained monitoring staffs is absent, and the integrity of the monitoring system is maintained by other trained staff.
- Review the internal audit and monitoring reports.

Data collecting & recording staff of the CPA implementer will be responsible for the daily measurement and recording of all meters' readings.

Meter maintaining staff of the CPA implementer will provide regular and preventative maintenance to the electricity meters. Meter maintaining staff will also be responsible for organizing meter calibration, accuracy validation and sealing procedure jointly with the third party entity (Power Grid Company).

QA staff of the CPA implementer will be responsible for data quality control and quality assurance. Data and records will be checked prior to being stored and archived to identify possible errors or omissions. The data checks will include cross checks of the meter, and checks of the electricity figures on the receipts from the grid company. All records will be checked for completeness. QA staff will also be responsible for preparing monitoring report of the proposed project including operating periods, power generation, power delivered to the grid, equipment defects, etc.

All other CDM monitoring staff of the CPA implementer will have clearly defined roles and responsibilities. The CDM Manager of the CPA implementer will perform the processes of training new staff and ensuring trained staffs performing the monitoring duties properly.

- Monitoring subject of the CPA implementer

The main data will be monitored including:

$EG_{PJ\ to\ CCPG,\ y}$: Quantity of electricity supplied by the project plant to the CCPG through the main line in the year y.
$EG_{CCPG\ to\ PJ,\ y}$: Quantity of electricity delivered to the project plant from the CCPG through the main line in the year y.
$EG_{backup,\ y}$: Quantity of electricity delivered to the project plant from the CCPG through the backup line in emergency.

Quantity of net electricity generation supplied by the project plant to the CCPG in year(s) *y* ($EG_{facility,\ y}$) is equal to

$$EG_{facility,y} = EG_{PJ\ to\ CCPG,\ y} - EG_{CCPG\ to\ PJ,\ y} - EG_{backup\ ,\ y}.$$

For calculation of the emission reduction by the project plant, only the net electricity produced by the proposed project ($EG_{facility,y}$) will be used.

Furthermore, surface area at full reservoir level (A_{PJ}) should be monitored. Cap_{PJ} should be checked by the nameplate.

- Monitoring equipment and installation at the CPA level

The electricity generated by the proposed project will be boosted, and then delivered to grid through Substation by the transmission line.

The CPA has [number] sets of turbines and generators with a total installed capacity of [number] MW. [Number] bidirectional meter $M_{[x]}$ with the accuracy of [number] as well as its backup one $M_{[x]}$' will be installed in the main line at the project site to monitor the electricity delivered to and imported from the grid. The meter M_{backup} installed at the project site will monitor the electricity imported from CCPG through the backup line in emergency.
The accuracy of the meters will be no lower than 0.5.

The metering equipments will be properly calibrated annually according to the relevant industrial standard DL/T448-2000.

- Data collecting by the CPA implementer

$EG_{facility,y}$

The CPA implementer is responsible for the meter operation; the metering devices will be kept in good condition.

The monitoring steps of the electricity delivered to the grid are listed as the following:

The CPA implementer will record readings (including the export electricity and import electricity) of the metering equipment at the fixed time of every month;

The CPA implementer will calculate net electricity delivered to the grid based on the meter's reading record;

Calculation of the emission reduction by the CPA. The conservative data between the records from meter readings and sale receipts will be used as the net electricity produced by the proposed project ($EG_{facility,y}$).

The CPA implementer will provide DOE with the meter records as well as the sale receipts for verification.

A_{PJ}

The surface area of the reservoir (A_{PJ}) will be monitored annually by a qualified and independent third-party. The report issued by this third-party will be presented to the DOE during verification.

Cap_{PJ}

The installed capacity after the implementation of the proposed project (Cap_{PJ}) will be checked by the nameplate after operation.

2. Data Quality Control

Quality control is to ensure the accuracy of data collected through measures including periodic calibration of monitoring meters, corrective actions, and internal audits. CME is responsible for comparing monthly data reports with on-site original data, crosschecking sales receipts with data reports to ensure data consistency and accuracy before transferring data to the data management unit.

- Quality Assurance and Quality Control at the CPA level

The metering equipments should be maintained properly and calibrated yearly according to relevant industrial standard by authorized third party to ensure the accuracy.

All CDM monitoring staff will have clearly defined roles and responsibilities. The CDM Manager of the CPA implementer will perform the processes of training new staff and ensuring trained staffs performing the monitoring duties properly.

If the reading of the main meter(s) in a certain month is so inaccurate as to be out of the error range or the meter does not work normally, the grid-connected generation shall be worked out by using the following measures:

a) To read the data of the backup meter.

b) To see the electricity sale receipts.

c) Or the project owner and the grid company shall prepare jointly and approve a correct reading estimation report, otherwise the emission of the project during the period of the main meter and its backup meter both failing to operate will be estimated as zero.

3. Training and Monitoring Personnel

All people that participate in the monitoring process will be suitably qualified and trained in the operation and maintenance of the plant. They will also receive a training session on the application of the monitoring plan.

4. Monitoring Reports and Verification

The CPA implementer will annually prepare a monitoring report which will include among others metering values of power supplied to and received from the grid, copies of sales/billing receipts, a report on calibration and a calculation of emission reductions.

Monitoring reports will be prepared and submitted to the DOE for verification by the CME.

- - - - -

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

Organization	Zhongtannengtou Tech Co., Ltd.
Street/P.O. Box	East Third Ring Road
Building	39 Court No.6 Building
City	Beijing
State/Region	
Postcode	100020
Country	P.R. China
Telephone	+86-10-65889817
Fax	+86-10-65889893
E-mail	cdm.zhongtan@gmail.com
Website	
Contact person	Chaoyuan Jia
Title	
Salutation	Ms.
Last name	Jia
Middle name	
First name	Chaoyuan
Department	
Mobile	
Direct fax	+86-10-65889893
Direct tel.	+86-10-65889817
Personal e-mail	

Organization	Department of Climate Change, National Development & Reform Commission of China
Street/P.O. Box	No. 38, Yuetan South Street, Xicheng District
Building	
City	Beijing City
State/Region	
Postcode	100824
Country	P. R. China
Telephone	+86-(0)10-68502963
Fax	+86-(0)10-68502358
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Website	
Contact person	Cuihua Sun
Title	
Salutation	Ms.
Last name	Sun
Middle name	
First name	Cuihua
Department	
Mobile	
Direct fax	+86-(0)10-68502358
Direct tel.	+86-(0)10-68502963
Personal e-mail	sunch@ndrc.gov.cn; wangshu@ccchina.gov.cn

Appendix 2: Affirmation regarding public funding

No public funds from Annex I countries.

Appendix 3: Application of methodology(ies)

No more information.

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

The Annex 4 provides the basic data and results of the baseline emission factor in the Central China Power Grid (CCPG).

The table list used for calculation of combined margin emission factor ($EF_{grid,CM,y}$) (including data, data sources and course of calculation) is as follows:

Table 4- 1 Low calorific values, CO_2 emission factors and oxidation factors of fuels 54
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Table 4- 1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuels	Low Calorific Values	Emission Factor ($kgCO_2/TJ$)
Raw Coal	20,908 kJ/kg	87,300
Cleaned Coal	26,344 kJ/kg	87,300
Mould Coal	20,908 kJ/kg	87,300
Other Washed Coal	8,363 kJ/kg	87,300
Coke	28,435 kJ/kg	95,700
Crude Oil	41,816 kJ/kg	71,100
Gasoline	43,070 kJ/kg	67,500
Diesel Oil	42,652 kJ/kg	72,600
Fuel Oil	41,816 kJ/kg	75,500
Other Oil Products	41,816 kJ/kg	72,200
Natural Gas	38,931 kJ/m^3	54,300
Coke Oven Gas	16,726 kJ/m^3	37,300
Other Gas	5,227 kJ/m^3	37,300
LPG	50,179 kJ/kg	61,600
Refinery Gas	46,055 kJ/kg	48,200

Data Source: The net calorific values are quoted from <China Energy Statistical Yearbook 2010>, Page 285.The emission factors are quoted from" 2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, as the lower value of 95% confidence interval.

1. The data and calculation of Simple OM Emission Factor of CCPG

1) CO_2 emission of all kinds of fuels in CCPG in 2007-2009

Table 4- 2 Operating Margin Emission Factor ($EF_{grid,OM,y}$) of CCPG in 2007

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Carbon content	Fuel emission factor	Average low calorific value	CO_2 emission (tCO_2e)
									(tC/TJ)	($kgCO_2$/TJ)	(MJ/t,km^3)	L=G ×J ×K/ 100000 (mass unit)
		A	B	C	D	E	F	G=A+…+F	H	J	K	L=G ×J ×K/ 10000 (volume unit)
Raw coal	10^4 t	2200.57	9357	3479.81	2683.81	1547.7	3239	22507.89	25.8	87,300	20,908	410,829,404
Washed coal	10^4 t		3.07			3.8		6.87	25.8	87,300	26,344	157,998
Other washed coal	10^4 t	0.04	87.16		2.06	96.42		185.68	25.8	87,300	8,363	1,355,631
Moulded coal	10^4 t						0.01	0.01	26.6	87,300	20,908	183
Coke	10^4 t							0	29.2	95,700	28,435	0
Coke oven gas	10^8 m^3	0.08	2.61	0.25	0.31	0.91		4.16	12.1	37,300	16,726	259,534
Other gas	10^8 m^3	29.17	25.79		24.69		23.98	103.63	12.1	37,300	5,227	2,020,444
Crude oil	10^4 t		0.43					0.43	20	71,100	41,816	12,784
Gasoline	10^4 t				0.04	0.01		0.05	18.9	67,500	43,070	1,454
Diesel oil	10^4 t	0.98	3.21	2.51	2.83	1.93		11.46	20.2	72,600	42,652	354,863
Fuel oil	10^4 t	0.42	1.25	1.33	0.63	0.64	1.74	6.01	21.1	75,500	41,816	189,742
LPG	10^4 t							0	17.2	61,600	50,179	0
Refinery gas	10^4 t	1.43	10.01	0.97	0.7			13.11	15.7	48,200	46,055	291,022
Natural gas	10^8 m^3		0.12	0.18		0.2	1.87	2.37	15.3	54,300	38,931	501,007
Other petroleum products	10^4 t							0	20	75,500	41,816	0
Other coking products	10^4 t							0	25.8	95,700	28,435	0
Other energy	10^4 t standard	23.43	63.65	35.95	29.46	23.21		175.7	0	0	0	0

	coal											
											Total	415,974,066

Data Source: <China Energy Statistical Yearbook 2008>

Table 4- 3 Operating Margin Emission Factor ($EF_{grid,OM,y}$) of CCPG in 2008

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Carbon content	Fuel emission factor	Average low calorific value	CO_2 emission (tCO_2e)
									(tC/TJ)	($kgCO_2$/TJ)	(MJ/t,km^3)	L=G×J×K/100000 (mass unit)
		A	B	C	D	E	F	G=A+…+F	H	J	K	L=G×J×K/10000 (volume unit)
Raw coal	10^4 t	2137.08	9480.74	2852.29	2620.44	1421.42	2727.61	21239.58	25.8	87,300	20,908	387,679,342
Washed coal	10^4 t		1.68			3.27		4.95	25.8	87,300	26,344	113,842
Other washed coal	10^4 t	0.04	80.54		2.06	101.75		184.39	25.8	87,300	8,363	1,346,213
Moulded coal	10^4 t				6.12		0.01	6.13	26.6	87,300	20,908	111,889
Coke	10^4 t		0.78		0.92			1.7	29.2	95,700	28,435	46,261
Coke oven gas	10^8 m^3	0.1	4.19	0.37	0.24	6.66	0.01	11.57	12.1	37,300	16,726	721,829
Other gas	10^8 m^3	23.67	41.36		3.31	0.37	0.01	68.72	12.1	37,300	5,227	1,339,814
Crude oil	10^4 t		0.17					0.17	20	71,100	41,816	5,054
Gasoline	10^4 t							0	18.9	67,500	43,070	0
Diesel oil	10^4 t	0.88	7.02	2.82	3.41	1.59		15.72	20.2	72,600	42,652	486,775
Fuel oil	10^4 t	0.07	1.45		1.29		3.14	5.95	21.1	75,500	41,816	187,848
LPG	10^4 t							0	17.2	61,600	50,179	0
Refinery gas	10^4 t	0.21	3.91	2.78	0.71		0.01	7.62	15.7	48,200	46,055	169,153
Natural gas	10^8 m^3		4.02	0.16		0.05	12.92	17.15	15.3	54,300	38,931	3,625,430
Other petroleum products	10^4 t			0.59				0.59	20	72,200	41,816	17,813
Other coking products	10^4 t						0.01	0.01	25.8	95,700	28,435	272
Other energy	10^4 t standard coal	18.16	68.11	62.35	11.42	64.87		224.91	0	0	0	0
											Total	395,851,534

Data Source: <China Energy Statistical Yearbook 2009>

Table 4- 4 Operating Margin Emission Factor ($EF_{grid,OM,y}$) of CCPG in 2009

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Carbon content	Fuel emission factor	Average low calorific value	CO_2 emission (tCO_2e)
									(tC/TJ)	($kgCO_2$/TJ)	(MJ/t,km^3)	L=G×J×K/100000 (mass unit)
		A	B	C	D	E	F	G=A+…+F	H	J	K	L=G×J×K/10000 (volume unit)
Raw coal	10^4 t	2184.31	9339.64	2888.29	2810.69	1413.64	2817.31	21453.88	25.8	87,300	20,908	391,590,892
Washed coal	10^4 t		3.35					3.35	25.8	87,300	26,344	77,044
Other washed coal	10^4 t		59.93			136.75	97.94	294.62	25.8	87,300	8,363	2,150,991
Moulded coal	10^4 t				2.63			2.63	26.6	87,300	20,908	48,005
Coke	10^4 t		1.08	0.06	0.09			1.23	29.2	95,700	28,435	33,471
Coke oven gas	10^8 m^3	0.09	6.04	1.2		1.03		8.36	12.1	37,300	16,726	521,564
Other gas	10^8 m^3	30.76	56.64		4.23	7.57		99.2	12.1	37,300	5,227	1,934,074
Crude oil	10^4 t		0.1					0.1	20	71,100	41,816	2,973
Gasoline	10^4 t							0	18.9	67,500	43,070	0
Diesel oil	10^4 t	0.69	4.28	1.23	1.55	1.19		8.94	20.2	72,600	42,652	276,830
Fuel oil	10^4 t	0.02	1.44	0.48	1.27	0.06	4	7.27	21.1	75,500	41,816	229,522
LPG	10^4 t							0	17.2	61,600	50,179	0
Refinery gas	10^4 t	0.25	2.18	0.82	1.91			5.16	15.7	48,200	46,055	114,544
Natural gas	10^8 m^3		7.69	0.27		0.14	21.84	29.94	15.3	54,300	38,931	6,329,176
Other petroleum products	10^4 t			0.29				0.29	20	72,200	41,816	8,755
Other coking products	10^4 t							0	25.8	95,700	28,435	0
Other energy	10^4 t standard coal	12.47	76.3	26.69	14.96	84.8		215.22	0	0	0	0
											Total	403,317,841

Data Source: <China Energy Statistical Yearbook 2010>

2) Thermal power generation in CCPG in 2007-2009

Table 4- 5 Thermal Power to CCPG in 2007

Province	Electricity generation	Electricity generation	Internal use rate	Supplied electricity
	(10^8kWh)	(MWh)	(%)	(MWh)
Jiangxi	421	42,100,000	7.72	38,849,880
Henan	1773	177,300,000	7.55	163,913,850
Hubei	609	60,900,000	6.69	56,825,790
Hunan	542	54,200,000	7.18	50,308,440
Chongqing	288	28,800,000	9.2	26,150,400
Sichuan	451	45,100,000	8.68	41,185,320
Total				377,233,680

Data Source: <China Electric Power Yearbook 2008>

Table 4- 6 Thermal Power to CCPG in 2008

Province	Electricity generation	Electricity generation	Internal use rate	Supplied electricity
	(10^8kWh)	(MWh)	(%)	(MWh)
Jiangxi	405	40,500,000	6.5	37,867,500
Henan	1890	189,000,000	7.22	175,354,200
Hubei	553	55,300,000	6.62	51,639,140
Hunan	537	53,700,000	6.46	50,230,980
Chongqing	286	28,600,000		28,600,000
Sichuan	401	40,100,000	10.21	36,005,790
Total				379,697,610

Data Source: <China Electric Power Yearbook 2009>

Table 4- 7 Thermal Power to CCPG in 2009

Province	Electricity generation	Electricity generation	Internal use rate	Supplied electricity
	(10^8kWh)	(MWh)	(%)	(MWh)
Jiangxi	445	44,500,000	5.8	41,919,000
Henan	1985	198,500,000	6.62	185,359,300
Hubei	630	63,000,000	6.21	59,087,700
Hunan	634	63,400,000	6.39	59,348,740
Chongqing	306	30,600,000		30,600,000
Sichuan	504	50,400,000	7.92	46,408,320
Total				422,723,060

Data Source: <China Electric Power Yearbook 20010>

3) Summary of power supply and CO_2 emission in CCPG in 2007-2009

Table 4- 8 Summaries of power supply and CO_2 emission in CCPG in 2007-2009

	2007	2008	2009
Electricity imported from NWCPG(MWh)	3,005,400	3,144,070	3,262,010
Simple OM of NWCPG	1.01129	0.98254	1.00759
Electricity imported from NCPG(MWh)		33,200	2,233,290
Simple OM of NCPG		1.00495	0.96418
Total CO_2 emission(tCO_2)	419,013,397	398,974,073	408,757,903
Total supplied electricity (MWh)	380,239,080	382,874,880	428,218,360
Emission factor(tCO_2/MWh)	1.10197	1.04205	0.95455

Data Source: <China Energy Statistical Yearbook 2008>, <China Energy Statistical Yearbook 2009>, <China Energy Statistical Yearbook 2010>

4) Calculation of $EF_{grid,OM,y}$ of CCPG

The weighted average emission factor of the three years is as follows:

$EF_{grid,OM,y}$ = (419,013,397+398,974,073+408,757,903)/(380,239,080+382,874,880+428,218,360) = 1.0297tCO_2/MWh

2. The data and calculation of BM Emission Factor of CCPG

1) Calculation of proportion of CO_2 emitted by the coal, gas, oil used for power generation respectively in the total emission

Table 4- 9 CO_2 emission of all kinds of fuels in CCPG in 2009

		Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Average low calorific value	Fuel emission factor	Carbon oxidation rate	CO_2 emission (tCO_2e)
Fuel type	Unit	A	B	C	D	E	F	G=A+…+F	H	I	J	K=G×H×I×J/100,000
Raw coal	10^4 t	2,184.31	9,339.64	2,888.29	2,810.69	1,413.64	2,817.31	21453.88	20,908	87,300	1	391,590,892
Washed coal	10^4 t	0	3.35	0	0	0	0	3.35	26,344	87,300	1	77,044
Other washed coal	10^4 t	0	59.93	0	0	136.75	97.94	294.62	8,363	87,300	1	2,150,991
Moulded coal	10^4 t	0	0	0	2.63	0	0	2.63	20,908	87,300	1	48,005
Coke	10^4 t	0	1.08	0.06	0.09	0	0	1.23	28,435	95,700	1	33,471
Other coking products	10^4 t	0	0	0	0	0	0	0	28,435	95,700	1	0
Sub-total												393,900,403
Crude oil	10^4 t	0	0.1	0	0	0	0	0.1	41,816	71,100	1	2,973
Gasoline	10^4 t	0	0	0	0	0	0	0	43,070	67,500	1	0
Diesel oil	10^4 t	0.69	4.28	1.23	1.55	1.19	0	8.94	42,652	72,600	1	276,830
Fuel oil	10^4 t	0.02	1.44	0.48	1.27	0.06	4	7.27	41,816	75,500	1	229,522
Other petroleum products	10^4 t	0	0	0.29	0	0	0	0.29	41,816	72,200	1	8,755
Sub-total												518,081
Natural gas	$10^7 m^3$	0	76.9	2.7	0	1.4	218.4	299.4	38,931	54,300	1	6,329,176
Coke oven gas	$10^7 m^3$	0.9	60.4	12	0	10.3	0	83.6	16,726	37,300	1	521,564
Other gas	$10^7 m^3$	307.6	566.4	0	42.3	75.7	0	992	5,227	37,300	1	1,934,074
LPG	10^4 t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10^4 t	0.25	2.18	0.82	1.91	0	0	5.16	46,055	48,200	1	114,544
Sub-total												8,899,358
Total												403,317,841

Data Source: <China Energy Statistical Yearbook 2010>

Calculate with data provided in Table 4- 9 as above and formula (6), (7), (8), the results is:

λ_{Coal} = 97.67%, λ_{Oil} = 0.13%, λ_{Gas} = 2.21%.

2) Calculation of $EF_{Thermal}$

Table 4- 10 Emission factors of the most advanced technologies for the relevant fuels

	Parameter	Electricity supply efficiency(%)	Fuel emission factor($kgCO_2$/TJ)	Fuel emission factor(tCO_2/MWh)
		A	B	D=3.6/A/10,000×B
Coal-fired power plant	$EF_{Coal,Adv,y}$	39.45	87,300	0.7967
Oil-fired power plant	$EF_{Oil,Adv,y}$	51.77	75,500	0.5250
Gas-fired power plant	$EF_{Gas,Adv,y}$	51.77	54,300	0.3776

Data source: Notification on Determining Baseline Emission Factor of China's Grid, issued by China's DNA on 20, Oct, 2011

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv,y} + \lambda_{Oil} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} = 0.78706\ tCO_2/MWh$$

3) Installed Capacity of CCPG in the latest 3 years

Table 4- 11 Installed capacity of CCPG for 2009

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	11,500	43,100	15,670	15,900	6,800	12,270	105,240
Hydro power	MW	3,770	3,650	30,010	11,460	4,530	25,810	79,230
Nuclear power	MW	0	0	0	0	0	0	0
Wind power & others	MW	60	50	10	2	10	0	132
Total	MW	15,330	46,800	45,690	27,362	11,340	38,080	184,602

Data Source: <China Electric Power Yearbook 2010>

Table 4- 12 Installed capacity of CCPG for 2008

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	9,340	42,680	14,210	14,430	6,660	12,770	100,090
Hydro power	MW	3,710	3,020	29,050	10,650	4,060	22,240	72,730
Nuclear power	MW	0	0	0	0	0	0	0
Wind power & others	MW	30	30	10	0	0	0	70
Total	MW	13,080	45,730	43,270	25,080	10,720	35,010	172,890

Data Source: <China Electric Power Yearbook 2009>

Table 4- 13 Installed capacity of CCPG for 2007

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	9,270	38,540	13,040	13,360	6,370	12,000	92,580
Hydro power	MW	3,570	2,740	24,020	9,220	2,240	19,860	61,650
Nuclear power	MW	0	0	0	0	0	0	0
Wind power & others	MW	0	0	10	17	24	0	51
Total	MW	12,840	41,280	37,070	22,597	8,634	31,860	154,281

Data Source: <China Electric Power Yearbook 2008>

4) Calculation of $EF_{grid,BM,y}$ of CCPG

Table 4- 14 Calculation of $EF_{grid,BM,y}$ of CCPG (Unit: MW)

	2007	2008	2009	Capacity addition from 2007 to 2009[1]	Capacity addition from 2008 to 2009[2]	Ratio to the total capacity addition
	A	B	C	D	E	F
Thermal power	92,580	100,090	105,240	20,280.4	10,467.5	53.25%
Hydro power	61,650	72,730	79,230	17,726.9	6,500	46.54%
Nuclear power	0	0	0	0	0	0.00%
Wind power & others	51	70	132	81	62	0.21%
Total	154,281	172,890	184,602	38,088.3	17,029.5	100.00%
Ratio to 2009's capacity	83.57%	93.66%	100.00%	20.63%	9.22%	

Attention: 1 and 2 are capacity addition calculated considering installed capacity, shut-down capacity and pumped storage capacity.

The $EF_{grid,BM,y}$ of CCPG is:

$EF_{grid,BM,y} = 0.78706 \times 53.25\% = 0.4191 tCO_2/MWh$

5) Calculation of $EF_{grid,CM,y}$ of CCPG

Table 4- 15 Calculation of $EF_{grid,CM,y}$ of CCPG (tCO_2/MWh)

$EF_{grid,OM,y}$	1.0297
$EF_{grid,BM,y}$	0.4191
$EF_{grid,CM,y}$	0.7244

$EF_{grid,CM,y} = 0.5 \times EF_{grid,OM,y} + 0.5 \times EF_{grid,BM,y} = 0.7244\ tCO_2/MWh$

Appendix 5: Further background information on the monitoring plan

Please refer to D.7.2 of the specific CPA-DD for the detailed description of monitoring plan.

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
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