CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1 Title of the project activity:

Sichuan Da County Jiujietan Hydropower Project

Version: 07

Date: 27/08/2012

Revision History (Original GSC Session)

Version number	Date	Reasons for revisions
1.3.3	19/03/2008	First GSC-PDD applying ACM0002 (Version 07) with ex-DOE TÜV SÜD and ex-buyer
02~03.2	06/2008-11/2008	Revising PDD according to the ex-DOE's validation Protocol.
03.3~04	02/2009-08/2009	Revising PDD according to ex-DOE's technical review comments.
04~05	09/2009-11/2009	Revising methodology ACM0002 (Version 07) and updating PDD according to ACM0002 (Version 10) requirements
05.1	18/06/2010	Revising PDD according to the ex-DOE requirements.
	10/03/2011	Ex-buyer issued termination orders to the ex-DOE. Validation of the Project stopped.

Revision History (Re-GSC Session)

Version number	Date	Reasons for revision
01	24/10/2011	Second GSC-PDD with new DOE and buyer
02	15/01/2012	PDD's update due to DOE's CARs and CLs
03	06/03/2012	PDD's update due to DOE's CARs and CLs
04	13/04/2012	PDD's update due to DOE's CARs and CLs
05	30/05/2012	PDD's update due to DOE's requirements
06	03/07/2012	PDD's update due to DOE's requirements

07	27/08/2012	PDD's update due to DOE's requirements

A.2. Description of the project activity:

Sichuan Da County Jiujietan Hydropower Project (hereafter the Project) is located at upstream of Shiti Town Da County Dazhou City Sichuan province. The main purpose of the Project is using the hydro potential available in Ba River to generate electricity. The installation capacity of the Project is 39MW, generating approximately 187.51GWh annually and provide net power of 180.95GWh to the grid per year. The power density and plant load factor (PLF) of the Project are 11.35W/m^2 and 54.89%[1] respectively. The Project will be connected through Sichuan Provincial Grid to the Central China Power Grid (CCPG) and substitute the CCPG's fossil-fuel-fired power generation with an annual amount of 131,078 tCO_2e emission reduction.

The baseline of the Project is the same as the scenario prior to the start of implementation of the Project: the same amount of electricity delivered to the grid would have been generated by the operation of grid-connected power plants and addition of new generation sources. The Project will assist China in stimulating and accelerating the commercialisation of grid-connected renewable energy technologies and markets. It not only supplies renewable electricity to the grid, but also contributes to the domestic sustainable development through the following aspects:

a) To alleviate power shortage in the local area and reduce greenhouse gases and air pollutants from combustion of fossil fuels;

b) To provide employment and especially for local people during construction of the power plant;

c) To promote local economic development through the sale of electricity and improve the economy in Da County;

d) To promote the social economic development in the poor minority area of the remote Southwest of China, particularly the rural infrastructure development such as roads due to the construction.

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[1] The annual operation hours of the Project is 4,808 hours which is determined by the design institute (Chengdu Hydro and Electric Reconnaissance and Design Institute) based on the historical hydraulic data. The PLF is determined as annual electricity generation divided by the installed capacity then divided by 8,760hours (total hours in a year): 187,510MWh/39MW/8,760hrs*100%=54.89%

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P. R. China (host)	Sichuan Bading Energy Development Co., Ltd. (project owner)	No
United Kingdom of Great Britain and Northern Ireland	Carbon & Energy Capital Co. LTD	No
United Kingdom of Great Britain and Northern Ireland	GFACC (IOM) Limited	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

People’s Republic of China

A.4.1.2. Region/State/Province etc.:

Sichuan Province

A.4.1.3. City/Town/Community etc

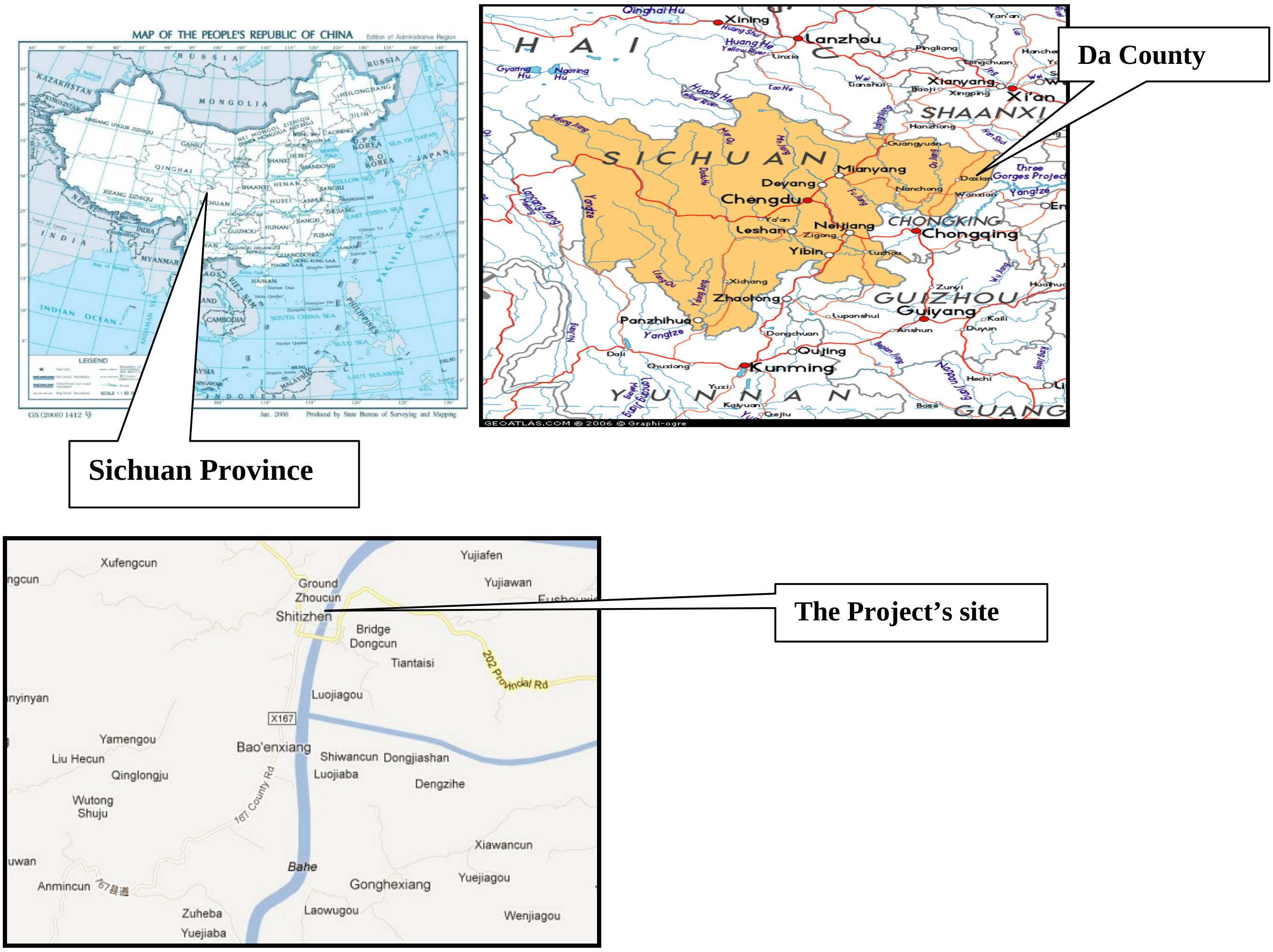
Da County, Dazhou City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The geographic site of the Project is located at upstream of Shiti Town, Da County, Dazhou City, Sichuan province, P.R China. It’s approximately 8km from Shiti Town and 37km from the Dazhou City. The Project is an after-the-dam type hydropower station. The hydro turbines and generators are installed under the dam. Therefore there is only one pair of coordinates for the Project, i.e. east longitude 107º14′16″

and north latitude 31º15′45”. The location of the project is indicated in the maps below.

Figure A-1: Location of the Project



A.4.2. Category (ies) of project activity:

The project activity is a large-scale potential CDM project that fits under the Category 1: Energy Industries (renewable / non-renewable sources).

A.4.3. Technology to be employed by the project activity:

The Project is a run-of-river hydropower plant, mainly containing the water-retaining, sluicing, ground water diversion holes plant for power generation and switching station and other building components. In

China, hydropower technology is well developed and it is environmentally safe and sound. The characteristics of the construction method and technology will prevent any damage on ecosystems. The total installed capacity is 39MW, providing an estimated annual net generation about 180.95GWh to the Central China Power Grid (CCPG). The baseline scenario is consistent with the scenario prior to the implementation of the Project activity: the same amount of electricity delivered to the grid would have been generated by the operation of grid-connected power plants and addition of new generation sources. The major technical parameters of the key equipment[2] used in the Project are illustrated below:

Table A-1 Technical parameters of the key equipment

Hydro turbines	Quantity:	2
	Model:	GZTF07C-WP-480
	Rated head:	12.8m
	Rated flow:	170.73 m^3/s
	Rated output:	20.11MW
	Rated Rotation Speed:	120r/min
	Technical lifetime	30 years[3]
Generators	Quantity:	2
	Model:	SFWG19.5-50/5590
	Rated Capacity:	21,667 kVA
	Rated Rotation Speed:	120r/min
	Rated voltage:	10.5kv
	Power factor:	0.9
	Technical lifetime	30 years[4]

[2] Purchase Contract of the key equipment (17/01/2008) signed by Project owner and Tianjin Tianfa Heavy Machinery & Hydro Power Equipment Manufacture Co., Ltd

[3] The technical lifetime of hydro turbines is sourced from Technical Agreement of Hydropower Generation Unit issued by manufacture Tianjin Tianfa Heavy Machinery & Hydro Power Equipment Manufacture Co., Ltd

[4] The technical lifetime of generators is sourced from Technical Agreement of Hydropower Generation Unit issued by manufacture Tianjin Tianfa Heavy Machinery & Hydro Power Equipment Manufacture Co., Ltd

The initial voltage for generators is 10.5 kV. Voltage for generators will be transported to a step-up substation and enhanced to 110 kV and then connected to the CCPG through Sichuan Grid. The equipment is manufactured in China and the Project does not involve in any technology transfer from developed countries. The hydropower technology it uses is environmentally safe and sound in China.

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

The first crediting period of emission reductions is 7 years (01/10/2012-30/09/2019) and the whole crediting period is renewable up to 21 years. The emission reductions are estimated to commence from 2012, after the successful registration of the Project to the CDM-EB.

Table A-2 Estimation of emission reductions in the first crediting period

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
01/10/2012-30/09/2013	131,078
01/10/2013-30/09/2014	131,078
01/10/2014-30/09/2015	131,078
01/10/2015-30/09/2016	131,078
01/10/2016-30/09/2017	131,078
01/10/2017-30/09/2018	131,078
01/10/2018-30/09/2019	131,078
Total estimated reductions (tonnes of CO_2e)	917,546
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	131,078

A.4.5. public funding of the project activity:

There is no public funding from Annex I Parties for this Project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

The Project uses the following methodology:"Consolidated Baseline Methodology for grid-connected electricity generation from renewable sources" ACM0002 (Version 12.3.0).

In line with the application of the methodology the Project draws on element of the following tools and methodologies:

- "Tool for the demonstration and assessment of additionality" (Version 06.0.0)
- "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

More information can be found at:

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

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The Project employs a renewable electricity generation technology which displaces fossil-fuel-fired power generation technology to supply electricity to the grid. Hence the Project applies the consolidated baseline methodology ACM0002 (Version 12.3.0) for grid-connected renewable power generation project activities under the following conditions:

1. The Project is a run-of-river hydro power plant.
2. The Project is a new hydro electric power project with reservoir having power density (installed power generation capacity divided by the surface area at full reservoir level) greater than $4W/m^2$.
3. The Project does not involve switching from fossil fuels to renewable energy at the site of the project activity;
4. The geographic and system boundaries for the CCPG can be clearly identified and the information on the characteristics of the grid is available.

B.3. Description of the sources and gases included in the project boundary

The Project boundary covers the power plant itself and all the power plants connected to CCPG.

According to the delineation of grid boundary as provided by the DNA of China[5], CCPG is made up of power grids of Hubei Province, Hunan Province, Sichuan Province, Jiangxi Province, Henan Province and Chongqing city. The Project boundary is illustrated in the diagram below:

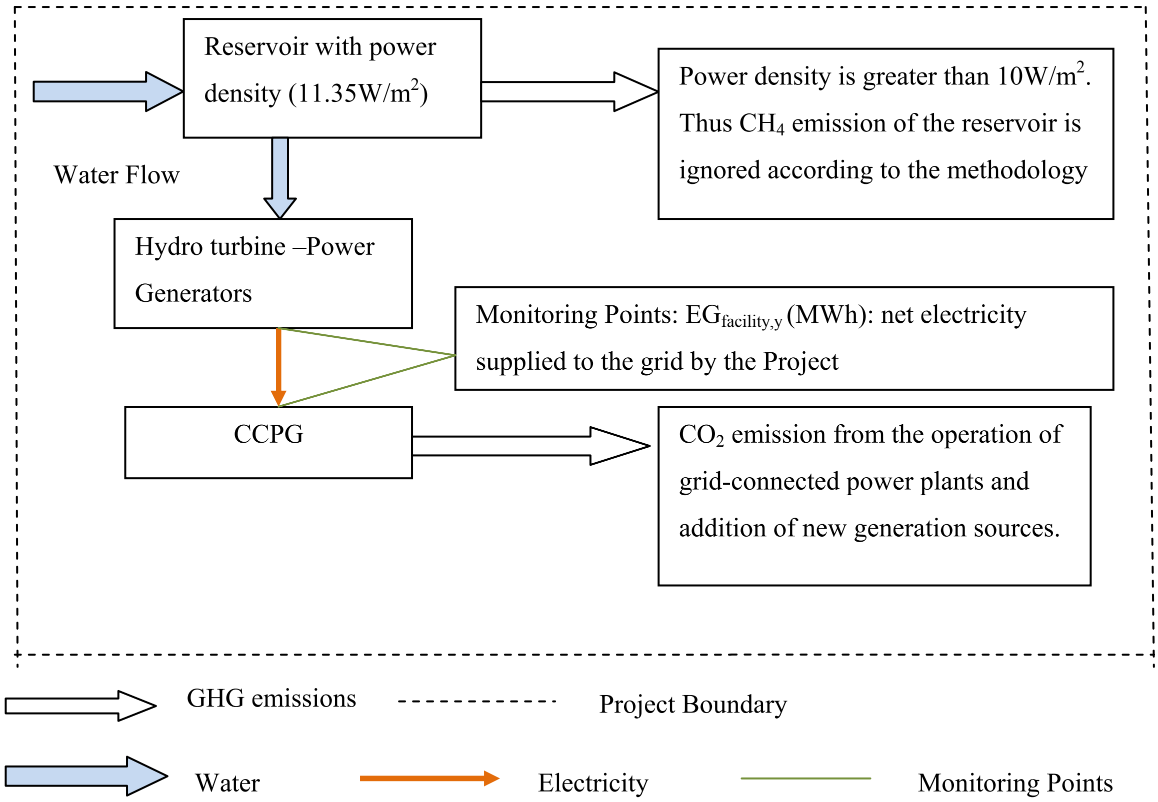


Figure B-1 The boundary of the Project activity

The emissions sources included and excluded from the Project boundary for determination of both baseline and project emissions are listed below:

Table B-2 Emission sources included or excluded from project boundary

	Source	**Gas**	**Included?**	**Justification / Explanation**
Baseline	CO_2 emissions from electricity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source

[5] National Development and Reform Commission (NDRC) China (20/10/2011), 2011 Baseline Emission Factors for Regional Power Grids in China. Source: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

	generation in fossil fuel fired power plants that are displaced due to the project activity	N_2O	No	Minor emission source
Project Activity	Emission of CH_4 from reservoir	CO_2	No	Minor emission source
		CH_4	No	The power density of the Project is greater than $10W/M^2$. Therefore, the Project emissions will not be considered
		N_2O	No	Minor emission source

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to ACM0002 (Version 12.3.0), If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The Project is a new grid-connected hydropower plant, so its baseline scenario is the same amount of electricity it feeds to CCPG is generated by the operation of power plants connected to CCPG and by the addition of new generation sources connected to CCPG.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The following steps demonstrate additionality for this project activity according to the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) as required by the methodology:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulation

Sub-Step 1 a. Define alternatives to the project activity:

The possible alternatives to the project activity are as followed:

1. The Project activity not undertaken as a CDM project activity;
2. Continuation of current situation, i.e. no project activity undertaken and the same amount of electricity is generated by the operation of grid-connected power plants and by the addition of new generation sources;
3. Build the similar capacity fossil-fuel-fired power plant with equivalent annual electricity generation at the same site;
4. Build the power plant of similar capacity with equivalent annual electricity generation at the same site, using other renewable energy.

***Sub-Step 1 b. Consistency with mandatory laws and regulations*:**

<u>Alternative 1:</u>

The Chinese power sector has undergone a transformation to a market-oriented system, Therefore investment in a power generation project is an individual power project developer's decision, based on the project return and risk profile.[6] Besides, there is no legal restriction of developing hydro power plant in Sichuan Province. Besides, Sichuan Province has abundant hydro energy source. So, this alternative is credible.

<u>Alternative 2:</u>

This alternative represents current practice where all power demand is met through CCPG imports. It is the default option of the project owner and is credible and realistic.

<u>Alternative 3</u>

This alternative is excluded. According to the State Council Office (2002)[7], the installation of fossil-fuel-

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[6] http://en.ndrc.gov.cn/policyrelease/t20060207_58851.htm

[7] The State Council Office PRC (2002), Notice on the Restriction of the Installation of Fossil-Fuel-Fired Power units with Capacity of and/or below135MW (Notice No. 2002-6).

fired power units with capacity below 135MW is strictly restricted in the areas covered currently by the large electric power grid.

Alternative 4:

Sichuan Province is short for renewable energy sources except for water energy. According to the China Electric Power Yearbook 2007[8], the installed capacity of renewable energy other than hydroelectricity in Sichuan Province is 0 MW. More specifically, for solar energy, it is reported that Sichuan Province is ranked as the one of the two provinces that receives the lowest solar energy in China.[9] At least in the east part of Sichuan Province where the project is located, the solar energy is extremely rare.[10] For wind energy, the energy source is a critical requirement to build a wind farm. The annual average wind speed should be greater than 3m/s for small size wind power generator.[11] But Dazhou city's annual average wind speed is only between 1-1.8m/s[12]. As for geothermal energy, Sichuan Province possesses a certain amount of geothermal energy, but the high temperature geothermal energy sources that are suitable to generate the same amount of electricity as the Project are only located in the west side of the province.[13]In conclusion, this alternative is excluded.

Therefore, alternative 1, i.e. the Project without undertaken as a CDM project, and 2 are realistic and credible.

Step 2. Investment Analysis

In accordance with "Tool for the Demonstration and Assessment of Additionality" (Version 06.0.0), determine whether the Project is not:

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue of sale of CERs

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Source: http://www.gov.cn/gongbao/content/2002/content_61480.htm

[8] Page 625 China Electric Yearbook 2007

[9] http://www.china5e.com/show.php?contentid=195375

[10] http://sourcedb.igsnrr.cas.cn/zw/lw/201103/P020110323544681286648.pdf

[11] http://www.86suntop.com/news/hangye/101.html

[12] http://www.dzfgw.gov.cn/zxgh/2007/10/dzfgwnews_0710181531534473_2.htm

[13] http://221.2.74.154:186/html/drfb/20114313738198.html

Sub-step 2a. Determine appropriate analysis method

Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b). If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

According to paragraph 19 of the "Guideline of the assessment of the investment analysis" (Version 05), if the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate. Alternative 2 is the supply of electricity from CCPG and not considered an investment so that the benchmark analysis (Option III) is applied.

Sub-step 2b. Option III Benchmark Analysis Method

According to "Economic Evaluation Code for Small Hydropower Project" (SL 16-95, Ministry of Water Resources) and its newest version SL 16-2010, which are applicable for small hydropower projects with a capacity below 50 MW in rural area in China, Internal Return Rate (IRR) is utilized to determine whether project activity is financial feasible or not. Therefore, IRR is identified as the most suitable financial indicator for small hydropower project.

To follow the requirement of "Tool for the Demonstration and Assessment of Additionality" (Version 06.0.0), the benchmark can be derived from Government/official approved benchmark where such benchmarks are used for investment decisions. In line with SL 16-95, the proposed benchmark IRR of total investment (after tax) for small hydropower project is 10%. According to the documents issued by Ministry of Water Resources of the People's Republic of China, SL 16-95 was replaced by the new version of "Economic Evaluation Code for Small Hydropower Project" (SL 16-2010), which was issued in October 2010 and implemented from Jan 22nd 2011. However, when project owner made the decision to invest the Project in 2006, SL 16-95 was valid. Besides, the benchmark IRR of total investment (after tax) in SL 16-2010 is still 10%. As a result, 10% is adopted as the benchmark IRR for investment analysis.

Sub-step 2c. Calculation and comparison of financial indicators

Basic data and assumptions for the calculation of the financial indicator of the Project are summarized in Table B-3:

Table B-3 Main parameters for the financial analysis

Parameters	Value	Source
1.Total investment	277,498,800 CNY	FSR
2. Fixed asset investment	259,979,100 CNY	FSR
3.Installed capacity	39 MW	FSR
4.Annual generated electricity	187,510MWh	FSR
5.Annual supplied electricity	180.947MWh	FSR
6.Electricity tariff	0.24CNY/kWh	FSR
7.Annual O&M costs	8,224,000 CNY	Calculated
7.1Maintenance costs	2,600,000 CNY	FSR
7.2 Salary and Welfare	2,436,000 CNY	Calculated
7.3 Material cost	195,000 CNY	FSR
7.4 Hydro resource fee	469,000 CNY	FSR
7.5 Maintenance of the reservoir area fund	938,000 CNY	FSR
7.6 Other cost	1,586,000 CNY	FSR
8. VAT tax rate	17%	FSR
9.Income tax rate (year5-year6)	0%	FSR
10.Income tax rate (year7-year9)	16.5%	FSR
11.Income tax rate (year10-year34)	33%	FSR
12.Residue value rate	5%	FSR
13. City maintenance & construction tax rate	5%	FSR
14.Educational surcharge rate	3%	FSR
15.Depreciation period	20 years	FSR
16.Annual emission reductions	131,078tCO_2e	Calculated
17.Expected CERs price	85 CNY /tCO_2e	ERPA

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Table B-4 shows the project IRR with and without the revenue of CERs. Without the revenue of CERs, the project IRR is 7.36% which is clearly lower than the financial benchmark of 10%. Thus the Project not registered as CDM project is not considered to be economically viable.

Table B-4. IRR with and without the CERs revenues

	Without CERs (Benchmark 10%)	With CERs (Benchmark 10%)
IRR	7.36%	10.92%

However, when taking into account the CDM revenues, the project IRR is 10.92% which exceeds the financial benchmark. Therefore the CDM revenues would improve the economic feasibility of the Project.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding financial attractiveness is robust or not to reasonable variations in the critical assumptions.

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

(1) Fixed asset investment

(2) Annual O&M costs

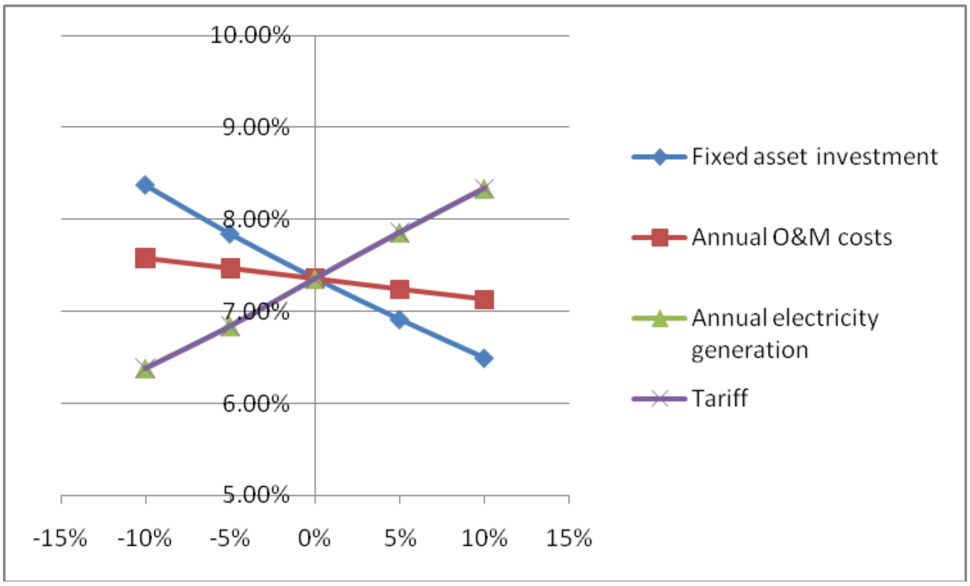
(3) Annual electricity generation

(4) Tariff

Firstly, the influences of changes in the total investments, O&M costs, electricity generation and electricity tariff are examined on the internal return rate (IRR). The four parameters are varied in a range of ±10%. The resulting IRRs are presented in Table B-5.

Table B-5.IRR of total investment sensitivity to different financial parameters of the Project

Factors	**Range**				
	-10%	-5%	0%	5%	10%
Fixed asset investment	8.37%	7.84%	7.36%	6.91%	6.49%
Annual O&M costs	7.58%	7.47%	7.36%	7.24%	7.13%
Annual electricity generation	6.38%	6.84%	7.36%	7.86%	8.34%
Tariff	6.38%	6.84%	7.36%	7.86%	8.34%



According to the sensitivity analysis, within the variation range of 10% in each parameter, the IRR of the Project is always lower than the investment benchmark.

To further analyze the probability of IRR of the Project reaching to the benchmark, critical threshold analysis is taken as below:

Table B-6. The threshold of IRR's variation to reach up to benchmark

Parameters	Thresholds
Fixed asset investment	-23%
Annual O&M costs	-124%
Annual electricity generation	+28%
Tariff	+28%

Fixed asset investment:

As Table 5-6 has indicated, the fixed asset investment of the Project needs to be reduced by 23% in order to arrive at the benchmark. However, this situation is impossible to happen, because according to the contracts of investment of the Project, the actually total investment cost has added up to greater than the designed fixed asset investment 259.9791 million CNY in FSR. [14]

Annual O&M cost:

The sensitive analysis has showed that the impact of O&M cost is insignificant. The benchmark threshold is -124%, which means that even if there is no O&M cost, the IRR would stay below the benchmark. As a result, there is no possibility of annual O&M cost causing IRR to reach the benchmark.

Annual electricity generation:

The calculation of output of the Project in FSR is based on scientific methods and reliable historical hydro-energy data. The increase of annual electricity generation by 28% is very unlikely.

Tariff

The power purchase contract of the Project signed by the project owner and power authority in Dazhou city has indicated that the actual tariff is 0.24 CNY/kWh (inclusive of VAT) which is consistent with the expected value in FSR and considered the actual operation condition of the plant. As a result, the tariff is unlikely to vary in the operation period, let alone to increase by 28%.

In conclusion, from the above critical point analysis the IRR of the Project without CDM revenue is impossible to rise to exceed the benchmark.

Step 3. Barriers Analysis

According to the "Tool for Demonstration and Assessment of Additionality" (Version 06.0.0), Step 3 is

[14] It is be inferred from the available signed investment contracts (construction contract, hydropower generation equipment purchase contract and gate hoist purchase contract) that the actual fixed asset investment of the Project has exceeded the designed 259,979,100CNY:

Construction contract: 149,296,620.07CNY

Hydropower generation equipment purchase contract: 58,500,000CNY

Gate hoist purchase contract: 57,393,200CNY

Total: 265,189,820.07CNY

not selected for the Project by project participants.

Step 4. Common Practice Analysis

In line with the *Step 4: Common practice analysis* of "Tool for the demonstration and assessment of additionality" (Version 06.0.0), the Project is classified as the type of measures listed in paragraph 6[15] and the common practice analysis proceeds as follows:

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The ±50% range of designed capacity for the proposed project is between 19.5MW and 58.5MW annually.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all} Registered CDM project activities shall not be included in this step;

Sichuan province is identified as the applicable geographical area for comparable hydropower projects. In China, the investment climates are different from province to province because of variations in the available natural resources, the level of economic development, the industrial structure, the fundamental infrastructure, development strategy and the policy framework. Thus, the relevant economic elements such as the tariff, the price of resources, such as water and labour service, are all different among provinces. As a result, the entirety of China cannot be considered as the identified geographical area, whereas Sichuan Province should be chosen as the boundary to ensure its homogeneity. It should be considered that the hydropower projects developed before 2002 cannot be included in the analysis since China State Grid Power Corporation (CSPC) was regrouped into five power companies, making great influence on investment environment for the power production projects in China.

[15] (b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies.)

The number of plants that deliver the same capacity within the applicable output from 19.5MW to 58.5MW, started commercial operation before the start of the Project and are not registered as CDM projects or under CDM validation in Sichuan Province utilizing the technologies and energy sources other than hydropower is noted as N_x.

Based on the references of China Water Resource Yearbook (2006-2009)[16] and reliable website information, the power plants applying hydropower technology that are with installed capacity between 19.5MW and 58.5MW and started in operation during 2002 and 2008 in Sichuan province are as follows:

Table B-7 Identified Hydropower Plants in Sichuan Province

Names of the Projects	**Capacity (MW)**	**Operational Year**	**Applying for CDM**	**Sources**
Fuliutan Hydropower Station	39	2002	No	http://www.chinarein.com/qkhc/detail.asp?id=781
Shazui Hydropower Station	38	2004	No	http://222.214.19.22/qy/34/index.html
Tongkou River Hydropower Station	45	2004	No	http://www.chinaqw.com/node2/node116/node120/node334/node336/userobject6ai4672.html
Sanjiang Meiya Hydropower Station	45	2004	No	http://www.iac.org.cn/default.asp?pg=36&channel_id=21&item_id=129&info_id=1526
Baishuihe Hydropower Station	24	2004	No	http://www.ctguly.com/view.asp?id=95
Niujiaowan Hydropower Station	25	2003	No	http://www.chinapower.com.cn/article/1004/art1004225.asp http://www.cnstock.com/ssnews/2004-4-9/qitaban/t20040409_544754.htm
Huilongqiao Hydropower Station	50	2004	No	http://renminqu.com.cn/product/show.asp?id=34&ProductType=10
Sankeshu	52	2005	No	http://ir.zaobao.com/asiapower/index.html

[16] China Water Resource Yearbook (2006-2009)

Hydropower Station				
Guojundu Hydropower Station	45	2008	No	http://business.sohu.com/20080701/n257845503.shtml
Sichuan Yanyuan Yongning River Hydropower Station	50	2007[17]	No	http://cdm.unfccc.int/Projects/DB/DNV-CUK1218652642.27/view The project is rejected by EB. Therefore it should not be considered as potential CDM project.
Sichuan Leshan Ebian Jinyan Hydro Power Project	46	2008[18]	Yes	http://cdm.unfccc.int/Projects/Validation/DB/UMD5Q00LZA6W6EGGQ5GCGA54ELBMO5/view.html
Bazhong Pingchang Shuangtan Hydropower Project, Sichuan Province, China	36	2008[19]	Yes	http://cdm.unfccc.int/Projects/Validation/DB/EGM7FKPCICKQO096SHMHF6TA9WCLZ9/view.html
Sichuan Leshan Ebian Yulinqiao Hydro Power Project	51	2008[20]	Yes	http://cdm.unfccc.int/Projects/Validation/DB/K2QAV3R09B1PZK5L76M11Y6YRFM7YD/view.html
Sichuan Liangtan Hydropower Station Second Phase Project	20	2007[21]	Yes	http://cdm.unfccc.int/Projects/DB/DNV-CUK1285943856.21/view

The number of hydropower projects exclusive of projects that apply CDM or are currently under CDM validation is noted as N_{hydro}. These projects are listed below:

[17] http://business.sohu.com/20070411/n249350923.shtml
[18] http://www.shp.com.cn/news/info/2008/8/27/1613026613.html
[19] http://www.sasac.gov.cn/n1180/n1226/n2410/n314274/5627998.html
[20] http://www.shp.com.cn/news/info/2008/8/27/1613026613.html
[21] http://www.sc-aaa.com/investor_detail.asp?subid=36&supid=19&id=374

Table B-8 Identified Hydropower Plants in Sichuan Province (exclsive of CDM projects)

Names of the Projects	Capacity (MW)	Operational Year	Comments on the major differences with the Project
Fuliutan Hydropower Station	39	2002	Fuliutan Hydropower Station is a state-owned project which compared to the Project owned by private company, is more convenient to access to financing and technology.
Shazui Hydropower Station	38	2004	Unit capacity investment: 4,289RMB/kW
Tongkou River Hydropower Station	45	2004	The expected IRR of Tongkou River Hydropower Station is 18% which is higher than the benchmark IRR 10% and the IRR of the Project is lower than the benchmark, which means Tongkou River Hydropower project is more economically attractive and need no additional fund for the normal operation of the station whereas the Project is the same case.
Sanjiang Hydropower Station	45	2004	Sanjiang Hydropower Station has 75% foreign capital investment of total investment. The project owner has no pressure on finance. It differs from the Project in investment climate.
Baishuihe Hydropower Statio	26	2004	Unit capacity investment: 4,999RMB/kW
Niujiaowan Third Phase Hydropower Station	25	2003	Unit capacity investment: 3,650RMB/kW
Huilongqiao Hydropower	50	2004	Unit capacity investment: 4,800RMB/kW

Station			
Sankeshu Hydropower Station[22]	52	2005	Sankeshu Hydropower Station is a project invested by foreign company (Asia Power Corporation Limited), which compared to the Project owned by private company, is more convenient to access the financing and technology
Guojundu Hydropower Station	45	2008	The owner of Guojundu Hydropower Station is Sichuan Mingxing Electric Power Co., Ltd, which is possessed by State[23]. Compared to the Project, it can more easily access the financing and technology.
Sichuan Yanyuan Yongning River Hydropower Station	50	2007	Unit capacity investment: 4,900RMB/kW

According to Table B-8, N_{hydro}=10

As a result, N_{all} is the sum of projects above using hydropower technology and none-hydropower technologies. $N_{all}=N_x+N_{hydro}=N_x+10$

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff},

All projects in N_x adopt technologies different that the technology applied in the project. As for the projects in N_{same}, according to Table B-7, all the projects that are state-owned or have foreign capital investment or with IRR above the benchmark should be noted as different projects because their investment climates are different from the Project's. The Project's unit capacity investment is 7,115RMB/kW: total investment (277,498,800RMB) divided by the installed capacity (39,000kW). The values of unit capacity investment of Shazui Hydropower Station, Baishuihe Hydropower Station,

[22] http://www.asiapower.com.sg/cn/corporate-profile.html

[23] http://www.mxdl.com.cn/investor_centre.aspx

Niujiaowan Hydropower Station, Huilongqiao Hydropower Station and Sichuan Yanyuan Yongning River Hydropower Station are less than it of the Project by over 20% and based on "Tool for Demonstration and Assessment of Additionality" (Version 06.0.0), the unit costs are considered to be different if they differ by at least 20%. As a result, the Project can be considered to have different technology when compared with the projects above. Therefore the number $N_{diff}=N_x+N_{hydro}=Nx+10$

Step 4: Calculate factor F =1-N_{diff}/N_{all} representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

F is calculated as belows:
$F=1-N_{diff}/N_{all}=1-(N_x+10)/(N_x+10)=0$
$N_{all}-N_{diff}=(N_x+10)-(N_x+10)=0$
Hence, F=0, which means that the Project is not a common practice ($F=0<0.2$ and $N_{all}-N_{diff}<3$)

Conclusion:
To summarize, it can be proved that the proposed Project activity is additional. Without CDM revenues, the Project activity would not be implemented smoothly.

Serious Consideration of CDM
Considering the project IRR of the Project is low, so the Project lacks economic attraction, it is necessary to apply for CDM project to overcome the obstacles. The starting date of the Project is determined by the date on which the equipment purchase contract was signed (17/01/2008). An overview of key events of CDM development is given in the following:

Date	Key events
Feb, 2006	FSR was completed
14/03/2006	FSR was approved by Development and Reform Commission (DRC) of Sichuan Province
09/06/2006	Board Decision that the Project should apply for CDM
Jul, 2006	Survey for stakeholders' opinion towards the Project was made.
Nov, 2006	EIA Report was completed.
18/12/2006	EIA Report was approved by Environment Protection Bureau of Sichuan Province

Feb, 2007	The project owner signed the consultant agreement with CDM consultancy company
28/12/2007	The project owner signed the ERPA with the buyer
25/12/2007	The Project was approved by the local government
17/01/2008	The Project started and signed the equipment purchase agreement
17/04/2008	PDD of the Project was published for global stakeholder consultation process.
22/04/2008	The host country approval (HCA) was issued by National Development and Reform Commission (NDRC) of China
14/05/2008	Ex-DOE TÜV SÜD site validation
17/01/2009	Compensation Agreement for Land Occupation was signed
Dec, 2009	Final World Commission on Dams Compliance Review was completed
Mar, 2010	Qualification of ex-DOE TÜV SÜD was suspended by EB. CDM progress paused.
July, 2010	Qualification of ex-DOE TÜV SÜD was resumed. CDM progress continued.
03/05/2011	The buyer terminated the ERPA and contract with ex-DOE
05/10/2011	The project owner signed the new ERPA with the new buyer
16/01/2012	Approval note of change of project participant was issued by NDRC of China
24/08/2012	UK Letters of Approval (LoAs) were issued

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to ACM0002 (Version 12.3.0), the calculation of emission factor should use the methodology tool
"Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

Project emission

The project emission is calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (1)$$

Where:

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

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

The Project is a hydropower generation project which does not consume fossil fuel, $PE_{FF,y} = 0$.
The Project is not a geothermal project, $PE_{GP,y} = 0$.
Therefore, $PE_y = PE_{HP,y}$.

The power density of the Project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad (2)$$

Where:

Cap_{PJ} =Installed capacity of the hydro power plant after the implementation of the project activity (MW). This is a newly built project with total installed capacity of 39MW.

Cap_{BL} =Installed capacity of the hydro power plant before the implementation of the project activity (MW). For new hydro power plants, this value is zero.

A_{PJ} =Area of the single or multiple reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (km^2). A new reservoir will be built, and the flooded surface of water is 3.4338 km^2 when the reservoir is full[24].

A_{BL} =Area of the single or multiple reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (km^2). For new hydro power plants, this value is zero.

$$PD = (39-0) / (3.4338-0) = 11.35\ W/m^2$$

The total installation capacity is 39MW, and the power density is $11.35W/m^2$, according to the methodology, hydro power project which power density $11.35W/m^2$ is greater than $10\ W/m^2$, $PE_{HP,y} = 0$. Therefore, the Project emission (PE_y) is zero.

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[24] Chengdu Water Survey and Electricity Power Design Institute (10/10/2007). *Surface area calculation of Sichuan Da County Jiujietan Hydropower Project.*

According to the calculation, the created surface area of the reservoir at the flooded water level is $3.4338km^2$

$$PE_y = 0 \qquad (3)$$

Baseline emission

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology 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:

$$BE_y = EG_{PJ,y} . EF_{grid,CM,y} \qquad (4)$$

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 CDM project activity 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" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

According to ACM0002 (Version 12.3.0), the Project is the installation of a new grid-connected renewable power plant where no renewable power plant was operated prior to the implementation of the Project, therefore,

$$EG_{PJ,y} = EG_{facility,y} \qquad (5)$$

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 CDM project activity 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)

According to ACM0002 (Version 12.3.0), the calculation of emission factor should use the methodology tool "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). The following procedure was adopted to determine $EF_{grid,CM,y}$ and BE_y.

Step 1: Identify the relevant electricity systems

In line with the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. Chinese DNA (NDRC) has published that the electricity generated by the Project is connected to the CCPG, which includes Sichuan Province.[25] According to official documents published by NDRC, Northwest China Power Grid (NWCPG) and North China Power Grid (NCPG) transferred electricity to CCPG. Therefore the CCPG can be determined as the project electricity system of the Project.. And connected electricity systems are NWCPG and NCPG. The CO_2 emission factors for the net electricity imports from the connected electricity systems are determined as the simple operating margin emission rates of the exporting grid in line with the option (b) of "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

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.

The Project is a grid-connected power plant and there is no off-grid power plant involved. Thus, Option Ⅰ is chosen to calculate the operating margin and build margin emission factor.

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

The tool to calculate 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.

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

In China, the dispatch information is not available to the public, further in the most recent 5 years (2005-2009), the low-cost/must run resources constituted less than 50% of total power generation of the CCPG according to China Power Yearbook (2006-2010). The ratios are shown below. Hence, 'Simple OM' option has been chosen.

Year	2005	2006	2007	2008	2009
Ratio	38%	35%	36%	41%	43%

The "Tool to calculate the emission factor for an electricity system (Version 02.2.1)" offers the choice between two data vintages to calculate the Simple OM:

- *Ex-ante* option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period; or

- *Ex-post* option: Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used.

$EF_{grid,OMsimple,y}$ is calculated *ex-ante* using the data from 2007 to 2009, available in China Energy Statistic Yearbooks 2008 - 2010, and China Electric Power Yearbooks 2008 - 2010 These data vintage remains fixed during the crediting period.

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

According to the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), there are two options to calculating the Simple OM emission factor:

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

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

Option B can only be used if:
(a) The necessary data for Option A is not available; and

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

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

Option A should be preferred and must be used if fuel consumption data or average efficiency and fuel type(s) used are available for each power plant / unit. However, the required data for each power plant /unit is unavailable in China. So option B is applied to calculate the operating margin emission factor.

Option B -Calculation based on total fuel consumption and electricity generation of the system

Under this option, the simple OM emission factor 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:

The formula for calculating OM is:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,j} FC_{i,y} \times NVC_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (6)$$

Where:

$EF_{grid,OMsimple,y}$ =Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$FC_{i,y}$ =Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit)

$NVC_{i,y}$ =Net calorific value (energy content) of fossil fuel type *i* in year y (GJ/mass or volume unit)

$EF_{CO2,i,y}$ =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)

y =All fossil fuel types combusted in power sources in the project electricity system in year y

i =Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

The Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the CCPG, excluding those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2008~2010, published annually) and *China Energy Statistical Yearbook* (2008~2010). Based on these data, the Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the CCPG is calculated as 1.0297 tCO_2e/MWh.

Step 5: Calculate the build margin emission factor

According to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), $EF_{grid,BM,y}$ is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available. However, due to the fact that data on both electricity generation and emission factor of each power plant / unit in the grid is currently not available in P. R. China (see Step 3), EB guidance on the estimation of the build margin in P.R. China can also be applied for the purpose of estimating the BM emission factor and $EF_{grid,BM,y}$ is calculated as follows:

The formula for the calculation of $EF_{grid,BM,y}$ is:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (7)$$

Where

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

$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ =CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m =Power units included in the build margin

y =Most recent historical year for which power generation data is available

More details can be found in Annex 3.

1) Calculate the build margin emission factor $EF_{grid,BM,y}$ ex-ante based on the recent years available data at the time of PDD submission.

2) For the first crediting period, the Build Margin emission factor $EF_{grid,BM,y}$ is updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{grid,BM,y}$ is calculated ex-ante, as described in option 1 above.

$EF_{grid,BM,y}$ is calculated here ex-ante according to option 1, which will be fixed in the crediting period, and no ex-post monitoring and updating is needed.

Taking account of data availability, the following conservative calculation has been approved by the CDM Executive Board. Using this modified method, newly-built capacity is weighted by the composition of power generation technologies and then emission factors are calculated using the efficiencies of the best available technologies.

Because capacities of technologies using coal, oil and gas cannot be separated from the total thermal power generation from publicly available statistics, the following method is used for the calculation: first, use the energy balance data of the most recent year available and calculate the percentages of CO_2 emissions of power generation using solid, liquid and gas fuel in the total CO_2 emission. Second, calculate grid thermal power emission factors, using the percentages (as weights) and emission factors of technologies corresponding to best available efficiencies. Lastly, the thermal power emission factor is multiplied by the percentage of thermal power in the newest 20% capacity in the grid, and the result is the Build Margin emission factor of the grid.

Note that the data used cannot distinguish the capacity installed in coal, fossil fuel, and gas from total fire power generation. Therefore, the calculation used as following:

Calculating the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the Energy Balance Table of the most recent year.

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}}{\sum_{i,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}} \tag{8}$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}}{\sum_{i,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}} \tag{9}$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}}{\sum_{i,j} F_{i,j,y} \times NCF_{i,y} \times EF_{CO2,i,y}} \tag{10}$$

Where:

$F_{i,j,y}$ = the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*, while *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$NCV_{i,j}$ = the fuel i net caloric value in the year y (for solid and liquid fuel for the GJ / t, for fuel gas for GJ/m^3).

$EF_{CO2,i,j}$ = the fuel emission factors (tCO_2/GJ)

Coal, Oil and *Gas* are footnote group for solid fuels, liquid fuels and gas fuels.

Calculating $EF_{Thermal}$

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \tag{11}$$

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ respectively represent the efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.

Calculating $EF_{BM,y}$

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \tag{12}$$

Where:

$CAP_{Total,y}$ is total capacity additions

$CAP_{Thermal,y}$ is capacity additions to thermal power.

The calculation of the $EF_{grid,BM,y}$ is done as indicated in the Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011[26] and the result is as follows:

Step 6 : Calculate the combined margin emission factor

Weighted Average CM

The combined margin emission factor is calculated as follow (default value w_{OM}=0.5 and w_{BM}=0.5 for the first crediting period):

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad (13)$$

$$= 0.5 \times 1.02973 + 0.5 \times 0.4191$$

$$= 0.7244 \ tCO_2e/MWh$$

Calculation of the baseline emissions

The baseline emissions in year *y* are calculated as

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = EG_{facility,y} \times EF_{grid,\,CM,y} \qquad (14)$$

Where: $EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr), and $EF_{grid,CM,y}$ is the baseline emission factor determined above.

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction

[26] NDRC China (20/10/2011), 2011 Baseline Emission Factors for Regional Power Grids in China.

and upstream emissions from fossil fuel use (e.g. extraction, processing and transport). These emissions sources are neglected.

Emission reductions

The emission reductions in year *y* are calculated as

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

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$FC_{i,j,y}$
Data unit:	ton or m^3
Description:	Quantity of fuel i consumed by relevant power sources j delivering electricity to the grid in years y. Hydro, nuclear power generation and low cost/must-run power sources are excluded.
Source of data used:	"Chinese Energy Statistical Yearbook", 2008-2010 editions;
Value applied:	Varies for each fuel and year, see Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology
Any comment:	See Annex 3 for detailed data.

Data / Parameter:	$EG_{P\,j,y}$
Data unit:	MWh
Description:	Electricity delivered to the grid by power source j in the year y. Hydro, nuclear power generation and low cost/must-run power sources are excluded.
Source of data used:	"Chinese Energy Statistical Yearbook", 2008-2010 editions;

Value applied:	Varies for each type of fuel used and year, see Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology
Any comment:	See Annex 3 for detailed data.

Data / Parameter:	NCV_i
Data unit:	TJ/ton or TJ/m^3
Description:	Net calorific value (energy content) per mass or volume unit of a fuel *i*.
Source of data used:	"Chinese Energy Statistical Yearbook" 2010 edition.
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology for the purpose of calculating fuel emission factors
Any comment:	See Annex 3 for detailed data.

Data / Parameter:	$EF_{CO2,i,}$
Data unit:	tC/TJ
Description:	CO_2 emission factor per unit of energy of the fuel *i*.
Source of data used:	"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods	The choice of data satisfies the guidance in the methodology for the purpose of calculating fuel emission factors

and procedures actually applied :	
Any comment:	Please note that to get to CO_2 emission factor per unit of energy it is necessary to multiply by 44/12.

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed generation capacity, i, per year, y, and provincial grid, j
Source of data used:	“Chinese Electricity Yearbook” 2008-2010 editions
Value applied:	Varies with province and year
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology for the purpose of calculating BM. Data is from an official national source.
Any comment:	See Annex 3 for detailed data.

Data / Parameter:	$EF_{Coal, Adv}$ $EF_{Oil, Adv}$ and $EF_{Gas, Adv}$
Data unit:	tCO_2/MWh
Description:	Emission Factor of the best available commercial power plants for coal, oil and gas power plants.
Source of data used:	2011 Baseline Emission Factors of Power Grids in China published by NDRC
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology for the purpose of BM calculation. Data is from an official national source.
Any comment:	See Annex 3 for details.

Data / Parameter:	λ_{Coal}, λ_{Oil}, λ_{Gas}
Data unit:	%
Description:	The percentage of CO_2 emitted for each source, coal, oil and gas, in the total emission at year 2010.
Source of data used:	"Chinese Energy Statistical Yearbook" 2010 edition
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The choice of data satisfies the guidance in the methodology. Data is from an official national source. See section B.6.1. Step 2 for details.
Any comment:	

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Determine the installed capacity based on recognized standards
Any comment:	

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water,

	before the implementation of the project activity, when the reservoir is full (m_2). For new reservoirs, this value is zero
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measured from topographical surveys, maps, satellite pictures, etc
Any comment:	

Data / Parameter:	$EF_{,grid, CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined Margin Emission Factor of CCPG
Source of data used:	2011 Baseline Emission Factors of Power Grids in China published by NDRC.
Value applied:	0.7244
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the procedures described in the "Tool to calculate the emission factor for an electricity system"
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The emission reductions in year *y* are calculated as

$$ER_y = BE_y - PE_y$$

The baseline emissions in year *y* (BE_y) are calculated as

$$BE_y = EF_{grid,CM,y} \times EG_y = EF_{grid,CM,y} \times EG_{facility,y}$$

Where: $EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr), and $EF_{grid,CM,y}$ is the baseline emission factor determined above.

The Project which power density is greater than 10W/m^2, and therefore the project emissions (PE_y) is also zero and the emission reductions are equal to the baseline emissions:

$$ER_y = BE_y = EF_{grid,\ CM,y} \times EG_y$$

$$= 180{,}947\text{MWh} \times 0.7244\ tCO_2/\text{MWh}$$

$$= 131{,}078tCO_2e$$

To sum up, the Project will be able to supply net power generation of 180,947MWh to the CCPG. Therefore, annual emission reduction of the Project is estimated at 131,078tCO_2e.

B.6.4 Summary of the ex-ante estimation of emission reductions:

As the Project starting date of the first crediting period is in 2012 with the renewable crediting periods, the emission reductions during the first crediting period are estimated as:

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
01/10/2012-30/09/2013	0	131,078	0	131,078
01/10/2013-30/09/2014	0	131,078	0	131,078
01/10/2014-30/09/2015	0	131,078	0	131,078
01/10/2015-30/09/2016	0	131,078	0	131,078
01/10/2016-30/09/2017	0	131,078	0	131,078
01/10/2017-30/09/2018	0	131,078	0	131,078
01/10/2018-30/09/2019	0	131,078	0	131,078
Total(tCO_2e)	0	917,546	0	917,546

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility, y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied to the grid by the Project
Source of data to be used:	Measured by the meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	180,947
Description of measurement methods and procedures to be applied:	The electricity supplied to the grid will be hourly measured and monthly recorded.
QA/QC procedures to be applied:	Payment invoices made to the grid operator and payment receipts together with the meter reading records would be used to verify the energy exported to the grid. This data will be cross checked on a regular basis between the metering devices at the Project stations to assure consistency, accuracy and transparency..
Any comment:	

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	The project installed capacity
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	39,000,000

Description of measurement methods and procedures to be applied:	The capacity of the Project will be recorded according to the installed units. Monitored annually.
QA/QC procedures to be applied:	The installed capacity of the Project will not changed and will be measured accuracy and ensure that it will not affect the calculation of emission reductions by the Project. Therefore further QA/QC procedures will be applied.
Any comment:	

Data / Parameter:	A_{PJ}
Data 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 to be used:	The measurement report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3,433,800
Description of measurement methods and procedures to be applied:	Measured from topographical surveys annually.
QA/QC procedures to be applied:	The power density of the Project is greater than 10 $W/m_{2;}$ the calculated design surface area will be measured accuracy and ensure that it will not affect the calculation of emission reductions by the Project. Therefore further QA/QC procedures will be applied.
Any comment:	

B.7.2 Description of the monitoring plan:

The project owner will establish a monitoring task force for the Project. The objective of the CDM task force is to provide credible, accurate, transparent and conservative monitoring data of the emission reductions, based on which the real, measurable and long term global environmental benefits relating to the GHG emission reduction accrued by the Project can be verified and certified.

Monitoring Organization, Responsibility and Training

A CDM Working Group will be established by the project owner to undertake the monitoring tasks. The management structure of the CDM Working Group is illustrated as following:

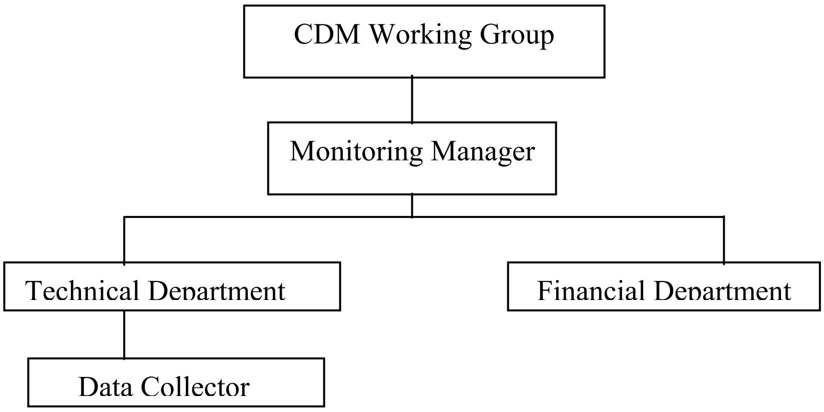

Figure B-2 The Diagram of Monitoring Organization

The Monitoring Manager is fully responsible for implementing and reviewing the monitoring tasks. The Technical Department and the Financial Department will cooperate with the Monitoring Manager. Of which, the Technical Department is charge of the organization of calibration tasks and regular maintenance of the meters equipped in the Project. The meters will be calibrated and maintained by specific technical staff and third party verification in accordance to relevant regulation and standard. The Financial Department is responsible for regular collecting the financial data required for checking, mainly including the meters reading records and the electricity sales invoices or receipts.

The Data Collector, under the Technical Department, is responsible for taking the prescribed, regular collection of the meter readings of the monitored parameters listed in section B.7.1. He will submit the results to the Technical Department. The Technical Department will check the validity of the data by comparing with previous recorded data and data from third party such as the Power Corporation. If a big difference does exist, it should be reported to Monitoring Manager. The validated data will be input to the CDM data management system to be archived electronically by the Technical Department.

In addition, all personnel in the CDM Working Group shall be trained according to the training manual to ensure they are qualified and competent.

Data to be monitored

Since the emission factor is calculated as *ex-ante* and according to the Monitoring Methodology ACM0002 (Version 12.3.0), the following data should be monitored:

a) Net electricity delivered by the Project to the Grid ($EG_{facility, y}$)

b) Surface area of the reservoir at full reservoir level of the Project (A_{PJ})

c) The project installed capacity ($Cap_{P,J}$)

Installation of monitoring equipment

According to the requirement from Technical administrative code of electric energy metering (DL/T448-2000), the monitoring meters shall be properly installed and checked by the project owner and the grid company before the Project in operation. The diagram of the meters' position is shown in Figure B-3:

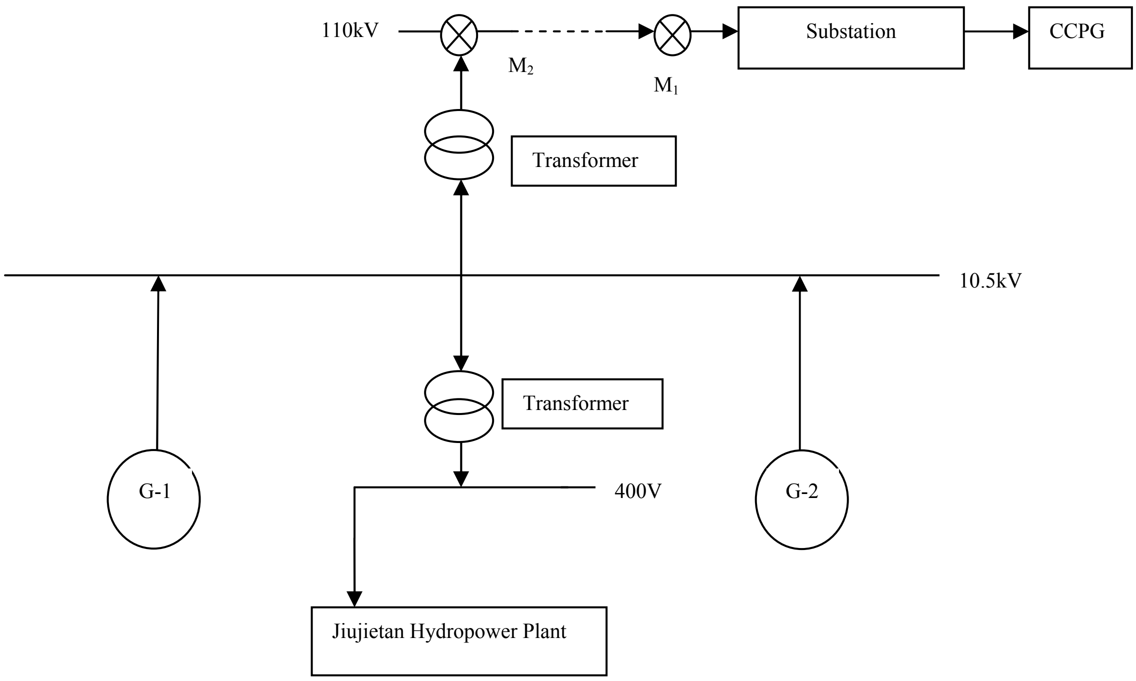

Figure B-3 Layout of monitoring meters of the Project

There are one meters installed at the project site and one meter will be installed at the side of substation connected to the grid.

Meter M_1 is a bidirectional meter which is installed at substation and used to measure the net electricity generation supplied to the grid by the Project.

Meter M_2 is also a bidirectional meter installed at the hydropower plant and measures the electricity coming out from the plant to the grid and the electricity received by the plant from the grid.

$EG_{facility}$ is determined by M_1 and the measurement results should be checked with the readings of M_2 correspondently.

The measurement of each meter is continuous and cumulative. Records of readings are made monthly. The accuracies of meter M_1, and M_2 are both 0.5s.

In the urgent cases, the project owner should notice the grid company timely. The amount of electricity consumed during the period when the meters do not work will be determined by the two sides through consultation.

The QA&QC procedures for recording, maintaining and archiving data shall be optimized.

Calibration

The project owner and the connected grid company signed an agreement to provide measurement and calibration quality control procedures to ensure the accuracy. Ammeter cycle test and inspection should be in accordance with national standards.

All the monitoring meters shall be calibrated by qualified organization in accordance to the national standards and sectoral regulations. The meters (M_1 and M_2) will be calibrated annually. The calibration records should be kept and retained according to the record management procedures. After verification and calibration, meters should be sealed. All meters should be jointly inspected and sealed on behalf of the project owner and Grid Company shall not be affected by either party except its accredited representatives.

All the meters installed shall be tested by a qualified metering verification institution commissioned jointly by the project owner and the grid company within 10 days after:

(a) Detection of a difference is larger than the allowable error in the readings of both meters;

(b) Repair the faulty meter caused by improper operation.

Data collection

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be established and implemented as part of this CDM project.

The project owner is responsible for monitoring of meters and the data of power measured will be recorded and collected daily, and archived in electronic form every month. The surface area of the reservoir at full reservoir level and installed capacity will be measured and monitored by the competent body annually while the Project is in commission. The data will be recorded and archived in electronic form annually.
The QA&QC procedures for recording, maintaining and archiving data shall be optimized to ensure the Project provides credible, accurate, transparent and conservative monitoring data of the emission reductions.

Monitoring report

The monitoring report is prepared by Monitoring Manager, and submitted to related framework after final judgment by the CDM project principal. The report should cover the monitoring of grid-connected power generation, the surface area of the reservoir, report on calculation of the emission reduction and records of monitoring instrument repair and calibration, etc. All written documentation should be stored and should be available to the verifier so that the reliability of the information could be checked.

Record and document management

All the data monitored under the monitoring plan will be kept in electronic and hard copy format for 2 years after the end of crediting period or the last issuance of CERs for this project activity, whichever occurs later. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The study of the baseline and monitoring methodology was concluded on 24/10/2011 by the following organization and person.

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Contact person：Tina Wang

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Email: wmn1432000@yahoo.com.cn

The entity is not one of the project participants in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

17/01/2008[27]

C.1.2. Expected operational lifetime of the project activity:

30 years, 0 month

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

01/10/2012 or the registration date whichever the later one.

C.2.1.2. Length of the first crediting period:

7 years, 0 month

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

27 Purchase Contract of the key equipment (17/01/2008) signed by Project owner and Tianjin Tianfa Heavy Machinery and Hydro Power Equipment Manufacture Co., Ltd.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The EIA Report of the Project approved by Sichuan Provincial Environmental Protection Bureau on 18/12/2006 [28] in accordance with current consent conditions. There is no significant impact on environment. The main assessment conclusions are provided below:

Solid Waste

There will be 200,000 cubic meters solid waste produced during the construction and during operation the major solid pollutants are manure and daily garbage from the staff.

Solutions:

The solid waste of construction, should consider first being fully utilized, combining with the backfilling of permanent and temporary constructible site or pile to the designated spoil area. In addition, to prevent the soil erosion when heavy rain and spoil landslide happen, the construction area and its surrounding should be reforested. And the living garbage and manure should be gathered and stacked, periodically cleaned and taken into the urban waste disposal system.

Waste Water Discharge

There are two kinds of waste water produced by the Project: the construction machinery cleaning and living sewage during the operation period. There are about three cubic meters waste water which is non-toxic but contains some kinds of suspensions produced in daily life.

Solutions:

According to the project layout and terrain features, wastewater treatment pond should be settled at the main wastewater production, the wastewater is discharged into the river after sediment. The suspension will dehydrate naturally and then be shipped to the designated spoil area. Living sewage is discharged after treatment, in order to avoid downstream river pollution as far as possible. In addition, a drinking water supply reservoir will be set up. Meanwhile, disinfection will be adopted to guarantee the health of construction labourers.

Dust and Noise

The suspended particles in the plant-site may cause disqualification during construction, and various mechanical noise mixed in plant-site will affect acoustic environment.

Solutions:

In the main machinery, vehicles, equipment selection, dust elimination and noise reduction are important indicator nature. The main source of dusts are from the road and spoil yards, water spray dust suppression measures will be taken; For the high dust and noise area, the staff could take personal dust and noise protective measures. In addition, the isolation booth can be constructed between the workers duty and operating room.

Soil Erosion:

During the construction period, there will be excavation of earth and rock. So soil collection, sand- and gravel collection from a small quarry are necessary. Besides, some temporary lines, residences and workshops will be built. All of these activities will undermine land surfaces and aquatic ecosystems. Some erosion is likely to occur. When the hydropower plant is in operation, it will not damage the surface of the earth. Thus, there will be no additional soil erosion during the operation period.

Solutions:

Project owner set special funds aside. At the end of construction, a comprehensive restoration will be conducted. The constructible zone will set up warning signs to indicate the constructible activities. They must limit the amount of cut down trees and not access to non-construction zone. Generally some river does not flow there. Special year in operation during power station will consider the impact on the environment, appropriate to add some water environment.

There are no endangered flora and fauna in flooded areas of reservoir. During construction, the project owner restores the damaged vegetation timely. As a result, there is no signification ecological effect caused by the Project. All in all, the major environmental impacts of the Project are brought by the construction of the Project and corresponding protection measurements are taken. The impact of the Project on environment is not signification.

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[28] Sichuan Provincial Environmental Protection Bureau (18/12/2006), EIA approval of the Project.

D.2. If environmental impacts are considered significant by participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

There are no significant environmental impacts of the Project.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

In order to make the stakeholders understand the Project, the project owner held the stakeholder comments meeting in local on 07/2006. The representatives are from local residents, including Da County, Shiti Town, Qiaowan village, Luoche village, Daorang village, Hurang village, and Jiangling Town. The survey was carried out in form of questionnaires which made in Chinese. 100 questionnaires have been issued, and 100 recycled.

The content of the questionnaire including:

- The introduction of the proposed Project;
- The attitude toward the Project construction;
- The impact on the life and work of participants investigated;
- The environmental problem should be considered during the Project construction;
- The impact on the local economic development;
- The suggestion about the environmental protection.

E.2. Summary of the comments received:

Summary of the questionnaires:

Serial number	Content of the survey	Idea and suggestion	Statistical result	
			Number	Percent
1	Whether support to the project	Support	87	87
		Object	0	0
		Indifferent	13	13
2	The effect to the local economic development	Large	79	79
		Common	21	21
		Small	0	0

3	The impact to the local environment	Benefit	57	57
		Harm	2	2
		No impact	41	41
4	What is the biggest impact of the project on you	Waste water	5	5
		Dust	7	7
		Noise	14	14
		Traffic difficulty	54	54
		other	25	25
5	The impact to the local vegetation	Large	0	0
		Common	23	23
		Small	77	77
6	Whether the Project construction to increase the water and land erosion	yes	15	15
		no	85	85
7	The most benefit from the Project construction	Promote local economic development	66	66
		Provide more employment opportunities	25	25
		other	9	9

The above mentioned survey shows that the local representatives are supportive to the Project construction. The representatives also concluded that the Project is benefit for the local agriculture and economic development as well as individual's life. It can be seen that the most stakeholders worry that the Project would bring traffic difficulty to their daily life. In order to solve this issue, the project owner is building a bridge across the river, where the hydropower plant is located, for the convenience of the people living at two sides. [29]

E.3. Report on how due account was taken of any comments received:

[29] The construction of the bridge was verified during the on-site validation.

There has therefore been no need to modify the Project due to comments received. The environmental concern from the respondents will be seriously considered by the project owner and will be solved by applying the reasonable measures.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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. Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the Project.

Annex 3

BASELINE INFORMATION

Tables A3-1 Fossil Fuel-fired Power Generation of CCPG in 2007

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Jiangxi	42,100,000	7.72	38,849,880
Henan	177,300,000	7.55	163,913,850
Hubei	60,900,000	6.69	56,825,790
Hunan	54,200,000	7.18	50,308,440
Chongjing	28,800,000	9.2	26,150,400
Sichuan	45,100,000	8.68	41,185,320
Total			377,233,680

Net MWh transferred from Northwest China Power Grid to CCPG	3,005,400
Simple OM of Northwest China Power Grid	1.01129
Total Emission of CO_2(tCO_2e)	419,013,395
Total Electricity of Supply (MWh)	380,239,080
Emission factor of CCPG in 2007	1.10197

Data source： China Electric Power Yearbook 2008

Tables A3-2 Calculate the Operating Margin Emission Factor of CCPG in 2007

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongjing	Sichuan	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO2(tCO_{2e})
									（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	L=G*J*K/100000 （quantity）
		A	B	C	D	E	F	G=A+B+C+ D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	2200.57	9357	3479.81	2683.81	1547.7	3239	**22507.89**	25.8	100	87,300	20,908	410,829,404
Cleaned coal	10^4t		3.07			3.8		**6.87**	25.8	100	87,300	26,344	157,998
Other washed coal	10^4t	0.04	87.16		2.06	96.42		**185.68**	25.8	100	87,300	8,363	1,355,631
Briquette	10^4t						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke	10^4t							**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.08	2.61	0.25	0.31	0.91		**4.16**	12.1	100	37,300	16,726	259,534
Other gas	10^8m^3	29.17	25.79		24.69		23.98	**103.63**	12.1	100	37,300	5,227	2,020,444
Crude oil	10^4t		0.43					**0.43**	20	100	71,100	41,816	12,784
Petrol	10^4t				0.04	0.01		**0.05**	18.9	100	67,500	43,070	1,454
Diesel oil	10^4t	0.98	3.21	2.51	2.83	1.93		**11.46**	20.2	100	72,600	42,652	354,863
Fuel oil	10^4t	0.42	1.25	1.33	0.63	0.64	1.74	**6.01**	21.1	100	75,500	41,816	189,742
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery dry gas	10^4t	1.43	10.01	0.97	0.7			**13.11**	15.7	100	48,200	46,055	291,022
Nature gas	10^8m^3		0.12	0.18		0.2	1.87	**2.37**	15.3	100	54,300	38,931	501,007
Other petroleum products	10^4t							**0**	20	100	72,200	41,816	0
Other coking products	10^4t							**0**	25.8	100	95,700	28,435	0
Other energy	10^4tce	23.43	63.65	35.95	29.46	23.21		**175.7**	0	0	0	0	0
												Total	415,974,066

Data source: China Energy Statistical Yearbook 2008

Tables A3-3Fossil Fuel-fired Power Generation of NCPG in 2008

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Jiangxi	40,500,000	6.5	37,867,500
Henan	189,000,000	7.22	175,354,200
Hubei	55,300,000	6.62	51,639,140
Hunan	53,700,000	6.46	50,230,980
Chongjing	28,600,000		28,600,000
Sichuan	40,100,000	10.21	36,005,790
Total			379,697,610

Net MWh transferred from Northeast China Power Grid to CCPG	3,144,070
Simple OM of Northeast China Power Grid	0.98254
Net MWh transferred from North China Power Grid to CCPG	33,200
Simple OM of North China Power Grid	1.00495
Total Emission of CO_2(tCO_2e)	398,974,078
Total Electricity of Supply (MWh)	382,874,880
Emission factor of CCPG in 2008	1.04205

Data source: China Electric Power Yearbook 2009

Tables A3-4 Calculate the Operating Margin Emission Factor of CCPG in 2008

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongjing	Sichuan	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO2(tCO_{2e})
									（tc/TJ）	（%）	(kgCO_2/TJ)	（MJ/t,km3）	L=G*J*K/100000（quantity）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	2137.08	9480.74	2852.29	2620.44	1421.42	2727.61	**21239.58**	25.8	100	87,300	20,908	387,679,342
Cleaned coal	10^4t		1.68			3.27		**4.95**	25.8	100	87,300	26,344	113,842
Other washed coal	10^4t	0.04	80.54		2.06	101.75		**184.39**	25.8	100	87,300	8,363	1,346,213
Briquette	10^4t				6.12		0.01	**6.13**	26.6	100	87,300	20,908	111,889
Coke	10^4t		0.78		0.92			**1.7**	29.2	100	95,700	28,435	46,261
Coke oven gas	10^8m^3	0.1	4.19	0.37	0.24	6.66	0.01	**11.57**	12.1	100	37,300	16,726	721,829
Other gas	10^8m^3	23.67	41.36		3.31	0.37	0.01	**68.72**	12.1	100	37,300	5,227	1,339,814
Crude oil	10^4t		0.17					**0.17**	20	100	71,100	41,816	5,054
Petrol	10^4t							**0**	18.9	100	67,500	43,070	0
Diesel oil	10^4t	0.88	7.02	2.82	3.41	1.59		**15.72**	20.2	100	72,600	42,652	486,775
Fuel oil	10^4t	0.07	1.45		1.29		3.14	**5.95**	21.1	100	75,500	41,816	187,848
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery dry gas	10^4t	0.21	3.91	2.78	0.71		0.01	**7.62**	15.7	100	48,200	46,055	169,153
Nature gas	10^8m^3		4.02	0.16		0.05	12.92	**17.15**	15.3	100	54,300	38,931	3,625,430
Other petroleum products	10^4t			0.59				**0.59**	20	100	72,200	41,816	17,813
Other coking products	10^4t						0.01	**0.01**	25.8	100	95,700	28,435	272
Other energy	10^4tce	18.16	68.11	62.35	11.42	64.87		**224.91**	0	0	0	0	0
												Total	395,851,534

Data source: China Energy Statistical Yearbook 2009

Tables A3-5Fossil Fuel-fired Power Generation of NCPG in 2009

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Jiangxi	44,500,000	5.8	41,919,000
Henan	198,500,000	6.62	185,359,300
Hubei	63,000,000	6.21	59,087,700
Hunan	63,400,000	6.39	59,348,740
Chongjing	30,600,000		30,600,000
Sichuan	50,400,000	7.92	46,408,320
Total			422,723,060

Net MWh transferred from Northwest China Power Grid to CCPG	3,262,010
Simple OM of Northwest China Power Grid	1.00759
Net MWh transferred from North China Power Grid to CCPG	2,233,290
Simple OM of North China Power Grid	0.96418
Total Emission of CO_2(tCO_2e)	408,757,899
Total Electricity of Supply (MWh)	428,218,360
Emission factor of CCPG in 2007	0.95455

Data source: China Electric Power Yearbook 2010

Tables A3-6 Calculate the Operating Margin Emission Factor of CCPG in 2009

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongjing	Sichuan	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO2(tCO_{2e})
									（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	L=G*J*K/100000 （quantity）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	2184.31	9339.64	2888.29	2810.69	1413.64	2817.31	**21453.88**	25.8	100	87,300	20,908	391,590,892
Cleaned coal	10^4t		3.35					**3.35**	25.8	100	87,300	26,344	77,044
Other washed coal	10^4t		59.93			136.75	97.94	**294.62**	25.8	100	87,300	8,363	2,150,991
Briquette	10^4t				2.63			**2.63**	26.6	100	87,300	20,908	48,005
Coke	10^4t		1.08	0.06	0.09			**1.23**	29.2	100	95,700	28,435	33,471
Coke oven gas	10^8m^3	0.09	6.04	1.2		1.03		**8.36**	12.1	100	37,300	16,726	521,564
Other gas	10^8m^3	30.76	56.64		4.23	7.57		**99.2**	12.1	100	37,300	5,227	1,934,074
Crude oil	10^4t		0.1					**0.1**	20	100	71,100	41,816	2,973
Petrol	10^4t							**0**	18.9	100	67,500	43,070	0
Diesel oil	10^4t	0.69	4.28	1.23	1.55	1.19		**8.94**	20.2	100	72,600	42,652	276,830
Fuel oil	10^4t	0.02	1.44	0.48	1.27	0.06	4	**7.27**	21.1	100	75,500	41,816	229,522
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery dry gas	10^4t	0.25	2.18	0.82	1.91			**5.16**	15.7	100	48,200	46,055	114,544
Nature gas	10^8m^3		7.69	0.27		0.14	21.84	**29.94**	15.3	100	54,300	38,931	6,329,176
Other petroleum products	10^4t			0.29				**0.29**	20	100	72,200	41,816	8,755
Other coking products	10^4t							**0**	25.8	100	95,700	28,435	0
Other energy	10^4tce	12.47	76.3	26.69	14.96	84.8		**215.22**	0	0	0	0	0
												Total	403,317,841

Data source: China Energy Statistical Yearbook 2010

Table A3-7 The Operating Margin Emission Factor of CCPG in 2007~2009

	2007	2008	2009	Total
Total emission (tCO_2)	419,013,395	398,974,078	408,757,899	1,226,745,374
Total Electricity Supply to Grid (MWh)	380,239,080	382,874,880	428,218,360	1,191,332,320
Emission factor (tCO_2/MWh)	1.10197	1.04205	0.95455	1.02973

Table A3-8 $EF_{Coal, Adv}$, $EF_{Oil, Adv}$ and $EF_{Gas, Adv}$

	Variation	Efficiency	Fuel EF (tCO_2 /TJ)	Oxidation Rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/10,000*B*C
Coal-fired power plant	$EF_{Coal,Adv}$	39.45	87,300	1	0.7967
Gas-fired power plant	$EF_{Gas,Adv}$	51.77	75,500	1	0.5250
Oil-fired power plant	$EF_{Oil,Adv}$	51.77	54,300	1	0.3776

Table A3-9 Breakdown per fuel of annual emissions

		Jiangxi	Henan	Hubei	Hunan	Chongjing	Sichuan	Total	Calorific value	EF	Oxidation rate	Emission
Fuels	**Unit**	**A**	**B**	**C**	**D**	**E**	**F**	**G=A+…+F**	**H**	**I**	**J**	**K=G×H×I×J/100,000**
Raw coal	10^4t	2,184.31	9,339.64	2,888.29	2,810.69	1,413.64	2,817.31	21,453.88	20,908	87,300	1	391,590,892
Cleaned coal	10^4t	0	3.35	0	0	0	0	3.35	26,344	87,300	1	77,044
Other washed coal	10^4t	0	59.93	0	0	136.75	97.94	294.62	8,363	87,300	1	2,150,991
Briquette	10^4t	0	0	0	2.63	0	0	2.63	20,908	87,300	1	48,005
Coke	10^4t	0	1.08	0.06	0.09	0	0	1.23	28,435	95,700	1	33,471
Other coking products	10^4t	0	0	0	0	0	0	0.00	28,435	95,700	1	0
Total								0.00				393,900,403
Crude oil	10^4t	0	0.1	0	0	0	0	0.1	41,816	71,100	1	2,973
Gasoline	10^4t	0	0	0	0	0	0	0	43,070	67,500	1	0
Diesel oil	10^4t	0.69	4.28	1.23	1.55	1.19	0	8.94	42,652	72,600	1	276,830
Fuel oil	10^4t	0.02	1.44	0.48	1.27	0.06	4	7.27	41,816	75,500	1	229,522
Other petroleum products	10^4t	0	0	0.29	0	0	0	0.29	41,816	72,200	1	8,755
Total								0				518,081
Nature gas	10^7m^3	0	76.9	2.7	0	1.4	218.4	299.4	38,931	54,300	1	6,329,176
Coke oven gas	10^7m^3	0.9	60.4	12	0	10.3	0	83.6	16,726	37,300	1	521,564
Other gas	10^7m^3	307.6	566.4	0	42.3	75.7	0	992	5,227	37,300	1	1,934,074
LPG	10^4t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery dry gas	10^4t	0.25	2.18	0.82	1.91	0	0	5.16	46,055	48,200	1	114,544
Total												8,899,358
Total												403,317,841

Data source: China Energy Statistical Yearbook 2010

Here:
$\lambda_{Coal,y}$ =97.66%，$\lambda_{Oil,y}$ =0.13%，$\lambda_{Gas,y}$ =2.21%。

Therefore,
$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ = 0.7871 tCO_2/MWh

Table A3-10 Installed Capacity of CCPG in 2009

Installed Capacity	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**
Thermal	MW	11,500	43,100	15,670	15,900	6,800	12,270	105,240
Hydro	MW	3,770	3,650	30,010	11,460	4,530	25,810	79,230
Nuclear	MW	0	0	0	0	0	0	0
Wind and other energies	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 Energy Statistical Year Book 2010

Table A3-11 Installed Capacity of CCPG in 2008

Installed Capacity	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**
Thermal	MW	9,340	42,680	14,210	14,430	6,660	12,770	100,090
Hydro	MW	3,710	3,020	29,050	10,650	4,060	22,240	72,730
Nuclear	MW	0	0	0	0	0	0	0
Wind and other energies	MW	30	30	10	0	0	0	70
Total	MW	13,080	45,720	43,280	25,080	10,730	35,010	172,890

Data source: China Energy Statistical Year Book 2009

Table A3-12 Installed Capacity of CCPG in 2007

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal	MW	9,270	38,540	13,040	13,360	6,370	12,000	92,580
Hydro	MW	3,570	2,740	24,020	9,220	2,240	19,860	61,650
Nuclear	MW	0	0	0	0	0	0	0
Wind	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 Energy Statistical Year Book 2008

Table A3-13 EF_{BM} of CCPG

	Installed Capacity of 2007	Installed Capacity of 2008	Installed Capacity of 2009	New Installed Capacity2007-2009 (MW)	New Installed Capacity2008-2009(MW)	Cumulative increase (%)
Thermal(MW)	92,580	100,090	105,240	20,280.4	10,467.5	53.25%
Hydro(MW)	61,650	72,730	79,230	17,726.9	6,500	46.54%
Nuclear(MW)	0	0	0	0	0	0.00%
Wind(MW)	51	70	132	81	62	0.21%
Total	**154,281**	**172,890**	**184,602**	**38,088.3**	**17,029.5**	**100.00%**
% versus 2008				20.63%	9.23%	

$EF_{BM,y}$=0.7871×53.25%=0.4191 tCO_2/MWh

Annex 4

MONITORING INFORMATION

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No additional information