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:

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Title of the project activity: Hunan Xiaotan Hydropower Project
Document version: 03
Date of completion: 31/07/2009

Version number	Date	Reason
Version 01	09/09/2008	GSP
Version 02	10/05/2009	Revised according to the Validation Protocol
Version 03	31/07/2009	Revised according to comments from DOE

A.2. Description of the project activity:

>>
Hunan Xiaotan Hydropower Project (hereinafter referred to as "the project") locates on Chenshui Branch of Yuanjiang River in Xiaotan Town, Chenxi County, Huaihua City, Hunan Province. Before the implementation of the project activity, Central China Power Grid (CCPG) which is dominated by fossil fuel-fired power plants supplied equivalent electricity. The project is a new hydropower plant with the installed capacity of 20 MW and the annual average electricity generation of 78,880 MWh/yr, the net electricity supply is 75,090 MWh/yr[1], the surface area at the full reservoir level is 0.65 km^2 [2], and thus the power density of the project is 30.77 W/m^2. The electricity is delivered to Central China Power Grid (CCPG). The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

[1]The annual average electricity generation is decided by the install capacity, generationg flow, water head and the average efficiency of water-turbine generator units.The annual average electricity generation of the proposed project is 78,880 MWh/yr, and the plant load factor is 0.4565. The annual average electricity generation is approved by local government (The Approval of Prelimilary Design Report, June 21, 2006).

The valid electricity generation is the actual electricity generation, it is decided on the basis of annual average electricity generation considering the unit maintenance, accidental shutdown and the grid acceptable capacity, thus the valid electricity is less than the annual average electricity generation.

The net electricity to the grid equal to the valid electricity minus plant electricity consumption and line loss. It is the actual electricity sent to the power grid. The net electricity of the proposed project is 75,090 MWh/yr.

Thus, the net electricity to the grid is lower than the annual average electricity generation.

In order to comply with the conservative principle, all electricity generation used in the PDD and IRR analysis are annual average electricity generation.

Reference: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2134.pdf

[2] Hunan Huaihua Hydro & Power Design Institute, Preliminary Design Report of Xiaotan Project, April 2006.

The project activity utilizes hydropower to generate electric energy which won't produce any greenhouse gas (GHG) during the operation. The electricity generated by the project can displace part of the electricity generated by the fossil fuel fired power plants of CCPG, thus the project activity could reduce GHG emissions and the expected annual emission reductions are 76,790 tCO_2e.

The project activity will promote the local and national sustainable development powerfully in the following aspects:

- Create a lot of job opportunities in the construction period, and some positions during operation period.
- Improve the local infrastructure by the project owner as a part of the project activities, like pavements and roads, etc.
- Provide clean electrical energy, mitigating the shortage of local electricity supply which can accelerate local economic development.

A.3. Project participants:

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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)
The Peoples' Republic of China (Host)	Chenxi County Qiongtian Hydropower Co., Ltd.	No
United Kingdom	OneCarbon International B.V.	No

For detailed information, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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The People's Republic of China

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

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Hunan Province

A.4.1.3. City/Town/Community etc:

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Xiaotan Town /Chenxi County/ Huaihua City

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

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The project locates in Xiaotan Town, Chenxi County, Huaihua City, 8km away from the county. The project activity is a riverbed-hydroelectric station, the power house is very close to the dam. Therefore the dam and the power house has the same GPS coordinates, namely 110°08′39″ E and 27°56′ 19″ N. The project location is shown in Fig. 1.

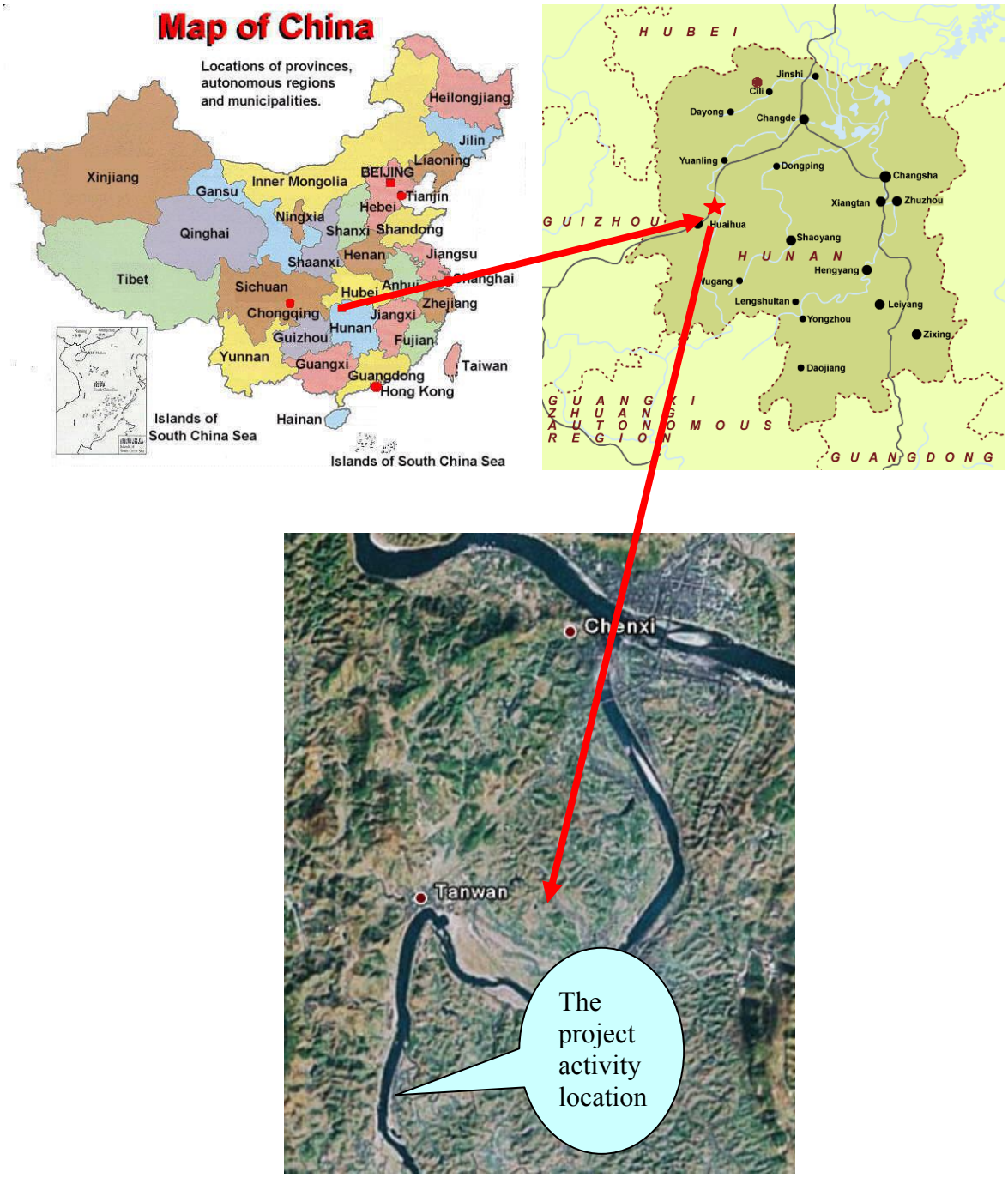

Fig. 1 Project activity location

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

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The project falls into:
Sectoral Scope 1: Energy industries (renewable sources)

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

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(1) Prior to the implementation of the project activity, equivalent annual electricity generation is supplied by CCPG.
(2) The project is a hydropower plant with a reservoir, and the total installed capacity is 20 MW. The project is designed to make use of water resources for electricity generation. The main construction of the project includes a dam, a powerhouse and a switch station, etc. The water pressure drive the turbines to rotate through diverting water from the intake of the penstocks to the powerhouses, the turbines drive the generators to rotate, thus the water energy is changed into electric energy, the project is connected to Chengxi Substation, the generated electricity will be delivered to CCPG. The project activity utilizes hydropower to generate electric power, thus no emission source or greenhouse gas is involved.

The detailed features of the project are shown in Table 1 as below:

Table 1 Technical parameters of main building and facilities of the project[3]

Parameters		Unit	value
Reservoir	Normal Water Level	m	123.5
	Area	km^2	0.65
Hydraulic Turbine	Model	—	GZTF07B-WP-450
	Quantity	Unit	2
	Rated Capacity	MW	11
	Rated Rotation	r/min	107.1
	Rated Water Head	M	7.2
	Rated Flow	m^3/s	170.39
	Efficiency	—	91.4%
	Age	year	0
	Lifetime	year	30
Generator	Model	—	SFWG10-56/5130

[3] Hunan Huaihua Hydro & Power Design Institute, Preliminary Design Report of Xiaotan Project, April 2006. Technical Agreement of Hydraulic Turbine and Generator between Chenxi County Qiongtian Hydropower Co., Ltd. and Tianjing Tianfa Heavy Hydropower Equipment Manufacture Co. Ltd., June 2007.
The information of the reservoir is from the Preliminary Design Report of Xiaotan Hydropower Project, and other parameters of hydraulic turbine and generator are from the Technical Agreement of Hydraulic Turbine and Generator of Xiaotan Hydropower Plant.

	Quantity	Unit	2
	Unit Capacity	MW	10
	Rated Voltage	kV	10.5
	Power Factor	—	0.9
	Age	year	0
	Lifetime	year	30
	Efficiency	—	97%

The information of monitoring equipments (meters) is shown in section B.7.2.

(3) The equivalent annual electricity generation is supplied by CCPG which is also the baseline scenario to the project activity.

(4) The strict environmental protection measures will be taken for the project activity according to EIA report, so the project is safe to environment.
(5) The main equipments, such as the turbines and generators, are made in the host country. No international technology is transferred from other countries to the project.

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

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The first crediting period of the project is 7 years, from Oct. 2009 to Sep. 2016. During the first crediting period the total estimated emission reduction is 537,530 tCO_2e by the project activity. The amounts of annual and total emission reductions are explained in the following Table 2:

Table 2 Estimated amounts of emission reductions over the chosen crediting period

Year	Annual estimation of emission reductions in tonnes of CO_2e
01/10/2009 – 30/09/2010	76,790
01/10/2010 – 30/09/2011	76,790
01/10/2011 – 30/09/2012	76,790
01/10/2012 – 30/09/2013	76,790
01/10/2013 – 30/09/2014	76,790
01/10/2014 – 30/09/2015	76,790
01/10/2015 – 30/09/2016	76,790
Total estimated reductions (tonnes of CO_2e)	537,530
Total number of the first crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	76,790

A.4.5. Public funding of the project activity:

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No public funding from parties included in Annex I is available to the project activity.

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:

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1. Baseline and Monitoring methodology

Approved consolidated baseline and monitoring methodology ACM0002 (Version 07):

"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

2. Reference:

Tool for the demonstration and assessment of additionality (Version 05.2);
Tool to calculate the emission factor for an electricity system (Version 01.1).

More information on the methodology and methodological tools listed above is available at the following website: 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:

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The project is a grid-connected renewable power generation project activity which meets all the applicable criteria stated in the methodology ACM0002 (Version 07):

1. The project activity is the installation of a hydro power plant;
2. The project is a new hydropower power plant, the power density is 30.77 W/m^2 which is greater than $4W/m^2$;
3. The geographic and system boundaries for CCPG which the project is connected to can be clearly identified and information on the characteristics of the grid is available.
4. The project activity doesn't involve switching from fossil fuels to renewable energy at the site of the project activity.
5. The project activity is not the biomass fired power plant.

Therefore, the methodology ACM0002 (Version 07) is applicable to the project activity.

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

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According to ACM0002 (Version 07), the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the CCPG that the power plant of the project activity is connected to. The project boundary is schematically illustrated in Figure 2.

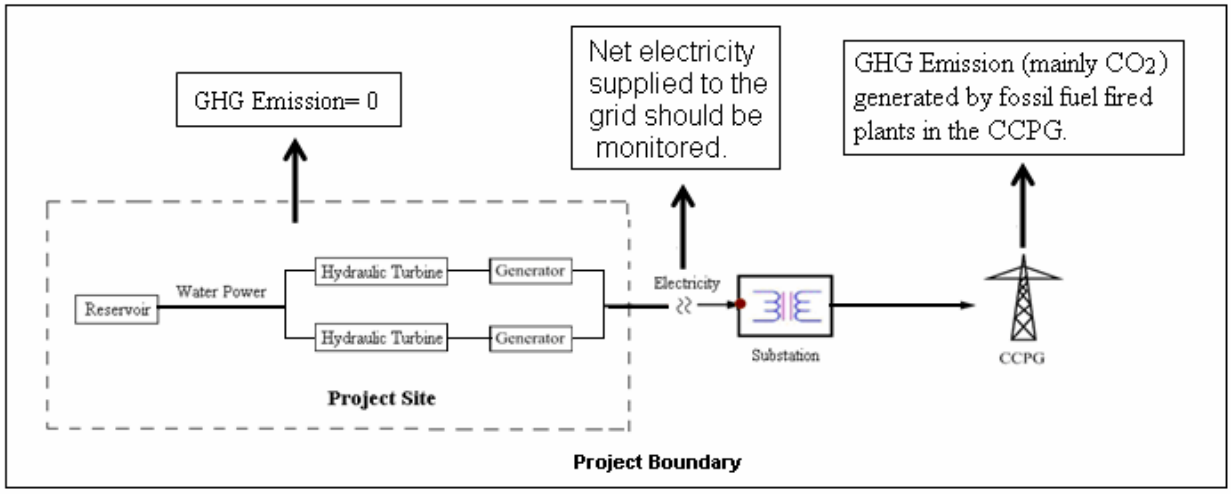

Fig. 2 Flow diagram of the proposed project activity

The project is connected to CCPG, the geographic extent of the CCPG boundary includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing City[4]. The GHG emissions sources in the project boundry are listed in Table 3 below:

Table 3 Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity supplied by CCPG	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	Emission from the reservoir of the project	CO_2	No	Minor emission source
		CH_4	No	The project power density is greater more than 10MW/m^2, CH_4 emissions don't have to 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:

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The possible baseline scenarios of the project activity include:

Scenario 1. The project activity undertaken without being registered as CDM project activity;

Scenario 2. Construct a fossil fuel-fired power plant with equivalent annual net electricity generation supplied to the grid;

[4] Office of National Coordination Committee on Climate Change, Baseline Emission Factor Calculation Result of China Grid, Dec. 30 2008

Scenario 3. Construct another renewable sources power plant with equivalent annual net electricity generation supplied to the grid;
Scenario 4. Equivalent annual electricity supplied by CCPG.

The analysis on each scenario is as follows:
Scenario 1. The project activity undertaken without being registered as CDM project activity
IRR of the project is only 8.56% which is less than the benchmark without CDM support, so the project isn't financially attractive (see Section B.5. for details), so Scenario 1 isn't feasible.
Scenario 2. Construct a fossil fuel-fired power plant with equivalent annual net electricity generation supplied to the grid
In China, the average annual utilization time of fossil fuel-fired power plants is 5,316 h[5] which is larger than that of hydropower plants, so the installed capacity of the fossil fuel-fired plants with equivalent annual electricity supplied to the grid to this project will be smaller than 20MW. However, according to the current laws and regulations in China, the thermal power plant with an installed capacity equal to or less than 135MW is strictly forbidden[6]. Therefore, the Scenario 2 doesn't comply with current mandatory applicable legislation and regulations in China, and is not feasible.
Scenario 3. Construct another renewable sources power plant with equivalent annual net electricity generation supplied to the grid.
This scenario is to construct renewable power plants, which can supply equivalent electricity annually as the project. Another renewable sources energy includes biomass, wind, solar, geothermal and ocean energy[7]. However, those kinds of energy are strongly depended on climate and natural rsources, and are still in the investigation phase and can bring only poor economic benefits[8], which can not be operated without support from the national policies[9]. Moreover, the utilization of geothermal and ocean energy are just in the very beginning in China[10], therefore it's not feasible for the project owner to invest another renewable sources power plant with equivalent annual net electricity generation supplied to the grid.
Thus Scenario 3 is not feasible.
Scenario 4. Equivalent annual electricity supplied by CCPG
This Scenario complies with national laws and regulations, and doesn't face any barrier, it is feasible.

According to the analysis above, the most plausible baseline scenario is: Scenario 4. Equivalent annual electricity supplied by CCPG.

[5] China Electricity Council, National Statistics Bulletin of Power Industry in 2007
http://news.hexun.com/2008-01-17/102931562.html

[6] General Office of the State Council of China, Notice on Strictly Prohibiting the Construction of Fuel-fired power plants with installed Capacity of 135 MW or below, 15 April 2002

[7] http://www.cogenchina.com/renewable_energy/law.php

[8] http://www.in-en.com/power/html/power-1145114599271031.html

[9] http://www.sei.gov.cn/ShowArticle.asp?ArticleID=105482&ArticlePage=3

[10] http://env.people.com.cn/GB/6285168.html

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):

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According to the "Tool for the demonstration and assessment of additionality" (Version 05.2) approved by EB, the additionality of the project is demonstrated and assessed through the following steps.

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

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

The alternatives available to the project activity are as follows:
Alternative 1—The project activity undertaken without being registered as CDM project activity;
Alternative 2—Construct a fossil fuel-fired power plant with equivalent annual net electricity generation supplied to the grid;
Alternative 3—Construct another renewable sources power plant with equivalent annual net electricity generation supplied to the grid;
Alternative 4—Equivalent annual electricity supplied by CCPG.

As the description in Section B.4., the area where the project locates lacks other renewable sources such as wind power, geothermal power and biomass energy, so Alternative 3 is not feasible.

Sub-step 1b. Consistency with mandatory laws and regulations:
As the description in Section B.4., the installed capacity of the fossil fuel-fired plants with equivalent annual electricity supplied to the grid to this project will be smaller than 20MW. However, according to the current laws and regulations in China, the thermal power plant with an installed capacity equal to or less than 135MW is strictly forbidden. Therefore, the Alternative 2 doesn't comply with current mandatory applicable legislation and regulations in China, and is not feasible. The Alternative 1 and Alternative 4 are consistent with the current mandatory laws and regulations.

Step 2. Investment analysis
Sub-step 2a. Determine appropriate analysis method
According to "Tool for the demonstration and assessment of additionality" (Version 05.2), there are three analysis methods for investment analysis, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

As the project activity will generate economic benefits from the sale of electricity generation other than CDM related income, simple cost analysis method is not applicable; the electricity supply by CCPG isn't a concrete investment project, so investment comparison analysis method isn't applicable too. Therefore, benchmark analysis method is chosen for the investment analysis.
Sub-step 2b. Option III. Apply benchmark analysis
Economic Evaluation Code for Small Hydropower Projects (SL16-95) was approved by The Ministry of Water Resources of the People's Republic of China in 1995, it is applicable for the economic assessment of hydropower projects below 25MW, and is still effective now[11]. Therefore, the document could be used

[11] The Notification of Effective Water Conservancy Technical Standard, The Ministry of Water Resources of the People's Republic of China, Jan. 12, 2009.

for economic evaluation of Xiaotan hydropower project.
The project IRR is an important parameter in financial assessment of hydropower project, according to SL16-95, the financial benchmark IRR of the total investment which is the project IRR in Chinese small hydropower industries (below 25MW) is 10% (after tax), it is the benchmark for Xiaotan project. This benchmark IRR is used extensively in China for investment analysis of hydropower projects.

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

Based on Preliminary Design Report, the main assumptions for the investment analysis are shown in Table 4.

Table 4 Main parameters for investment analysis and evaluation

No.	Main Parameter	Unit	Value	Reference
1	Installed capacity	MW	20	PDR
2	Total investment	Million RMB yuan	173.84	PDR
3	Annual average electricity generation	MWh	78,880	PDR See footnote 17
4	Residual rate of fixed assets value	%	5	PDR
5	Electricity tariff (with VAT)	RMB yuan/KWh	0.316	PDR
6	Value-added Tax	%	6	PDR
7	Sale surtax	%	8	PDR
8	Income tax	%	33	PDR
9	Project lifetime	year	30	See Footnote 17
10	Operational and maintenance costs	Million RMB yuan	2.34	PDR

The analysis of Electricity tariff is analysis as follow:
The electricity tariff is guided by national policy in China, according to the Notice of Hunan Price Bureau in Aug. 2005, the electricity tariff for the project will be 0.316 RMB/kWh which is in line with the value in PDR.
The electricity tariff will keep stable and is credible and reasonable throughout the investment period, the analysis is shown as follow:

(1) It is common practice to adopt the fixed electricity tariff and fixed costs when taking the investment analysis in Feasibility Study Report (FSR) or Preliminary Design Report (PDR) in China. According to Economic Assessment Method and Parameters for Construction Projects (Version 3), the fixed price should be used in the investment analysis. According to Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project published by China Electric Power Press in September 2002, the price used for investment analysis should be based on the current price system. Thus it is reasonable to adopt fixed electricity tariff and costs to take investment analysis.

(2) In China, the electricity tariff is strictly controlled by the central government. The electricity tariff will not be significantly changed without permission by the central government. In order to ensure the stability of the price for the whole country, the central government takes strict measurment to control the basic price such as the tariff and commodity price. The adjustment of electricity tariff needs to be realized by negotiation of several government departments or even needs to be approved by the CPC Central Committee, so it is impossible for power generation enterprises to forecast the electricity tariff variation

in the future, and the electricity tariff used for financial analysis could not be forecasted. Thus only fixed electricity tariff derived from relevant electricity guiding price could be adopted.

According to the Notification of Electric Power Tariff Reform by the Office of National Council (Guobanfa (2003) No.62)[12] issued on 9 July 2003, the related policies for the electricity tariff management in China are as follows:

Clause 33: The electricity tariff is controlled and managed by the price responsible department of government. For crucial price decision, it is required to consult power supervision department, power electric association and related marketing entities for opinions. The power electric supervision and management department recommends the electricity tariff adjustment methods to price responsible department of government in accordance with situation of market.

Clause 34: The principles of electricity tariff management, the electricity transmission tariff and capacity tariff of power electric market should be decided and issued by price responsible department of State Council.

Clause 35: The price responsible department of government and power electric supervision department should supervise and check the implementation of electricity tariff for participants in power electric market.

(3) In Hunan Province, the electricity generated by utilization of renewable resource got higher tariff in the past several years, but it was decreased for the Mechanism of Tariff Competition for electricity to the grid. According to the document from Hunan Price Bureau, the electricity tariff of Hunan Province has decreased from 0.348 RMB yuan [13] in 2000 to 0.327 RMB yuan[14] in 2002 and then 0.30 RMB yuan[15] in 2004 which indicated a decreasing trend. And from 2005 to 2008, the electricity tariff of similar power plants in locality is stable at 0.316 RMB/kWh[16]. The increasing rate of electricity tariff from 2004 to 2008 is 0.32%, which can be ignored comparing the electricity decreasing trend from 2000 till now.

It can be found that the IRR (Please see the attached IRR excel spreadsheets) is 8.56% with the realistic and reasonable tariff. The project IRR is still far below the benchmark IRR (10%).
The IRR of the project is shown as Table 5.

[12] http://www.chinabaike.com/law/zy/xz/bgt/1336813_3.html

[13] Notice on Electricity Tariff Adjustment of Hunan Power Grid, Price Bureau of Hunan Province [No. 49(2000)], Mar. 6, 2000.

[14] Notice on Adjustment and Confirmation of the Electricity Tariff of Hunan Power Grid, Price Bureau of Hunan Province, [No.327 (2001)], Dec.31st, 2001.

[15] Notice on Adjustment and Confirmation of the Electricity Tariff of Hunan Power Grid, Price Bureau of Hunan Province, [xiangjiachong (2004) No.114], Aug. 2004.

[16] Notice on the Electricity Price of Power Grid of Hunan Province (Xiangjiachong (2005) No.129), Aug. 23, 2005

Notice on Electricity Tariff Adjustment of Hunan Province, Oct. 22, 2008.

Table 5 The project financial indicator without CERs revenue[17]

Item	Unit	Without CERs revenue	Benchmark	With CERs revenue
IRR	%	8.56	10	12.04

Without CERs revenue, the project IRR of the proposed project is only 8.56%, which is lower than benchmark IRR. With CERs revenue, the project IRR is 12.04% which is obviously higher than benchmark IRR. Thus, the project is not financially attractive.

Sub-step 2d. Sensitivity analysis

The purpose of the sensitivity analysis is to examine how the uncertainty of single variable such as electricity tariff, electricity generation, total investment and annual O&M costs impacts on the IRR, so as to check the stability and credibility of the results obtained in above. The result of the sensitivity analysis is shown in Table 6 as follows:

Table 6 Sensitivity Analysis

Variation range & Assessment / Factor	Variation range to reach benchmark	Practical assessment of the critical factors
Electricity Tariff	+16.3%	When the tariff increase, the IRR of project moves up. That means only when the electricity tariff increases at least 16.3%, the IRR of the project would overtop the benchmark of 10%. But it is impossible. According to the document from Hunan Price Bureau, the electricity tariff of Hunan Province has decreased from 0.348 RMB yuan in 2000 to 0.327 RMB yuan in 2002 and then 0.30 RMB yuan in 2004 which indicated a decreasing trend. And from 2005 to 2008, the electricity tariff of similar power plants in locality is stable at 0.316 RMB/kWh. The increasing rate of electricity tariff from 2004 to 2008 is 0.32%, which can be ignored comparing the electricity decreasing trend from 2000 till now. In addition, the electricity tariff of 0.316 yuan/kWh is from the PDR, which is in line with the document "Notice to Adjust the Electricity Tariff of Hunan Province" which is promulgated by Price Bureau of Hunan Province in Oct.

[17] The IRR in the PDD of GSP is 7.83% and the IRR in this PDD is 8.56%, the difference is induced by the updating of parameters in IRR calculation: the electricity generation in the GSP PDD is the net electricity generation (75,090 MWh/yr), and the lifetime in the GSP PDD is 25 years which is from the PDR; the electricity generation in this PDD is the annual average electricity generation (7888 MWh/yr) which is more conservative, and the lifetime is revised to 30 years which is in line with the lifetime of main equipments, it is more conservative in IRR analysis. Therefore the IRR in this PDD is more conservative.

		2008, therefore the 16.3% increase of electricity tariff is unlikely to occur.
Electricity generation	+16.2%	When the annual operation hour increase, the IRR of project moves up. Besides the determined design proposal of the project, the variation of electricity generation is mainly subject to the water resources of project site, and also be the outcome of the year's rainfall. It is impossible for the electricity generation of project to increase more than +16.2%, because the electricity generation was speculated according to the hydrology documents for 46 years (1957-2002)[18] and it would not change much. And thus, the 16.2% increase of project's electricity generation is unlikely to occur.
Total investment	-14.2%	When total investment of project decrease, the IRR of project moves up. As there is no change for the composing of total investment, the total investment of project is mainly subject to the price of industrial products, and according to the chart of "Ex-factory Price Indices of Industrial Products", which is published by the National Bureau of Statistics of China in 2007, the price indices increased 5.53% from 1999 to 2006[19], which is equal to an 0.69% annual increase rate. Moreover, according to the contracts of Xiaotan Project, the total investment of Xiaotan Hydropower has reached 184.719 million RMB yuan which is greater than the estimated total investment in PDR. Therefore, it is unlikely for the total investment of project to decrease more than 14.2%.
O&M cost	/	When the O&M cost of project decrease, the IRR of project moves up. However, the IRR is still under benchmark even when O&M cost is zero.

Within the reasonable variation scope of electricity tariff, electricity generation, total investment and O & M costs, the IRRs of the project are always lower than the benchmark, thus the project isn't attractive economically.

[18] Preliminary Design Report of Xiaotan Project, Hunan Huaihua Hydro & Power Design Institute, April 2006.

The proof document from Hunan Taoyi Hydrology Monitoring Station, May 6 2009.

[19] Ex-factory Price Indices of Industrial Products , National Bureau of Statistics of China, 2006 http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm

Step 4. Common practice analysis

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

According to the "Tool for the demonstration and assessment of additionality" (Version 05.2), the word similar means that projects with similar features in the aspects of location, type, scale, and investment climate, etc. Therefore, projects similar to the proposed project activity are hydropower projects in the same region, with similar technology, of similar scale, and are built in comparable investment climate.

Projects of other types are with different technology, return rate of investment, construction period, etc., Hydropower projects located in different provinces of CCPG are of different location, which means different hydraulic condition and investment climate (e.g. with regards to tax, loan policy, electricity tariff, the commodity price[20] and labor wage[21]). Therefore projects located in other provinces of CCPG or of other type needn't to be considered.

According to Classification & Design Safety Standard of Hydropower Project (DL5158-2003), hydropower plants with capacity below 50 MW are classified as small size projects. Thus in the common practice anlysis in the PDD, the similar scale for other similar activities is defined between 0 ~ 50 MW which includes ±50% (10 ~ 30 MW) of the installed capacity of the project.

Hydropower plants operated before 2002 were all developed by the state-owned enterprises, and these plants were constructed with national or local governmental funds, or the governments provided the loan guarantee for developers of the plants, the developers didn't have any financing difficulties. Meanwhile, the government provided favourable policies for electricity tariff of the plants at that time, namely the electricity tariff of each power plant was determined according to the principle of full-cost recovery[22], so developers didn't have any investment risk. "The Notification on the Scheme of Electric Power System Reform" was issued by Chinese government in Feb. 2002, the main aim is to break the monopolization and optimize resource collocation, which means an open and competitive regional electricity market, however, without governmental funds, project of high investment cost and bad financial index are of low financial attractive. Therefore hydropower projects constructed after 2002 are analized in this step.

Hydropower projects without CDM application which operated after 2002 with the installed capacity below 50MW in Hunan Province are listed in the Table 7 below.

[20] http://www.askci.com/data/ShowData.asp?ID=81878

[21] http://www.stats.gov.cn/tjsj/ndsj/laodong/2006/html/06-03.htm

[22] Ministry of Water Resources and Electric Power, State Economic Committee and State Price Bureau, Notice on Implementation Method of Various Electricity Tariff (No. 101 Shuidiancaizi[1987]), 28 Nov. 1987

Table 7 Hydropower projects operated after 2002 in Hunan (0-50MW) [23]

No.	The project name	Installed capacity (MW)	Type of the project owner	Operation time (year)	Investment of per kWh (RMB yuan/kWh)	Electricity tariff (RMB yuan/kWh)	IRR[24]
1	Mulongtan	15	State owned enterprise	2003	1.75	0.348	Above 10%
2	Ruoshui	15	Private company	2006	1.85	0.327	Above 10%
3	Yongxing	20	State owned enterprise	2005	1.85	0.348	Above 10%
4	Chengjiangkou	25	Private company	2006	1.96	0.327	Above 10%
5	Leizhong	40.5	State owned enterprise	2004	1.8	0.348	Above 10%
6	Ouyanghai Expanded Project	30	State owned enterprise	2006	1.62	0.327	Above 10%
7	Yangmingshan II	25	State owned enterprise	2004	1.21	0.348	Above 10%

Sub-step 4b. Discuss any similar options that are occurring:

There is an essential distinction between the proposed project and the hydropower plants with the installed capacity of 0~50 MW operated since 2002 in Hunan Province (listed in Table 7). In general, investors will give priority to the development of the hydropower plants with good technical and economic indicators, the hydropower plants in Table 7 were developed due to the excellent natural conditions or circumstance such as high water head and low construction costs, so these plants had excellent technical and economic indicators.

The investment of unit power energy (per kWh) is equal to the total investment divides by the average annual electricity generation, it is an important index which indicates the financial state of the

[23] Investigation Report on Medium and Small Size Hydropower Plants Operated after 2002 in Hunan Province, Hunan Investigation, Design & Research Institute of Water Resources and Hydropower, Mar. 2008.

Hunan Investigation, Design & Research Institute of Water Resources and Hydropower is an A-Class qualified hydropower designation institute with history of 53 years, it is one of the most outstantanding design institute in China, it has been accomplished the design of 1400 projects in 15 Countries, and used to participated the compilation of over 100 technical standard and design standard.

[24] The exact IRRs are not shown as it is confidential information. The evidence Investigation Report was verified by DOE.

hydropower project[25], the higher the index, the better the project is. The investment of unit power energy of the proposed project is high up to 2.2 RMB yuan/kWh, which is 12%～82% higher than that of the 7 projects(1.21～1.96 RMB yuan/kWh). The electricity tariff of the proposed project is only 0.316 RMB yuan/kWh, which is much lower than that of the 7 projects (0.327 ~ 0.348 RMB yuan/kWh). Moreover, the IRR for all these projects are above 10%.Thus plants in Table 7 above were financially attractive and had no investment risks. But the proposed project has poorer financial indicators and is not financially attractive.

The detailed description of the distinctions of the identified similar projects is shown as follow:

As for Chengjiangkou Hydropower Project, there is a Dongjiang reservoir with adjusting ability in the upriver of the project, and Chengjiangkou project leads to small submergence due to Dongjiang reservoir, thus the investment for Chengjiangkou project is much less than Xiaotan project.

As for Ruoshui Hydropower Project, there is a Baiyun reservoir with adjusting ability in the upriver of the project, and Ruoshui project leads to small submergence due to Baiyun reservoir, thus the investment for Ruoshui project is much less than Xiaotan project.

As for Yongxing II Hydropower Project, there is a Dongjiang reservoir with adjusting ability in the upriver of the project, and Yongxing II project leads to small submergence due to Dongjiang reservoir thus the investment for Yongxing II project is much less than Xiaotan project. Moreover, Yongxing II project is owned by state-owned enterprise while Xiaotan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets to be used as mortgage in bank.

As for Leizhong Hydropower Project, there is a Dongjiang reservoir with adjusting ability in the upriver of the project. Leizhong project leads to small submergence due to Dongjiang reservoir thus the investment for Leizhong project is much less than Xiaotan project. Moreover, Leizhong project is owned by state-owned enterprise while Xiaotan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets to be used as mortgage in bank.

In conclusion, these projects are financially attractive and haven't any investment risk, it was easy for the project owners of these projects to obtain loans from banks, there weren't any financing difficulty. But the proposed project has poorer financial indicators and isn't financially attractive, it would be very difficult for the project owner of the proposed project to obtain a bank's loan without CDM support. Therefore, there is a severe financing difficulty for the proposed project, the project activity faces severe financing difficulty and is not a common practice in Hunan Province.

Thus, the project is not a common practice in Hunan Province.

The implementation timeline of the proposed CDM project activity is shown as follow:

[25] http://www.zbwater.gov.cn/Item/1382.aspx

Table 8 Overview of key events in the development of the project

Activity	Date
Feasibility Study Report[26]	Augest, 2004
Approval of Feasibility Study Report[27]	Dec. 16, 2004
Environmental Impact Assessment[28]	March, 2005
Approval of Environmental Impact Assessment[29]	May 11, 2005
The consultation document to Hunan CDM Project Service Center on the CDM feasibility of Xiaotan Hydropower Project[30]	Nov. 19, 2005
The reply from Hunan CDM Project Service Center on the CDM feasibility of Xiaotan Hydropower Project[31]	Nov. 26, 2005
The Letter of Intention on the Transfer of Xiaotan Project[32]	Dec. 26, 2005
The establishment of Chenxi County Qiongtian Hydropower Co., Ltd.[33]	Mar. 2006
Prelimilary Design Report [34]	April 2006
The board decision of starting CDM applicaltion. (Qiongshuidian[2006] No. 3) [35]	May 28, 2006
Establishment of CDM Project Department. (Qiongshuidian[2006] No. 4) [36]	May 29, 2006
Approval of Prelimilary Design Report[37]	June 21, 2006
The Project Transfer Agreement[38]	Aug. 7, 2006

[26] The Feasibility Study Report of Hunan Xiaotan Hydropower Project, Hunan Huaihua Hydro & Power Design Institute, Aug. 2004.

[27] The Approval of Feasibility Study Report, Dec. 16, 2004.

[28] The Environmental Impact Assessment of Xiaotan Hydropower Plant, Huaihua Research Institute of Environmental Protection, March, 2005.

[29] The Approval of Environmental Impact Assessment, May 11, 2005.

[30] The consultation document to Hunan CDM Project Service Center on the CDM feasibility of Xiaotan Hydropower Project, Huaihua Qiongtian Real Estate Development Co., Ltd., Nov. 19, 2005

[31] The reply on the CDM feasibility of Xiaotan Hydropower Project, Hunan CDM Project Service Center, Nov. 26, 2005.

[32] The Letter of Intention on the Transfer of Xiaotan Project between Chenxi County Xiaotan Hydropower Co., Ltd. and Huaihua Qiongtian Real Estate Development Co., Ltd, Dec. 26, 2005.

[33] The Duplicate Business License of Chenxi County Qiongtian Hydropower Co., Ltd., Mar. 2006.

[34] Preliminary Design Report of Xiaotan Project, Hunan Huaihua Hydro & Power Design Institute, April 2006.

[35] The Board Meeting Minute of Chenxi County Xiaotan Hydropower Co., Ltd., Chenxi County Qiongtian Hydropower Co., Ltd., May 28, 2006.

[36] The Notification on Establishment of CDM Department, Chenxi County Qiongtian Hydropower Co., Ltd., May 29, 2006.

[37] The Approval of Prelimilary Design Report, June 21, 2006.

[38] The Project Transfer Agreement between Chenxi County Xiaotan Hydropower Co., Ltd. and Chenxi County Qiongtian Hydropower Co., Ltd., Aug. 7, 2006.

The Road Construction Agreement[39]	Aug. 11, 2006
The Apprval of Xiaotan Hydropower Project Tranfer[40]	Aug. 25, 2006
Take part in the CDM training course in Hunan CDM Project Service Center[41]	Nov. 20, 2006
The Intention Agreement of CDM Project Development[42]	Nov. 20, 2006
The Contract of Farmland Elevation[43]	Jan. 1, 2007
Procurement Contract of Water-turbine Generator Units[44]	June 4, 2007
Got the Construction Permission from Hunan Huaihuai Construction Adminstration Bureau [45]	June 7, 2007
Service Agreement of CDM Project Development[46]	June 26, 2007
Procurement Contract of Microcomputer Excitation System of Water-turbine Generator Units[47]	July 9, 2007
Procurement Contract of Governor of Water-turbine Generator Units[48]	July 9, 2007
Contract of Grid Connection Construction[49]	Aug. 28, 2007
Contract of Construction [50]	Sep. 13, 2007
Start construction[51]	Sep. 15, 2007

[39] The Road Construction Agreement between Chenxi County Xiaotan Hydropower Co., Ltd. and Mr. Liao Changyi, Aug. 11, 2006.

[40] The Apprval of Xiaotan Hydropower Project Tranfer, Chenxi County Government, Aug. 25, 2006

[41] The conference guideline of the training course at Hunan CDM Project Service Center, Nov. 20, 2006.

[42] The Intention Agreement of Hunan Xiaotan Project between Hunan CDM Project Service Center and Chenxi County Qiongtian Hydropower Co., Ltd., Nov. 20, 2006

[43] The Contract of Farmland Elevation between Chenxi County Qiongtian Hydropower Co., Ltd. and Zhongfang County City Construction Co., Ltd., Jan. 1, 2007.

[44] The Procurement Contract of Water-turbine Generator Units between Chenxi County Qiongtian Hydropower Co., Ltd. and Tianjing Tianfa Heavy Hydropower Equipment Manufacture Co. Ltd., June 4, 2007.

[45] Document of Construction Permission, Hunan Huaihuai Construction Adminstration Bureau, June 7, 2007.

[46] Service Agreement of CDM Project Development between Chenxi County Qiongtian Hydropower Co., Ltd. and Hunan Xiangke Clean Development Co., Ltd., June 26, 2007.

[47] The Procurement Contract of Microcomputer Excitation System of Water-turbine Generator Units between Chenxi County Qiongtian Hydropower Co., Ltd. and Wuhan Hongshan Electric Technology Co. Ltd., July 9, 2007.

[48] Procurement Contract of Governor of Water-turbine Generator Units between Chenxi County Qiongtian Hydropower Co., Ltd. and Wuhan Sichuang Auto-control Technology Co., Ltd., July 9, 2007.

[49] The Contract of Grid Connection Construction between Chenxi County Qiongtian Hydropower Co., Ltd. and Chenxi Power Construction Co., Ltd., Aug. 28, 2007.

[50] The Contract of Construction between Chenxi County Qiongtian Hydropower Co., Ltd. and Hunan Water Resource and Hydropower Project Company, Sep. 13, 2007.

[51] The Construction License of Hunan Xiaotan Hydropower Project, Hunan Supervision and Consultation of Water Resource and Hydropower Project Company, Sep. 15, 2007.

The Supervision Contract[52]	Nov. 8, 2007
The Agreement for Temporary Land Utilization of Baomudong Village[53]	Oct. 26, 2007
The Supplemental Agreement for Temporary Land Utilization of Baomudong Village [54]	Nov. 2007
The Drinking Water Project [55]	Nov. 28, 2007
The Compensation Agreement of Land Expropriation of Xiaotan Village and Baomudong Village[56]	Dec. 12, 2007
Receive the approval of Chinese NDRC [57]	March 20, 2008
Contract of Electromechanical Installation Works[58]	April 14, 2008
Procurement Contract of Cement[59]	June 5, 2008
Emission Reductions Purchase Agreement [60]	June 30, 2008
The Agreement of Installnation of Metal Structure and Hoisting Equipment[61]	Sep. 5, 2008
GSP [62]	Sep. 25, 2008
DOE on-site interview [63]	Oct. 9, 2008
The Supervision Contract of Immigration Settlement [64]	Nov. 15, 2008

[52] The Supervision Contract of Xiaotan Hydropower Project between Chenxi County Qiongtian Hydropower Co., Ltd. and Hunan Supervision and Consultation of Water Resource and Hydropower Project Company, Nov. 8, 2007.

[53] The Agreement for Temporary Land Utilization between Chenxi County Qiongtian Hydropower Co., Ltd. and Baomudong Village of Chenxi County, Oct. 26, 2007.

[54] The Supplemental Agreement for Temporary Land Utilization between Chenxi County Qiongtian Hydropower Co., Ltd. and Baomudong Village of Chenxi County, Nov. 2007.

[55] The Drinking Water Project of Baomudong Village between Chenxi County Qiongtian Hydropower Co., Ltd. and Chenxi No. 2 Construction Co., Ltd., Nov. 28, 2007.

[56] The Compensation Agreement of Land Expropriation between Chenxi County Qiongtian Hydropower Co., Ltd. and Baomudong Village of Chenxi County, Dec. 12, 2007.

The Compensation Agreement of Land Expropriation between Chenxi County Qiongtian Hydropower Co., Ltd. and Xiaotan Village of Chenxi County, Dec. 12, 2007.

[57] The Approval of Chinese NDRC, March 20, 2008.

[58] The Contract of Electromechanical Installation Works between Chenxi County Qiongtian Hydropower Co., Ltd. and Huaihua Water Resource and Hydropower Project Construction Co., Ltd., April 14, 2008.

[59] The Procurement Contract of Cement between Chenxi County Qiongtian Hydropower Co., Ltd. and Hunan Chenxi Central China Cement Co., Ltd., June 5, 2008.

[60] Emission Reductions Purchase Agreement, June 30, 2008.

[61] The Agreement of Installnation of Metal Structure and Hoisting Equipment between Chenxi County Qiongtian Hydropower Co., Ltd. and Tiaojiang Xiangzhong Hydronic Equipment Co., Ltd., Sep. 5, 2008.

[62] http://cdm.unfccc.int/Projects/Validation/DB/LB1NN6T1UAFJI2VLUZN5JGDZ0TRIML/view.html

[63] The Email on the date of on-site validation, Oct. 9, 2008.

The Supply Agreement of the Protection Construction of Downstream Right Bank of Xiaotan Hydropower Project[65]	Dec. 15, 2008
The expected operation date	Oct. 1, 2009

According to the FSR, the project is not financial attractive. Considering the financing difficulty, the former project owner Chenxi Xiaotan Hydropower Co., Ltd. decided to transfer the develop rights of Xiaotan Hydropower Plant.

On Oct. 2005, "Procedures of CDM Projects Operation and Management" was issued by Chinese NDRC, Huaihua Qiongtian Real Estate Development Co., Ltd. consulted Hunan CDM Project Service Center and knew that Xiaotan Hydropower Project is a typical CDM project, the project would over benchmark IRR of 10% with the CERs revenues, they are greatly encouraged by the news. For the incentive of CERs revenue, the Letter of Intention on the Transfer of Xiaotan Project was signed on Dec. 26, 2005.

As hydropower development is not included in the business scope of Huaihua Qiongtian Real Estate Development Co., Ltd., Chenxi County Qiongtian Hydropower Co., Ltd. was established to responsible for the development and management of Xiaotan Hydropowr Plant in Mar. 2006.

The Prelimilary Design Report of the project was completed in April 2006, according to the PDR, the CERs revenue would improve the financial condition of the project. Chenxi County Qiongtian Hydropower Co., Ltd. held the board meeting and decided to apply for CDM support, and established the CDM department to responsible for the application. Then the Project Transfer Agreement was signed on Aug. 7, 2006.

Hunan CDM Project Service Center held a training course in Nov. 2006, the lead of Chenxi County Qiongtian Hydropower Co., Ltd. took part in the course and the Intention Agreement of CDM Development was signed at the same day. The Service agreement of CDM Project Development was signed in June 2007. Owing to the incentives of CDM, the project construction started in Sep. 2007. The approval of Chinese NDRC was received in March 2008, and the ERPA was signed in June, 2008. The PDD was published in the EB website in Sep., 2008, and DOE on-site interview was taken in Oct., 2008.

The Contract of Farmland Elevation was signed on Jan. 1, 2007, and the water-turbine generator units were purchased on June 4, 2007, then the Microcomputer Excitation System of Water-turbine Generator Unit and the Governor of Water-turbine Generator Unit was purchased on July 9, 2007. The Contract of Grid Connection Construction was signed on Aug. 28, 2007, and the Contract of Project Construction was signed on Sep.13, 2007. Then the project started construction on Sep. 15, 2007. The Supervision Contract was signed on Nov. 8, 2007, The Compensation Agreement of Land Expropriation was signed on Dec. 12, 2007. The Contract of Electromechanical Installation Works was signed on April 14, 2008, the Procurement Contract of Cement was signed on June 5, 2008. The Supervision Contract of Immigration Settlement was signed on Nov. 15, 2008. Thus, under the incentive of CERs revenue, the construction of the project was implemented smoothly.

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[64] The Supervision Contract of Immigration Settlement between Chenxi County Qiongtian Hydropower Co., Ltd.and Hunan Xiangyi Immigration Supervision Co., Ltd., Nov. 15, 2008.

[65] The Supply Agreement of the Protection Construction of Downstream Right Bank of Xiaotan Hydropower Project between Chenxi County Qiongtian Hydropower Co., Ltd. and Xiaotan Department of Hunan Water Resource and Hydropower Company, Dec. 15, 2008.

Therefore the incentives from the CDM has been seriously considered in the decision to proceed with the project activity, and the continuing and real actions were taken to secure the CDM status for the proposed project in parallel with its implementation

In conclusion, the project is additional.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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Project Emissions

The power density of the project is more than 10W/m^2, according to the baseline methodology ACM0002 (Version 07), PE_y =0.

Baseline Emissions

According to baseline methodology ACM0002 (Version 07), the baseline emissions are the CO_2 emissions from the equivalent electricity supply by CCPG that is displaced by the project activity. So the baseline emissions by the project activity during a given year *y* is obtained as follow:

$$BE_y=EG_y \cdot EF_{grid,CM,y} \qquad (1)$$

Where:

BE_y is baseline emissions in year y (tCO_2/yr).

EG_y is electricity supplied by the project activity to the grid in year *y* (MWh).

$EF_{grid,CM,y,}$ is combined margin CO_2 emission factor for grid connected power generation in year y calculated using "Tool to calculate the emission factor for an electricity system (Version 01.1)" according to the following six steps:

STEP 1. Identify the relevant electric power system.
STEP 2. Select an operating margin (OM) method.
STEP 3. Calculate the operating margin emission factor according to the selected method.
STEP 4. Identify the cohort of power units to be included in the build margin (BM).
STEP 5. Calculate the build margin emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1. Identify the relevant electric power system

The project is connected to CCPG, according to "Bullet of Baseline Emission Factor of China Grid" issued by Office of National Coordination Committee on Climate Change on Dec. 30 2008[66], the geographic extent of the grid boundary includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing City.

Step 2. Select an operating margin (OM) method

[66] The emission factor in the PDD of GSP (0.99695 tCO_2e /MWh) is from the bulletin of Chinese NDRC published on July 18 2008, however, as there is something wrong with the data source of emission factor, the value was revised to 0.9735 tCO_2e /MWh by Chinese NDRC on Dec. 30 2008. Thus the updated value of emission factor (0.9735 tCO_2e /MWh) is used in this PDD.

According to "Tool to calculate the emission factor for an electricity system (Version 01.1)", there are four methods for calculating the $EF_{grid,OMsimple,y}$:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM

Method (a) can be used if low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages data for hydroelectricity production. It can be found from Table 8 that the low-cost/must run resources constitute less than 50% of CCPG during year 2002 to 2006. Thus, method (a) is applicable to calculate $EF_{grid,OMsimple,y}$.

Table 8 Constitution of low-cost/must run resources in CCPG during year 2002～2006[67]

Year	2002	2003	2004	2005	2006
Percentage (%)	35.95	34.43	38.37	38.56	36.97

For the project, $EF_{grid,OMsimple,y}$ is calculated using 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 DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

Step 3. Calculate the operating margin emission factor according to the selected method.
According to "Tool to calculate the emission factor for an electricity system (Version 01.1)", there are three options based on different data for calculating $EF_{grid,OMsimple,y}$, namely Option A, Option B and Option C. Due to the availability of the data, Option C is used for calculating $EF_{grid,OMsimple,y}$, the formula is as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \qquad (2)$$

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)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i = All fossil fuel types combusted in power sources in the project electricity system in year y
y = 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),

[67] China Electric Power Yearbook 2003～2007

following the guidance on data vintage in step 2

For the project, the result of $EF_{grid,OMsimple,y}$ issued by Chinese NDRC is used[68], to see A1～A7 in Annex 3 for details.

Step 4. Identify the cohort of power units to be included in the build margin (BM)

According to "Tool to calculate the emission factor for an electricity system (Version 01.1)", the sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The set of power units that comprises the larger annual generation should be used. According to "Bullet of Baseline Emission Factor of China Grid" issued by Office of National Coordination Committee on Climate Change on Dec. 30 2008, because of the unavailability of the data at the power plant level in China, a deviation method is used to calculate the build margin emission factor, to see Step 5 for details.

According to "Tool to calculate the emission factor for an electricity system (Version 01.1)", there are two options (Option 1 and Option 2) to calculate the build margin emission factor in terms of vintage of data. For the proposed project, Option 1 is chosen to calculate the build margin emission factor, namely For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 5. Calculate the build margin emission factor.

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

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)

[68] Office of National Coordination Committee on Climate Change, Bullet of Baseline Emission Factor of China Grid, Dec. 30, 2008.

m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

Because of the unavailability of the data at the power plant level in China, the 22nd CDM EB meeting agreed the following deviation approaches for $EF_{grid,BM,y}$ calculation:

1) Use the efficiency level of the best technologies commercially available in the provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{grid,BM,y}$.

2) Use capacity additions during last several years for estimating the $EF_{grid,BM,y,}$ i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

3) Use installed capacity to replace annual power generation to estimate weights.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total thermal installed capacity, the $EF_{grid,BM,y}$ will be calculated as:

1) Based on the most recent years energy balance of the CCPG, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total CO_2 emissions of thermal power plants;

2) Based on the best technologies commercially available which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the emission factor of thermal power plants in CCPG. This approach is more conservative as it assumes all recently built plants have the fuel efficiency as that of the most advanced commercialized technologies;

3) Calculating the $EF_{grid,BM,y}$ through emission factor of thermal power plants times the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

The above calculation approach has been used by several recently registered China projects. The BM emission factor in this PDD is calculated as following sub-steps.

Sub-Step 5a: Calculating the percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in CO_2 emissions from total thermal power plants

$$\lambda_{coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (4)$$

Where:

λ_{Gas}, λ_{Oil} and λ_{Coal} are respectively the percentages of CO_2 emissions from the gas-fired, oil-fired, coal-fired power plants in CO_2 emissions from total thermal power plants;
$F_{i,j,y}$ is the amount of fuel *i* (tce) consumed by the power sources province *j* in year *y*;

$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel *i*, taking into account the carbon content of the fuels used by the grid and the percent oxidation of the fuel in year *y*.

Sub-Step 5b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{Coal} \times EF_{coal,adv} + \lambda_{Oil} \times EF_{oil,adv} + \lambda_{Gas} \times EF_{gas,adv} \quad (5)$$

Where:

$EF_{Thermal}$ is the emission factor of thermal power plants;
$EF_{Coal, Adv}$, $EF_{Oil, Adv}$ and $EF_{Gas, Adv}$ are corresponding to the emission factors of coal, oil and gas, which are applied by the most advanced commercialized technologies.

Sub-Step 5c: Calculating the Build Margin (BM) emission factor ($EF_{grid,BM,y}$)

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (6)$$

Where:

$EF_{grid,BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year *y*;
CAP_{Total} is the installed capacity of all recently built power plants;
$CAP_{Thermal}$ is the newly installed capacity of recently built thermal power plants;
$EF_{Thermal}$ is the emission factor of thermal power plants.

The detailed calculations are shown in Table A8-Table A11 of Annex 3.

Step 6. Calculate the combined margin (CM) emissions factor.
The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (7)$$

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

The following default values are used for WOM and WBM:
w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period , and wOM = 0.25 and wBM = 0.75 for the second and third crediting period.

Leakage

According to baseline methodology ACM0002 (Version 07), there is no need for the project to consider leakage (L_y).

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emissions, project emissions and emissions due to leakage. The final GHG emission reduction is calculated as follows:

$$ER_y\ (tCO_2e/yr) = BE_y - PE_y - L_y \quad (8)$$

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

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Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operation Marginal Emission Factor of CCPG
Source of data used:	Calculation
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Make the exante estimation according to the 3 years' average data.
Any comment:	Data used are from Chinese authorities.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Marginal Emission Factor of CCPG
Source of data used:	Calculation
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Ex-ante estimation according to the 3 years' average data.
Any comment:	Data used are from Chinese authorities.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Build Marginal Emission Factor of CCPG
Source of data used:	Calculation
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Ex-ante estimation according to the 3 years' average data.
Any comment:	Data used are from Chinese authorities.

Data / Parameter:	$NCV_{i,y}$
Data unit:	kJ/kg or kJ/m^3
Description:	The net calorific value (energy content) per mass or volume unit of fuel i in year y
Source of data used:	*China Energy Statistical Yearbook 2007*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Electricity generation*
Data unit:	MWh
Description:	The electricity generated by fuel-fired power plants in CCPG
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Internal power consumption rate of power plants*
Data unit:	%
Description:	The internal power consumption rate of power plants in province *j* in CCPG in year *y*.
Source of data used:	*China Electric Power Yearbook 2005-20076*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i in year y
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.

Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific Chinese value available, to adopt the IPCC default value.
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel *i* (in a mass or volume unit) consumed by CCPG in year *y*
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Installed capacities of province *j* in CCPG in years *y*.
Source of data used:	*China Electric Power Yearbook 2002-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$GENE_{best,coal,}$
Data unit:	/
Description:	The power supply efficiency of coal-fired power plants with best technology commercially available
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	37.28%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of oil/gas-fired power plants with best technologies commercially available
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. The proposed project is a new hydro power plant, 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 reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For the project, the reservoir is new, 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 and maps.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

Project Emissions

According to the formula (1) in section B6.1 from the baseline methodology ACM0002, the project emission in year y is:

$$PE_y = 0$$

Baseline Emissions

According to the formula (2)-(7) in section B.6.1, the results of $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ and $EF_{grid,CM,y}$ are listed in following Table 9 , the detailed calculation processes are shown in Annex 3.

Table 9 Calculating result of baseline emission factor of CCPG

$EF_{grid,OM,y}$ (tCO$_2$e/MWh)	$EF_{grid,BM,y}$ (tCO$_2$e/MWh)	$EF_{grid,CM,y}$ (tCO$_2$e/MWh)
1.27834	0.6687	0.9735

According to the formula (1) in section B.6.1, the annual baseline emission (BE_y) of the project is calculated as follow:

$$BE_y = EG_y \times EF_{grid,CM,y} = 78{,}880\text{MWh} \times 0.9735\ \text{tCO}_2\text{e/MWh} = 76{,}790\ \text{tCO}_2\text{e/yr}$$

Leakage

According to the baseline methodology ACM0002, $LE_y = 0$

Emission Reductions

According to the formula (10) in section B.6.1, the annual emission reductions (ER_y) of the project is calculated as follow:

$$ER_y\ (\text{tCO}_2\text{e/yr}) = 76{,}790 - 0 - 0 = 76{,}790\ \text{CO}_2\text{e/yr}$$

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

>>

The estimated project emission reductions in the first crediting period are listed in Table 10:

Table 10 The ex-ante estimation of emission reductions

Year	Estimation of project activity emissions (tonnes of CO$_2$e)	Estimation of baseline emissions (tones of CO$_2$e)	Estimation of leakage (tonnes of CO$_2$e)	Estimation of overall emission reductions (tonnes of CO$_2$e)
01/10/2009 – 30/09/2010	0	76,790	0	76,790
01/10/2010 – 30/09/2011	0	76,790	0	76,790
01/10/2011 – 30/09/2012	0	76,790	0	76,790
01/10/2012 – 30/09/2013	0	76,790	0	76,790
01/10/2013 – 30/09/2014	0	76,790	0	76,790
01/10/2014 – 30/09/2015	0	76,790	0	76,790

01/10/2015 – 30/09/2016	0	76,790	0	76,790
Total (tonnes of CO_2e)	0	537,530	0	537,530

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

>>

B.7.1 Data and parameters monitored:

>>

Data Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied to CCPG in year y.
Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	78,880
Description of measurement methods and procedures to be applied:	Continuous measurement by the meter with accuracy of 0.5S and monthly recording.
QA/QC procedures to be applied:	The main meter will be calibrated once a year and net electricity supplied by the project activity to CCPG would be double checked by receipt of sales.
Any comment:	/

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20,000,000
Description of measurement methods and procedures to be applied:	Yearly monitored based on recognized standards
QA/QC procedures to 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:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	650,000
Description of measurement methods and procedures to be applied:	Yearly measured from topographical surveys and maps.
QA/QC procedures to be applied:	/
Any comment:	/

B.7.2 Description of the monitoring plan:

>>

1. Monitoring subject

The main data monitored are the net electricity delivered to CCPG by the project, the installed capacity of the project and the area of the reservoir measured in the surface of the water, when the reservoir is full.

2. Monitoring management structure

In order to obtain reliable monitoring data, the project owner will establish a monitoring management structure prior to the start of the crediting period. Clear responsibilities will be assigned to all staffs involved in the CDM project. A General Manager will be appointed who has the overall responsibilities for the monitoring of the project, other staffs will be responsible for the data recording, data collecting, data archiving and emission reductions calculation. The detailed structure is as follows:

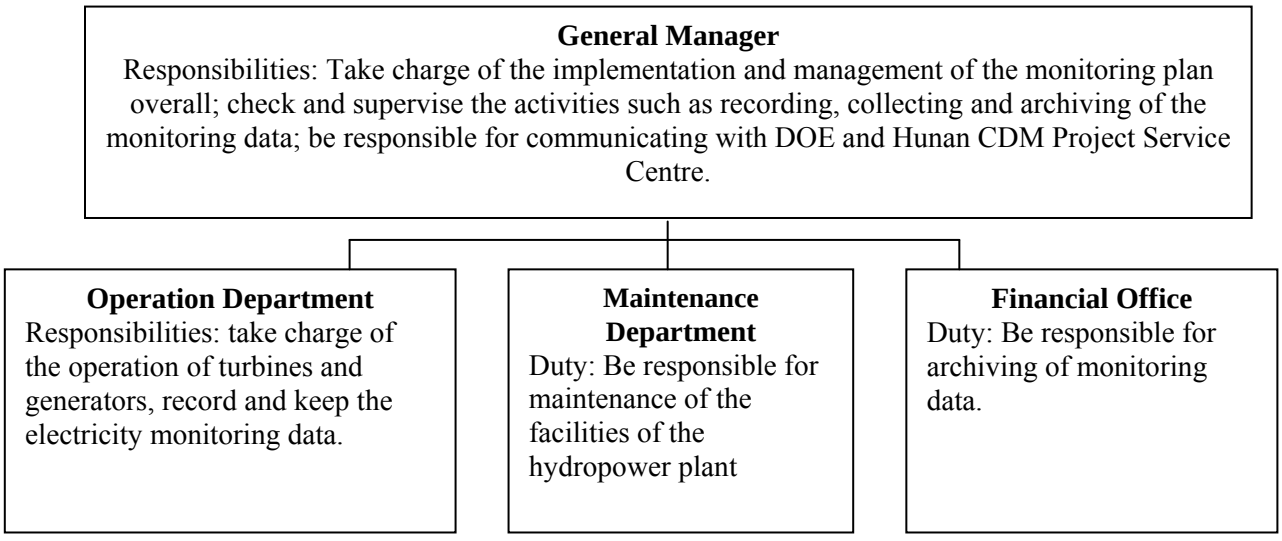

Fig. 3 Operational and management structure

3. Monitoring apparatus and installation:

The meters will be installed in accordance with "Technology & Management Regulations for Power Metering Devices" (DL/T448-2000) with the accuracy of 0.5S. The main meter and back-up meter will be installed at the connection point to the grid, the project owner owns the meters.

4. Data monitoring

The readings of the main meter are used for calculating the emission reductions when the main meter is in normal operation state. The monitoring processes are as follows:
(1) The designated persons from the grid company and the project company record the readings of the meter for the electricity delivered to CCPG and consumed by the project activity from CCPG;
(2) The project owner provides the power grid company with a settling accounts sheet about the net electricity supplied to CCPG monthly;
(3) The project owner provides the power grid company with a sale receipt after the power grid company has confirmed the settling accounts sheet, and preserves the copy of the sale receipt.

5. Quality control

1) Calibration of meters
The calibration of meters conducted in accordance with "Technology & Management Regulations for Power Metering Devices" (DL/T448-2000) to ensure the accuracy. The main meter and back-up meter at the connection point to the grid will be calibrated once per year.
When the main meter or back-up meter have a breakdown, the party finding the breakdown should tell another party and inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring state.

2) Emergency treatment
When the main meter or back-up meter have a breakdown, the electricity generation difference will be treated as follows:
a. When Main Meter has a breakdown, the readings of Backup Meter will be adopted;
b. If both of the Main Meter and Backup Meter have breakdowns, the project owner should notice the power grid company immediately and solve the problem with a conservative calculation method.

After handling of the emergency, the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.

6. Data management
All monitoring data and records will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

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)

>>

Final Date of completion of the application of the baseline study and monitoring methodology:
31/07/2009

Name of the responsible person/entity:

Ying Ma
Unit: Hunan CDM Project Service Center
Address: No. 59 Bayi Road, Changsha, Hunan, 410001, China
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Above individuals / entities are not project participants.

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:

>>

07/08/2006 (The date when the Project Transfer Agreement was signed, which is the earliest starting date of the activity.)

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

>>

30 years

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:

>>

01/10/2009 or the registration date whichever is later.

C.2.1.2. Length of the first crediting period:

>>

7 years

C.2.2. Fixed crediting period:

>>

Not applicable

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>

At the stage of the feasibility study of the project, the project developer entrusted a third party - Huaihua Research Institute of Environmental Protection to make the environmental impact assessment (EIA) report. The EIA report has been approved by the Hunan Huaihua Environmental Protection Bureau in the approval of "Huaihuanhan [2005]34" on May 11, 2005, the approval is as follows: "Based on the evaluation results in the EIA report and the preliminary examination suggestion from Chenxi Environmental Protection Bureau, the project construction is approved".

According to EIA report, no transboundary environment impacts is involved with the project activity, the forecasting and assessment of the main impacts on the environment and relevant protection measures to be taken are as follows:

- ♦ When the dam is completed, and begins to reserve the water, the waterfall will hit and move the sands and soils on river bed, meanwhile the nutrient and the organic deposited in the sands will come back into the water. Thus there will be a length of polluted river, which will lower the quality of water resources.
- ✓ The environmental protection guidance manual during the project construction should be made and environmental supervision and management should be performed to guarantee civilized construction. Measures to control pollution and conserve soil and water should be fully implemented to alleviate the impact on the environment.

- ♦ The waste water will be produced by equipments, machines and trucks during the construction period , the production and life wastewater will be produced during the construction and operation period of this project. The sand accumulated in the reservoir region may be carried to the down-stream river because of hydraulic scouring and sedimentation.
- ✓ The equipments, machines and trucks should be collected for cleaning and the wastewater should be treated by precipitation-microfiltration process. The kitchen sewage should be treated by oil separation-precipitation process before discharged into Chenshui River. The fecal wastewater should be treated by digestion in the septic tank and then utilized as agricultural fertilizer. The wastewater caused by sand-pebble cleaning should be treated by precipitation-flocculation process. Hydraulic sand sluice should been performed in the flood period to be combined with flood discharge as much as possible.

- ♦ The dust, waste residue will be produced during the project construction.
- ✓ Clean water should be sprayed periodically to control flying dust. The waste residue should be transported to two waste residues site with slag wall. Production and life solid waste should be transported to Chenxi landfill site for landfill disposal periodically.

- ♦ The waste oil will be produced during the operation of the project.
- ✓ The waste oil should be eliminated by oil absorbing paper or saw dust. The used paper or saw dust should be treated by incineration process and accident risk should be prevented.

- ♦ Resettlement: the number of resettlers of the project is 42 persons.

- ✓ According to the related laws and regulations of Chinese government, a detailed resettlement plan was made in the Resettlement Planning Report of Xiaotan Hydropower Project. The purpose of the plan is to guarantee the resettlers' living standard equal to or better than the previous situation and to achieve the sustainable development. The resettlement will be implemented strictly based on the national policies and the resettlement plan.

D.2. If environmental impacts are considered significant by the project 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:

>>

The host Party and the project owner both regard that the proposed project will not bring significant impacts on the environment.

SECTION E. Stakeholders' comments

>>

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

>>

Chenxi County Government took public notification in the influenced district in June 25, 2006, the detailed information of the project was shown clearly in the notification, such as project site, intalled capacity, etc. The purpose of the notification is to let the stakeholders know of Xiaotan Hydropower Project and to give their comments, the comments from the stakeholders were collected by local government.

After the publication of the notification, the project owner carried out a survey on stakeholders in the way of questionnaire on Xiaotan Hydropower Plant on June 28, 2006. The stakeholders are local residents as well as governmental officials and resettlers, including different sexes, occupation, ages and education background. There were 40 copies of questionnaire distributed, and all pieces were received.
The questions listed in questionnaire are summarized as follows:

Questions:

1. Do you support this project?
2. Is the project beneficial to the local economic development?
3. Do you think the noise and dust due to the construction of the project will affect local environment?
4. Do you think the project will have impacts upon animals and plants in the local area?
5. Will the project have impacts upon water usage for local people?
6. Will the project have impacts on natural scenery?
7. Will the project have impacts upon the health of local people?
8. Do you think resettlers have difficulty to resettle?
9. Do you think the living quality of resettlers will be improved?

The result of the survey is outlined in the section E.2.

E.2. Summary of the comments received:

>>

1. 100% people support the implementation of the project.
2. 100% people believe the project can benefit the local economy.
3. 90 % people think the noise and dust due to the construction of the project has no impact upon local environment at all; 10% people think the project will cause a little impact; no people think there will be great impact.
4. 92.5% people think the project have no impact upon the animals and plants at all; 7.5% people think will have a little impact upon the animals and plants of the project site; no people thinks the project will bring great impact on the animals and plants.
5. 95% people believe that the project won't affect water usage for local people; 5% people think the project will have a little impact on the water usage for local people; no people think the project will have great impact on the water usage for local people.
6. 100% people think the project has beneficial impacts upon the natural scenery.
7. 100% people think the project has no impact upon the health of local people.

8. 95% people think that resettlers will have no difficulty to resettle; 5% people think that resettlers will have a little difficulty to resettle, and they can overcome the difficulty; no people think resettlers will have great difficulty to resettle.
9. 97.5% people think that resettlers' living quality can be improved a lot; 2.5% people think that the living quality won't change; no people think that resettlers' living quality may decrease.

There are some issues that stakeholders concern most:
a. 10% of the participants worry about the noise and dust produced during the construction period will affect the daily life. 7.5% people care about the little impact upon the animals and plants of the project site. 5% people think the project will have a little impact on the water usage for local people.
b. Stakeholders hoped that there would be reasonable compensation for resettlers.

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

>>
After the project owner compiling the investigation result, they made quick response to the questions mentioned above. Following are the corresponding replies to the problems shown in the previous section:
1. The environmental protection measures presented in the EIA report will be taken strictly to minimize the adverse impacts from the project and bring the positive impacts on the environment into full play;
2. The government will be responsible for the management of the compensation for the resettlers in a unified way according to the latest national policy[69]. The government will extract a proportion of the income of hydropower generation and distribute the money to the resettlers according to the national standard.

[69]Approval of EIA (Huaihuanhan [2005]34), Huaihua Environmental Protection Bureau, May 11, 2005.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Owner

Organization:	Chenxi County Qiongtian Hydropower Co., Ltd.
Street/P.O.Box:	Xiaotan village, Shibi town, Chenxi county
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State/Region:	Hunan province
Postfix/ZIP:	419524
Country:	Peoples' Republic of China
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URL:	/
Represented by:	Xiaoping He
Title:	Present
Salutation:	Mr
Last Name:	He
Middle Name:	/
First Name:	Xiaoping
Department:	Chenxi Qiongtian Hydropower Co., Ltd
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Represented by:	Jan Willem Bode
Title:	Legal Representative
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from parties included in Annex I is available to the project activity.

Annex 3

BASELINE INFORMATION[70]

The installed capacity, fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>.

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A1 below.

Table A1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908 kJ/kg	25.8	100%
Cleaned Coal	26344 kJ/kg	25.8	100%
Other Washed Coal	8363 kJ/kg	25.8	100%
Coke	28435 kJ/kg	29.2	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Natural Gas	38931 kJ/m^3	15.3	100%
Coke Oven Gas	16726 kJ/m^3	12.1	100%
Other Gas	5227 kJ/m^3	12.1	100%
LPG	50179 kJ/kg	17.2	100%
Refinery Dry Gas	46055 kJ/kg	15.7	100%

Data Source:

The net calorific values are quoted from <China Energy Statistical Yearbook 2007>, Page 287.

The emission factors and oxidation factors are quoted from <Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories >, Table 1.4, Page 1.24, Chapter 1, Volume 2.

[70] Office of National Coordination Committee on Climate Change, Bulletin of Baseline Emission Factor of China Grid, Dec. 30 2008.

Step 1: Calculating the Operating Margin emission factor ($EF_{grid,OM,y}$)

Table A2 Simple OM Emission Factors Calculation of CCPG for Year 2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J* 44/12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*4 4/12 /1000 (for volume unit)
Raw Coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339,092,605
Cleaned Coal	10^4 t		2.34					2.34	25.8	100	26344	58,316
Other Washed Coal	10^4 t	48.93	104.22			89.72		242.87	25.8	100	8363	1,921,441
Coke	10^4 t		109.61					109.61	29.2	100	28435	3,337,011
Coke Oven Gas	10^8 m^3			1.68		0.34		2.02	12.1	100	16726	149,900
Other Gas	10^8 m^3					2.61		2.61	12.1	100	5227	60,527
Crude Oil	10^4 t		0.86	0.22				1.08	20	100	41816	33,118
Gasoline	10^4 t		0.06			0.01		0.07	18.9	100	43070	2,089
Diesel Oil	10^4 t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42652	266,627
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464,893
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	15.7	100	46055	153,506
Natural Gas	10^8 m^3						2.27	2.27	15.3	100	38931	495,775
Other Petroleum Products	10^4 t							0	20	100	38369	0
Other Coking Products	10^4 t							0	25.8	100	28433	0
Other Energy	10^4tce		16.92		15.2	20.95		53.7	0	100	0	0
											Total	**346035809.73**

Data Source: <China Energy Statistical Yearbook 2005>

Table A5 Fuel-fired Electricity Generation of CCPG for Year 2004

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	301.27	30127000	7.04	28006059
Henan	1093.52	109352000	8.19	100396071
Hubei	430.34	43034000	6.58	40202363
Hunan	371.86	37186000	7.47	34408206
Chongqing	165.2	16520000	11.06	14692888
Sichuan	346.27	34627000	9.41	31368599
Total				249074186

Data Source: <China Electric Power Yearbook 2005>

According to Table A2, the total CO_2 emissions of CCPG is 346,035,810 tCO_2e in year 2004. According to Table A3, the total supplied electricity of CCPG is 249,074,186 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2004}$ is 1.38929 tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of CCPG for Year 2005

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44 /12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352,614,497
Cleaned Coal	10^4 t	0.02	0					0.02	25.8	100	26344	498
Other Washed Coal	10^4 t		138.12			89.99		228.11	25.8	100	8363	1,804,669
Coke	10^4 t		25.95		105			130.95	29.2	100	28435	3,986,695
Coke Oven Gas	10^8 m^3			1.15		0.36		1.51	12.1	100	16726	112,054
Other Gas	10^8 m^3		10.2			3.12		13.32	12.1	100	5227	308,897
Crude Oil	10^4 t		0.82	0.36				1.18	20	100	41816	36184.78
Gasoline			0.02			0.02		0.04	18.9	100	43070	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	20.2	100	42652	299,798
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286,959
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	15.7	100	46055	176,572
Natural Gas	10^8 m^3						3	3	15.3	100	38931	655,209
Other Petroleum Products	10^4 t							0	20	100	38369	0
Other Coking Products	10^4 t				1.5			1.5	25.8	100	28435	40,349
Other Energy	10^4tce		2.88		1.74	32.8		37.42	0	100	0	0
											Total	**360,323,575**

Data Source: <China Energy Statistical Yearbook 2006>

Table A5 Fuel-fired Electricity Generation of CCPG for Year 2005

Province	Electricity Generation (10^8 kWh)	Electricity Generation (MWh)	Auxiliary Power Ratio (%)	Supplied Electricity (MWh)
Jiangxi	300	30000000	6.48	28056000
Henan	1315.9	131590000	7.32	121957612
Hubei	477	47700000	2.51	46502730
Hunan	399	39900000	5.00	37905000
Chongqing	175.84	17584000	8.05	16168488
Sichuan	372.02	37202000	4.27	35613474.6
Total				286203304.6

Data Source: <China Electric Power Yearbook 2006>

According to Table A4, the total CO_2 emissions of CCPG is 360,323,575tCO_2e in year 2005. According to Table A5, the total supplied electricity of CCPG is 286,203,305 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2005}$ is 1.25898 tCO_2e/MWh.

Table A6 Simple OM Emission Factors Calculation of CCPG for Year 2006

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44 /12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*44 /12 /1000 (for volume unit)
Raw Coal	10^4 t	1926.02	8098.01	3179.79	2454.48	1184.3	3285.22	20127.82	25.8	100	20908	398,107,508
Cleaned Coal	10^4 t					5.79		5.79	25.8	100	26344	144,295
Other Washed Coal	10^4 t	4.51	104.12		8.59	79.21		196.43	25.8	100	8363	1,554,036
Briquette	10^4 t						0.01	0.01	26.6	100	20908	204
Coke	10^4 t		17.23		0.32			17.55	29.2	100	28435	534,299
Coke Oven Gas	10^8 m^3		0.52	1.07	4.24	0.38	0.01	6.22	12.1	100	16726	461,572
Other Gas	10^8 m^3	12.69	3.95		1.7	4.36	0.01	22.71	12.1	100	5227	526,655
Crude Oil	10^4 t		0.49					0.49	20	100	41816	15,026
Gasoline	10^4 t		0.01					0.01	18.9		43070	298
Diesel Oil	10^4 t	0.91	2.23	1.41	1.78	0.96		7.29	20.2	100	42652	230,298
Fuel Oil	10^4 t	0.51	1.26	1.31	0.8	0.57	3.49	7.94	21.1	100	41816	256,872
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	0.86	8.1	1	0.97			10.93	15.7	100	46055	289,780
Natural Gas	10^8 m^3			0.28		0.16	18.63	19.07	15.3	100	38931	4,164,943
Other Petroleum Products	10^4 t							0	20	100	38369	0
Other Coking Products	10^4 t						0.01	0.01	25.8	100	28435	269
Other Energy	10^4tce	17.45	37.36	31.55	18.29	29.35		134	0	100	0	0
											Total	**406,286,055**

Data Source: <China Energy Statistical Yearbook 2007>

Table A7 Fuel-fired Electricity Generation of CCPG for Year 2006

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	344.49	34449000	6.17	32,323,497
Henan	1512.35	151235000	7.06	140,557,809
Hubei	548.41	54841000	2.75	53,332,873
Hunan	464.08	46408000	4.95	44,110,804
Chongqing	234.87	23487000	8.45	21,502,349
Sichuan	441.93	44193000	4.51	42,199,896
Total				334,027,226

Data Source: <China Electric Power Yearbook 2007>

According to Table A6, the total CO_2 emissions of CCPG is 408,776,270 tCO_2e in year 2006. According to Table A7, the total supplied electricity of CCPG is 337,056,176 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2006}$ is 1.212784 tCO_2e/MWh.

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2004-2006, as follow:

$$\mathbf{EF}_{grid,OM,y} = 1.27834\ tCO_2e/MWh$$

Step 2: Calculating the Build Margin emission factor ($EF_{grid,BM,y}$)

Sub-Step 2a: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table A8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Average Low Calorific Value	Emission Factor (tC/TJ)	Oxidation	CO_2 Emission (tCO_2e)
Fuel	Unit	A	B	C	D	E	F	G=A+…+F	H	I	J	K=G*H*I*J*44/12/100
Raw Coal	10^4 t	1926.02	8098.01	3179.79	2454.48	1184.3	3285.22	20127.82	20908	25.8	100%	398,107,508
Cleaned Coal	10^4 t	0	0	0	0	5.79	0	5.79	26344	25.8	100%	144,295
Other Washed Coal	10^4 t	4.51	104.12	0	8.59	79.21	0	196.43	8363	25.8	100%	1,554,036
Briquette	10^4 t	0	0	0	0	0	0.01	0.01	20908	26.6	100%	204
Coke	10^4 t	0	17.23	0	0.32	0	0	17.55	28435	29.2	100%	534,299
Subtotal												**400,340,342**
Crude Oil	10^4 t	0	0.49	0	0	0	0	0.49	41816	20	100%	15,026
Gasoline	10^4 t	0	0.01	0	0	0	0	0.01	43070	18.9	100%	298
Coal Oil	10^4 t	0	0	0	0	0	0	0	43070	19.6	100%	0
Diesel Oil	10^4 t	0.91	2.23	1.41	1.78	0.96	0	7.29	42652	20.2	100%	230,298
Fuel Oil	10^4 t	0.51	1.26	1.31	0.8	0.57	3.49	7.94	41816	21.1	100%	256,872
Other Petroleum Products	10^4 t	0	0	0	0	0	0	0	38369	20	100%	0
Other Coking Products	10^4 t	0	0	0	0	0	0.01	0.01	28435	25.8	100%	269
Subtotal												**502,763**
Natural Gas	$10^7 m^3$	0	0	2.8	0	1.6	186.3	190.7	38931	15.3	100%	4,164,943

Coke Oven Gas	$10^7 m^3$	0	5.2	10.7	42.4	3.8	0.1	62.2	16726	12.1	100%	461,572
Other Gas	$10^7 m^3$	126.9	39.5	0	17	43.6	0.1	227.1	5227	12.1	100%	526,655
LPG	10^4 t	0	0	0	0	0	0	0	50179	17.2	100%	0.
Refinery Dry Gas	10^4 t	0.86	8.1	1	0.97	0	00	10.93	46055	15.7	100%	289,780
Subtotal												**5,442,950**
Total												406,286,055

Data Source: <China Energy Statistical Yearbook 2007>

According to Table A8 and formula (4) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal} = 98.54\%, \quad \lambda_{Oil} = 0.12\%, \quad \lambda_{Gas} = 1.34\%$$

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption of power supply of 329.94 gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators. The standard coal consumption (equivalent) for power supply of oil-fired and gas-fired power plants are 252 gce/kWh.

Parameters used for calculating fuel-fired emission factor are shown in Table A9 below:

Table A9 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Suppy	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coar-fired Power Plant	$EF_{Coal,Adv}$	37.28%	25.8	100%	0.9135
Gas-fired Power Plant	$EF_{Gas,Adv}$	48.81%	15.3	100%	0.4138
Oil-fired Power Plant	$EF_{Oil,Adv}$	48.81%	21.1	100%	0.5706

According to Table A9 and formula (5) in section B.6.1, the $EF_{Thermal}$ is 0.9064 tCO_2e/MWh

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table A10 Installed Capacities of CCPG

Installed Capacity	Unit	2004	2005	2006	New Capacity Additions from Year 2005-2006	Percentage of newly added installed capacity to 2005
		A	**B**	**C**	D=C-A	
Fuel-fired	MW	53825.7	60167.2	76658	22832.3	73.77%
Hydro	MW	34642	38405.2	42719	8077	26.10%
Nuclear	MW	0	0	0	0	0.00%
Wind & Others	MW	0	24	41	41	0.13%
Total	MW	88467.7	98596.4	119418	30950.3	100%

Data Source: <China Electric Power Yearbook 2005-2007>

According to Table A11 and formula (6) in section B.6.1, the $EF_{grid,BM,y}$ is calculated as:

$$EF_{grid,BM,y} = 0.9064 \times 73.77\% = 0.6687 \text{ tCO}_2\text{e/MWh}$$

Step 3: Calculating the baseline emission factor ($\boldsymbol{EF}_{grid,CM,y}$)

According to formula (7) in section B.6.1, the baseline emission factor of CCPG is calculated as:

$$\boldsymbol{EF}_{grid,CM,y} = 0.9735 \text{ tCO}_2\text{e/MWh}$$

The EF_y applied in this PDD is fixed during the first crediting period and may be revised at the renewal of the crediting period.

Annex 4

Monitoring Plan

Please refer to the part B.7 of the Project Design Document for more detailed information. There is no additional information could be provided in this part.
