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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Zilenghe 24MW Hydropower Project in Yunnan Province

Version number of the document: 04

Date: 30/07/2008

A.2. Description of the project activity:

The purpose of the Zilenghe 24MW Hydropower Project (hereafter referred to as the Project) developed by Fugong Hengda hydropower development Co., Ltd., is to generate renewable electricity without CO_2 emissions by utilizing water resource of the Zilenghe river. The electricity will be transmitted to the Yunnan Power Grid, subject to China Southern Power Grid (CSPG).

The Project is a run-of-river hydropower plant. No reservoir will be formed in the Project and no people will be resettled for the project construction accordingly. The total installed capacity of the Project is 24MW(4×6MW), with annual net electricity output of 98.73GWh to CSPG. The Project activity will achieve greenhouse gas (GHG) emission reductions by avoiding CO_2 emission compared with the business-as-usual scenario, in which electricity generated by those fossil fuel-fired power plants connected into CSPG. The estimated emission reductions are 83, 263 tCO_2e per year.

In addition to reduce GHG emissions by producing clean energy, the Project will also make contributions to sustainable development of the local communities and the host country by means of:

- Contributing to local economy development by providing electricity to meet local increasing energy demands;
- Reducing GHG emissions compared to a business-as-usual scenario;
- Reducing the emission of other pollutants resulting from local coal-based power plants, compared with the business-as-usual scenario;
- Creating new job opportunities: including many short-term and long-term job opportunities during the project construction and operation period;
- Direct donation to local community: including 150,000 RMB for building classroom for Zhihuitian primary school, 2 km power line and 1.6 km water supply pipes and related equipment for Shawa Village.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Fugong Hengda Hydropower Development Co., Ltd. (the project owner)	No
Netherlands	Carbon Asset Management Sweden AB （the buyer）	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

People's Republic of China

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

Yunnan Province

A.4.1.3. City/Town/Community etc:

Pihe Town, Fugong County, Nujiang Lisu Autonomous Prefecture

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 is located within Pihe Town, Fugong County, Nujiang Lisu Autonomous Prefecture, Yunnan province, P.R.China. The project site is about 10km north to the government office of Pihe Town and 40km south to the center of Fugong County. The geographical coordinates of the Project are listed in degrees as bellow:

Coordinates	Longitude	Latitude
Power house	98°54′21″E	26°34′56″N
Diversion Dam 1#	98°57′39″E	26°37′33″N
Diversion Dam 2#	98°57′28″E	26°37′20″N
Diversion Dam 3#	98°57′32″E	26°36′33″N

Figure 1. Map showing the location of Fugong County

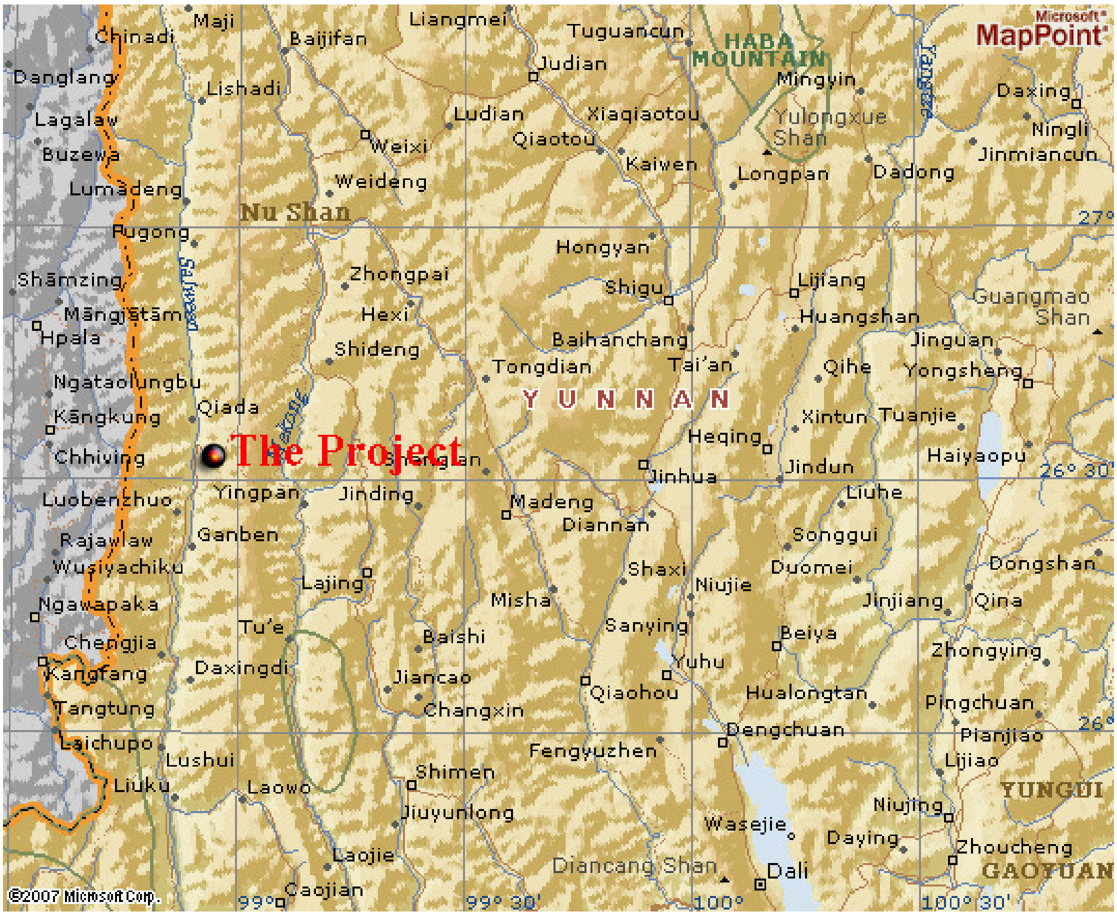

Figure 2. Map showing the location of the Project

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

This category would fall within sectoral scope 1: energy industries (renewable-/non-renewable sources).

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

The Project is a run-of-river hydropower station and uses the natural downward flow of the Zilenghe river and small scale turbine generators to capture the kinetic energy carried by water. Water is taken from the Zilenghe river at a high point and gravity fed down a pipe to a lower point where it emerges through four sets of turbine generators and re-enters the river. Accordingly, the main buildings of the power station consist of diversion dam (1#, 2# and 3#), diversion tunnel (7395m), forebay, penstock, power house, booster station and transmission line. No reservoir will be formed in the Project. The designed water head is 662m and the total installed capacity of the Project is 24MW (4×6MW). The designed flow and expected annual net output to the grid is 4.83m^3/s and 98.73GWh respectively.

The key technical indicators of the hydro turbines and the generators of the Project are listed in Table 1.

Table 1. Key technical parameters of the hydro turbine and the generator

Hydro Turbine		Generator	
Turbine Type	CJA475-W-136/2×8.5	Generator Type	SFW6000-8/2150
Rated head	662m	Rated speed	750r/min
Rated power	7312kW	Rated Power	6000kW
Rated flow	1.24m3/s	Power Factor	0.8

Rated speed	750r/min	Rated Voltage	10.5kV

The electricity generated by the Project will be boosted by two sets of 110/10.5kV transformers and transmitted to Yagu substation through an 8km 110kV transmission line.

All technologies and facilities of the Project are provided domestically so that the Project involves no technology transfer from abroad.

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

The renewable crediting period is adopted for the Project. An estimation of emission reductions over the first 7-year crediting period from Nov.1st, 2008 to Oct.31st, 2015 is 582,841 tCO_2e.

Years	Estimation of annual emission reductions in tonnes of CO_2e
2008	83,263
2009	83,263
2010	83,263
2011	83,263
2012	83,263
2013	83,263
2014	83,263
Total estimated reductions (tonnes of CO_2e)	**582,841**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	83,263

A.4.5. Public funding of the project activity:

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No public funding from Annex I Parties is involved in the Project.

SECTION B. Application of a baseline and monitoring methodology:

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

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The Project applies the approved baseline and monitoring methodology ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06).

"Tool for the demonstration and assessment of additionality" (Version 04).

For more information please refer to
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 newly-built grid-connected renewable power generation project activity, and meets the applicability of ACM0002 due to following reasons:

- The Project is a newly-built run-of-river hydropower project.
- The Project is not an activity that involves switching from fossil fuels to renewable energy at the site of the Project activity; and
- The geographic and system boundaries for CSPG that the Project is connected into can be clearly identified and information on the characteristics of the Grid is available.

Therefore the methodology ACM0002 is chosen and applicable to the Project.

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

The electricity output will be transmitted through a 110 kV transformer to substation nearby. Based on the description of grid boundaries in *Notification on Determining Baseline Emission Factors of China Power Grid* [1] issued by the National Development and Reform Commission, the DNA of China, YNPG is covered by CSPG which consists of several provincial power grids such as Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid. Therefore, CSPG is defined as the **project boundary** of the Project.
The spatial extent of the project boundary includes the project site and all power plants connected physically to CSPG.
The included emissions resources and gases within the Project boundary are listed as below.

	Source	Gas	Included?	Justification / Explanation
Baseline	Emission by fossil fuel power plants in CSPG	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative
Project Activity	The Project	CO_2	No	Excluded for simplification.
		CH_4	No	No reservoir will be formed in the project.
		N_2O	No	Excluded for simplification.

[1] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889, August 9th, 2007.

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

For the Project, the possible alternative scenarios that provide outputs or services comparable to the Project should be as follows:

Alternative I: To implement the proposed project activity, but not as a CDM project activity;
Alternative II: To construct a thermal power plant with the same installed capacity as the Project;
Alternative III: To construct a power plant using other renewable resources with the same installed capacity as the Project;
Alternative IV: To provide for the same annual electricity output as the Project by CSPG.

These alternatives are discussed as below:

Alternative I: The alternative is in compliance with current laws and regulations of China. However, according to the investment analysis in section B.5, the proposed project activity without CDM revenues is economically unattractive because the project internal rate of return (IRR) is lower than the financial benchmark IRR. Therefore, Alternative I is not feasible and should not be the baseline scenario of the Project.

Alternative II: According to the current regulations in China, construction of coal-fired power plants with capacity of less than 135 MW are forbidden in the areas which can be covered by large grids[2], and the fossil fuel-fired power units with capacity of less than 100 MW is strictly limited for installation[3]. Therefore, Alternative II is not in compliance with current laws and regulations of China, and should not be the baseline scenario of the Project.

Alternative III: The alternative is in compliance with current laws and regulations of China. However, Yunnan province, where the Project is located, lacks of economically feasible wind resources for constructing a wind farm with the same installed capacity as the Project.[4] Furthermore, there are no adequate biomass sources, solar sources, wave and tidal sources or geothermal sources for constructing a power plant with the same installed capacity as the Project. Therefore, Alternative III is not feasible and should not be the baseline scenario of the Project.

Alternative IV: The alternative is in compliance with current laws and regulations of China and economically feasible.

In conclusion, Alternative IV is the most likely one to be implemented among all the alternatives. Therefore Alternative IV is identified as the baseline scenario of the Project.

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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Date	Events	Evidences
02/05/2006	The project started construction after obtaining approval by local government. But soon the geological condition of the diversion tunnels were found very unstable result from highly weathered	The letter of construction permission issued by the supervisory company

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[2] *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or below* issued by the General Office of the State Council, decree no. 2002-6.

[3] Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators (issued in Aug., 1997).

[4] http://www.newenergy.org.cn/html/2003-9/2003991.html

	rock and serious ground water seepage, which indicated a strong probability of cave in.	
20/05/2006	As portended 11# tunnel caved in at the depth of 25m away from the entrance. In consideration of ensuring the quality of the project and the safety of builder, the supervisory company issued an order to suspend the project construction immediately and request the design institute to redesign the diversion tunnel project.	The letter of construction suspension issued by the supervisory company
22/05/2006	The supervisory company, entrusted by the project owner, finished a damage assessment report based on careful assessment of supervisory records and the damage caused by the accident.	The damage assessment report finished by the supervisory company
June, 2006	Design change report was finished by the design institute, in which a reassessment of financial feasibility of the project with and without CDM finance was requested by the project owner. According to the design change report, the project was financially unfeasible due to the increased cost of diversion tunnel project, but the expected CDM revenue can help the project IRR higher than the financial benchmark and therefore the project become feasible.	Design change report finished by the design institute
18/06/2006	The project owner, taking into full account the results in the design change report, made the decision to proceed with the project under CDM.	Management decision made by the meeting of shareholder of the project
24/08/2006	The Fugong Subbranch of Agricultural Bank of China, taking into account that CDM finance could help the project to overcome investment barrier, issued a letter of intent to the application for added loan from the project owner.	Response from Fugong Subbranch of the Agricultural Bank of China
25/08/2006	The project restarted construction.	The letter of construction permission to restart the project issued by the supervisory company
27/01/2007	Requested by the supplier of hydropower generators, the capacity of generators of the project was changed from 3×8MW to 4×6MW with the same total capacity of 24MW. It is indicated that the financial attractiveness of the project did not change significantly for the increase of 2.1 million RMB in the project investment and increase of 0.3 million per year in project income caused by capacity variation.	The approval of capacity adjustment by local government
30/07/2007	Term sheet of the project was signed by both project participants.	
23/10/2007	The project started GSP on EB website.	

The additionality of the Project is demonstrated by using the *Tool for the Demonstration and Assessment of Additionality* approved by the CDM EB and requested by the methodology ACM0002. The *Tool for the Demonstration and Assessment of Additionality* provides for a step-wise approach to demonstrate and assess the additionality. These steps include:

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

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

For the Project, the possible alternative scenarios in absence of the CDM project activity should be as follows:

Alternative I: To implement the proposed project activity, but not as a CDM project activity;
Alternative II: To construct a thermal power plant with the same installed capacity as the Project;
Alternative III: To construct a power plant using other renewable resources with the same installed

capacity as the Project;

Alternative IV: To provide for the same annual electricity output as the Project by CSPG.

Alternative III is not realistic because Yunnan Province, where the Project is located, lacks of feasible wind resources for constructing a wind farm with the same installed capacity as the Project.[5] Furthermore, there are no adequate biomass sources, solar sources, wave and tidal sources or geothermal sources for constructing a power plant with the same installed capacity as the Project.

To sum up, Alternative I, Alternative II and Alternative IV should be considered in the following analysis.

Sub-step 1b. Enforcement of applicable laws and regulations:

Alternative I: To implement the proposed project activity, but not as a CDM project activity. The alternative is in compliance with current laws and regulations of China.

Alternative II: To construct a thermal power plant with the same installed capacity as the Project. Based on the requirements of applicable laws and regulations, the alternative is not realistic. According to the current regulations in China, construction of coal-fired power plants with capacity of less than 135 MW are forbidden in the areas which can be covered by large grids and the fossil fuel-fired power units with capacity of less than 100 MW is strictly limited for installation.

Alternative IV: To provide for the same annual electricity output as the Project by CSPG. The alternative is in compliance with current laws and regulations of China.

To sum up, Alterative I and Alterative IV should be considered in the following analysis.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

The benchmark analysis is chosen and the Internal Return Rate (IRR) is used to assess the financial viability of the project activity.

Sub-step 2b – Option III. Apply benchmark analysis

According to *Economic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources (Document No. SL16-95), the benchmark IRR for small hydropower project is 10%. Therefore, 10% is adopted as the financial benchmark IRR for the Project. If the project IRR of the Project is less than 10%, the Project will be financially unfeasible and then be additional.

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

Basic parameters of the Project

The basic parameters to calculate the financial indicators of the Project are listed in Table 2.

Table2. Basic parameters for IRR calculation

Items	Unit	Data	Source

[5] http://www.newenergy.org.cn/html/2003-9/2003991.html

Installed capacity	MW	24	Feasibility Study Report
Estimated annual net electricity generated	GWh	98.73	Feasibility Study Report
Project lifetime	year	20	Feasibility Study Report
Total investment	Million RMB	119.86	Design Change Report
Electricity tariff(incl. VAT)	RMB/kWh	0.18	Feasibility Study Report
VAT	%	6	Feasibility Study Report
Income tax (exempt for the first two years and halve for the later three years)	%	33	Feasibility Study Report
Tax of expense for city maintenance and construction	%	3	Feasibility Study Report
Tax of education fee addition	%	5	Feasibility Study Report
Annual O&M cost	Million RMB	343.05	Design Change Report

Comparison of financial indicator

Based on these data listed on Table 2 above, the project IRR of the Project is only 6.99% without the income from selling CERs. It is lower than the benchmark IRR of 10%. Therefore, the Project is not financially attractive and fulfils the requirement of additionality.

Taking into account of the income from selling CERs (calculated with the price of 10.5US$/t$CO_2$e), the project IRR of the Project will be increased to 12.87%, which is higher than the benchmark return rate of 10%. The Project is economically attractive, which means that the CDM revenues could help the Project overcome the investment barrier.

Sub-step 2d. Sensitivity analysis

The purpose of this step is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

Three factors are considered in following sensitivity analysis:

- ✧ Income
- ✧ Total investment.
- ✧ Annual O&M cost.

Assuming that the above three factors fluctuate within the range[6] of -10%~+10%, the corresponding

[6] Based on the information from the Project owner, the actual total investment exceeds the estimated investment in *FSR* due to the increasing price of raw material and labour force. Meanwhile, the operation cost of the Project will also exceed the estimation in *FSR*. It is therefore conservative to assume that total investment and annual O&M cost vary in the range of ±10%.

As for the project Income, it is calculated as the electricity generation multiplied by the tariff. The electricity generation is calculated by qualified Design Institute based on hydrological data of 40 years and in general will be very close to real situation in the long term. And the tariff was decreasing in the last 3 years according to an investigation report on local power market. Therefore, the range of ±10% can be considered reasonable for the sensitivity analysis of project Income.

impacts on the IRR of total investment of the Project are shown in Table3 and Figure 3.

Table3. IRR of total investment sensitivity analysis

	-10%	-5%	0	5%	10%
Project Income	5.73%	6.36%	6.99%	7.61%	8.23%
Total Investment	8.14%	7.54%	6.99%	6.49%	6.03%
Annual O&M cost	7.25%	7.12%	6.99%	6.86%	6.73%

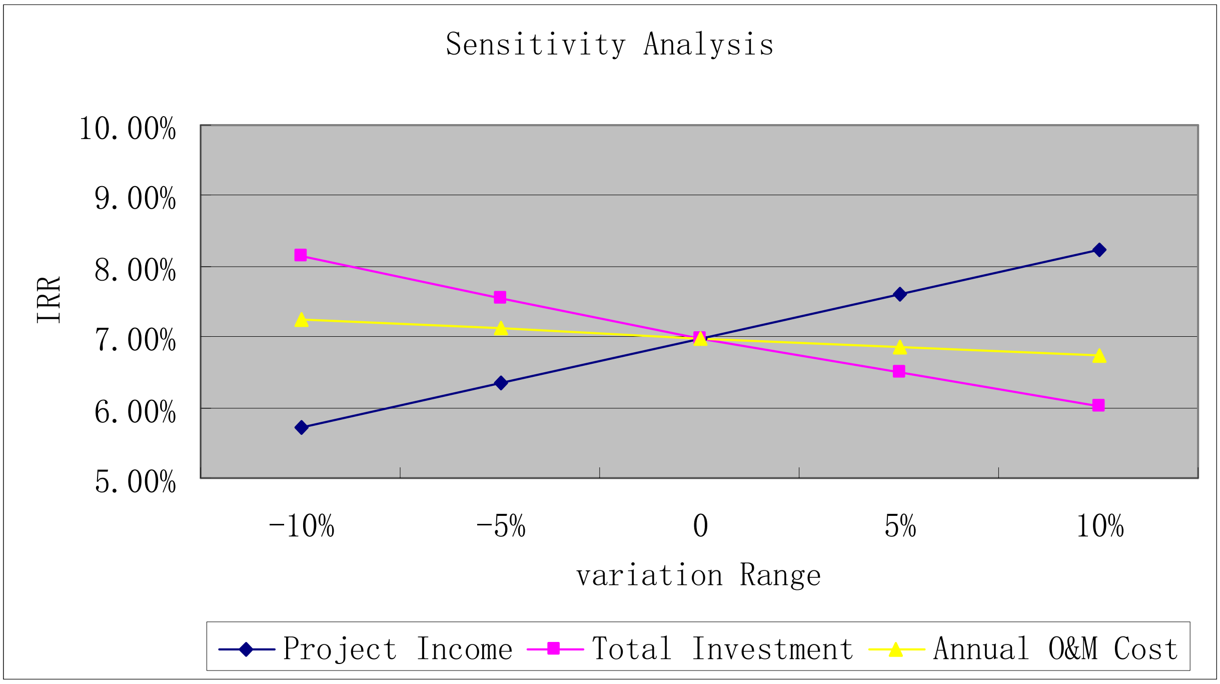

Figure 3. IRR of total investment sensitivity analysis

As shown in the sensitivity analysis above, even the fluctuation range of the factors reach 10%, the project IRR of the Project could not reach the benchmark and the conclusion regarding that the Project is financially unattractive is still tenable.

Step3. Barrier analysis

No barrier analysis has been applied.

Step 4 Common practice analysis

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

Projects applied in common practice analysis are defined as hydropower projects with similar installed capacity (15MW to 50MW[7]) in Yunnan Province. Referring to *China Hydro Resources Yearbook (2006 edition),* the information of hydropower projects with capacity between 15MW and 50MW are listed as below.

[7] *Almanac of China's Water Pow*er, Volume 10, Page 141: Projects with capacity of 0.5MW~50MW are defined as small hydropower projects.

Table4. Information of similar projects in Yunnan[8]

No.	Project Name	Installed Capacity (MW)	Operati on date	Project largest share holder	Type of Company
1	Luozehe Hydropower Project	25	1988	Yunnan Yiliang Country Hydropower Company	State Owned
2	Laohushan Erji Hydropower Project	25	1998	Dian Neng Group	State Owned
3	Xiashilong Hydropower Project	25	2005	Guangnan County Power Co., Ltd.	State Owned
4	Yanziya Hydropower Project	25	2005	Dianxi Power Bureau	State Owned
5	Original Sanjiangkou Hydropower Station	30	1993	Yunnan Bao Shan Power Stake-holding Company	State Owned
6	Jirenhe Hydropower Project	30	1993	Diqing Prefecture Power Company	State Owned
7	Wunihe Hydropower Project	30	2005	Baoshan Power Company	State Owned
8	Nadinghe Hydropower Project	34		Wen Shan Power Company	State Owned
9	Laodukou Hydropower Project	37.5		Diandong Power Company	State Owned
10	Maomaotiao Hydropower Project	40		Wenshan Power Company	State Owned
11	Yisahe Hydropower Project	26.6	1994	Yuanjiang Power Ltd	State Owned
12	Chongjianghe Hydropower Project	48		China Guodian Operation	State Owned
13	Houqiao Hydropower Project	32	2005	Baoshan Power Stakeholding Company	State Owned
14	Lamenga Erji Hydropower Project	32		Wenshan Power Company	State Owned
15	Hongshiyan Hydropower Project	44		DianNeng Group	State Owned

8 Data source:
Note: Project name & installed capacity information are from page577 of *China Water Resources Year Book 2006 edition.* The other information is from following web links:
http://www.yn.gov.cn/yunnan,china/73469366967992320/20041130/15017.html
http://www.yn.xinhuanet.com/newscenter/2006-01/23/content_6106793.htm
http://www.hglm.com/rdsq/gzzj/200611/23511_2.html
http://yzh.yndl.com/Article/ShowInfo.asp?ID=1922
http://yunnan.yunnan.cn/4453/2007/01/08/860@476105.htm
http://www.ydxw.com/showinfo.asp?id=3532
http://www.ydxw.cn/showinfo.asp?id=32571
http://www.china5e.com/news/power/200508/200508100295.html
http://news.sina.com.cn/c/2004-12-30/09444669685s.shtml
http://www.guangdongdz.com/cjbd/163/1638475.html
http://www.china5e.com/news/water/200312/200312050091.html
http://www.ydxw.com/showinfo.asp?id=12343
http://finance.memail.net/050110/129,5,571873,00.shtml
http://0871.und.cn/small/cpybase.do?companyid=D658A7E06D9B41318F44FBF1B0E6C0E7
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1386.pdf

16	Menggahe Hydropower Project	40		Menggahe Hydro Development Co,.Ltd	Private Owned
17	Ximaxingyun Hydropower Project	26		Yingjiang Xinyun Company	Private Owned
18	Mengdianhe Hydropower Project (Second Phase)	30	2004	Mengdianhe Erji Hydropower Co,.Ltd.	Private Owned

Besides above-mentioned projects in table 4, there are other projects have similar capacity with the proposed project, such as Maguan Daliangzi, Mangyahe Yiji, Mangyahe Erji, Heier, Lufeng, Mujiajia Yiji, Sanjiangkou, Mangzhang Langwaihe Project etc. However, these projects are now in the process of finding carbon finance[9].

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

In China's electric power sector, electricity had been a crucial component of the centrally planned economy[10]. Before 2002, the electric power sector in China is a monopoly market dominated by state-own companies[11]. Accordingly, the generation, transmission and distribution of state-own hydropower projects run as a whole. In order to break the monopoly, the central government launched power market reform in 2002 aiming at introducing competition, attracting multi-level investors, constructing fair power market and weakening government's involvement[12]. Despite the introduction of economy-wide market reforms, the government involvement remains strong[13] and the result is far from success. Though the transmission and distribution sector was divided into two regional companies, it was still controlled by state[14]. The essence of this reform is regional reorganization, and the form of monopoly changed from national to regional, which resulted in no real changes and competition among state-own enterprises[15].

However, private investors must face strong competition from state-own companies, which have overwhelming capital and government background. Especially in China, the power generation company must sold the power to grid company directly and sold to other users is not allowed. Due to the lack of internal link with state-own grid company, private-own small projects can not receive equal treatment with state-own company, which lead to great uncertainty in power sales[16]. Just as described by Chen Huizhou, officer from Ministry of Water Resources, P.R. China, some projects can generate but are not

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9 http://cdm.ccchina.gov.cn/

10 Emily T. Yeh, Joanna I. Lewis, State power and the logic of reform in China's electricity sector, Pacific Affairs, Vol.77 ,2004

11 http://www.cecs.gov.cn/index.php?option=com_content&task=view&id=1932&Itemid=94&PHPSESSID=41bef7bfad905fab760ba8ce9d3761c8

12 http://www.cecs.gov.cn/index.php?option=com_content&task=view&id=1932&Itemid=94&PHPSESSID=41bef7bfad905fab760ba8ce9d3761c8

13 Emily T. Yeh, Joanna I. Lewis, State power and the logic of reform in China's electricity sector, Pacific Affairs, Vol.77 ,2004

14 China Southern Power Grid Corporation takes in charge of five provinces: Guangdong, Guangxi, Yunnan, Guizhou and Hainan. State Grid Corporation takes in charge of all the rest provinces. "Scheme for Electric Power System Reform", China's State Council

15 Xue yabo, The reform of China's monopoly Industries: take electric sector for example. Meizhong Jingji Pinglun, No.2 Vol.5, 2005

16 Xue yabo, The reform of China's monopoly Industries: take electric sector for example. Meizhong Jingji Pinglun, No.2 Vol.5, 2005

allowed to do so, some are allowed to generate but is not accepted by grid[17]. So, compared with state-own projects, private projects were not developed in a comparable environment with respect to investment climate.
Furthermore, compared with private investors, state-own companies have great advantages in access to financing. They have very large capital reserves and operational capacity and they can easily access to financing through various channels, such as commercial loans and direct funds from government. On the contrary, private investors in China usually face the awkward situation of lack of financing channels[18]. For private hydro developer like the Project owner, commercial loans is the only financing channel, but usually very difficult due to small capital reserves and power sale uncertainty.

According to above information from table 4, it is clearly identified that 15 out of above 18 projects have the common background of state-own company and can be considered significantly different from the Project.

The remaining 3 projects, which have similar background with the Project, are Mengdianhe Hydro Project (Second Phase), Menggahe Hydropower Project and Ximaxingyun Hydropower Project.
However, Menggahe Hydropower Project is also in the process of CDM application[19]. Ximaxingyun Hydropower Project is a captive plant and supplies electricity to aluminum factory directly[20]. Furthermore, the electricity tariff for aluminum plant is 0.394RMB/kWh[21] in Yunnan province, which means Ximaxingyun Hydropower Project gets an income equal to 0.394RMB/kWh, obviously higher than 0.18 RMB/kWh. As for Mengdianhe Hydropower Project (Second Phase), the annual operation hours and unit investment are 6000h and 3800RMB/kW[22]. In contrast, the Project has the operation hours and unit investment as 5513h which is 9% lower than Mengdianhe Project, and 4994RMB/kW which is 31% higher than Mengdianhe Project[23]. So the Project can be considered significantly different from those identified exceptions and not a common practice.

In conclusion, the proposed project satisfies all the criteria of *Tool for the Demonstration and Assessment of Additionality* and is improved additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Step 1. Baseline emissions calculation

According to ACM0002, to calculate the baseline emissions, emission factors of operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) were determined by ex-ante. Then the baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$.

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17 Chen Huizhou, Director of the Bureau of Rural Hydropower and Electrification, Ministry of Water Resources, P.R. China. Several Issues Regarding Development Rural Hydropower in China.
18 Private economy, China's economic development and market-oriented reform. Tian Guoqiang, Economics Department of Texas A&M University. Cuiwei, Development Research Center of China's State Council.
19 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1346.pdf
20 http://0871.und.cn/small/cpybase.do?companyid=D658A7E06D9B41318F44FBF1B0E6C0E7
21 http://www.yn.gov.cn/yunnan,china/79381449580478464/20070927/1157455.html
22 http://www.dhtjb.com/Html/20041230111017-1.html
23 *Feasibility Study Report of Zilenghe Project*

Substep 1.1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$)

The Operating Margin Emission Factor(s) ($EF_{OM,y}$) is calculated based on one of the four following methods according to the approved methodology ACM0002:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The application of method (c) requires availability of dispatch data. However, the detailed data of dispatch are taken as confidential business information by the grid company and not publicly available. Thus, method (c) cannot be adopted for the Project. Similarly, the data of annual load duration curve required by method (b) also can not be obtained publicly. Therefore, method (b) is also not applicable here.

Among the total electricity generations of the CSPG, the amount of low-cost/must run resources accounts for about 34% in 2001, 33% in 2002, 31% in 2003, 30% in 2004 and 29% in 2005[24], all less than 50%. It can't fulfil the requirement of method (d), but fulfils the requirement of method (a). Thus, the method (a) can be used to calculate the operating margin emission factor.

For the Project, *ex-ante* data are used for calculating the OM emission factor ($EF_{OM,y}$).

In accordance with ACM0002, the simple OM emission factor ($EF_{OM,simple,y}$) is calculated as:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \qquad (1)$$

where:

$F_{i,j,y}$ is the total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year(s) *y*, *j* refers to the power sources serving the grid, excluding those low-operating cost and must-run power plants, and including imports to the grid[25],

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the oxidation rate of the fuel in year(s) *y*, and

$GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by the sources *j*.

The CO_2 emission coefficient $COEF_i$ is obtained from formula (2) as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (2)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of fuel *i* (here the country-specific values are adopted),

---

[24] *China Electric Power Yearbook*, 2002~2006 Edition.

[25] An import from a connected electricity system should be considered as one power source *j*.

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i* (here the IPCC default values are adopted),

$OXID_i$ is the oxidation factor of the fuel *i* (here the IPCC default values are adopted).

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2002 to 2006 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Table 1.3 and Table 1.4*, *Volume 2, 2006 IPCC Guidelines for National Greenhouse Gas Inventories".*

Substep 1.2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

For the Project, *ex-ante* data are used for calculating the BM emission factor ($EF_{BM,y}$).

According to ACM0002, the build margin emission factor ($EF_{BM,y}$) is calculated using the following formula (3):

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (3)$$

where:

$F_{i,m,y}$, $COEF_{i,m,y}$ and $GEN_{m,y}$ are analogous to the variables described in *substep1.1* above for plants *m*.

Currently in China, the build margin data of sampling plants group *m* are not available publicly. Taking notice of this situation, EB accepts the following deviation in application of methodology AM0005 in China[26]:

- ✧ Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.
- ✧ Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Since methodology AM0005 has been replaced by the consolidated methodology ACM0002, the deviation above is also applicable to the consolidated methodology ACM0002. Therefore, for the Project: Firstly, calculate the share of different power generation technology in recent capacity additions. Secondly, calculate the weight for capacity additions of each power generation technology. And finally, calculate the emission factor using the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal-based, oil-based and gas-based at present, BM is calculated with following steps and formulas:

Substep 1.2.1 Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the Energy Balance Table of the most recent year.

[26] http://cdm.unfccc.int/Projects/Deviations

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by province *j* in year(s) *y*.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/tCe), taking into account the carbon content of the fuels (coal, oil and gas) used by province *j* and the percent oxidation of the fuel in year(s) *y*, and *COAL*, *OIL* and *GAS* are footnote group for solid fuels, liquid fuels and gas fuels.

Substep 1.2.2 Calculate emission factor for thermal power of each grid based on the result of Substep 1.2.1 and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (7)$$

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

Substep 1.2.3 Calculate BM of the grid based on the result of Substep1.2.2 and the share of thermal power of recent 20% capacity additions.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006(published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Table 1.3 and Table 1.4*, *Volume 2, "2006 IPCC Guidelines for National Greenhouse Gas Inventories"*.

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid,* the weighted average fuel consumption for power generation of 14 sets of 600 MW sub-critical coal-fired power generators built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

Substep 1.3. Calculate the Baseline Emission Factor (EF_y)

Based on the approved methodology ACM0002, the baseline emission factor (EF_y) is calculated as the weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor

($EF_{BM,y}$), as

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \tag{9}$$

According to the approved methodology ACM0002, the weight w_{OM} and the weight w_{BM} are both take 0.5 as default.

Substep 1.4 Calculate the Baseline Emissions

Baseline emissions are calculated with baseline emission factor (EF_y) and electricity supplied by the Project to the grid (EG_y), as follows:

$$BE_y = EG_y \times EF_y \tag{10}$$

Step 2. Project activity emissions

The annual project emissions by the project activity are zero, then PE_y =0 tCO_2e.

Step 3. Leakage

As newly built hydropower plants, there is no energy generating equipment be transferred from another activity and no existing equipment be transferred to another activity involved in the project activities. No leakage is considered in the Project, as $L_y = 0$ tCO_2e.

Step 4. Emission reductions

The emission reductions (ER_y) by the Project activity during a given year y is the difference between baseline emissions (BE_y), project activity emissions (PE_y) and leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \tag{11}$$

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

>>

Data / Parameter:	*Power generation*
Data unit:	*MWh*
Description:	*The total power generation and power generated by low-cost/must run power plants within CSPG in year 2001, 2002, 2003, 2004 and 2005.*
Source of data used:	*China Electric Power Yearbook 2002, 2003, 2004, 2005 and 2006.*
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CSPG is defined as the project boundary of the Project.* *According ACM0002, method of simple OM can only be used where low-cost/must run resources constitute less than 50% of total grid generation.*
Any comment:	*Official data*

Data / Parameter:	$GEN_{j,y}$
Data unit:	*MWh*
Description:	*The power generation supplied to CSPG in year 2003, 2004 and 2005, excluding those generated by low-cost/must run power plants.*
Source of data used:	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CSPG is defined as the project boundary of the Project.* *According to ACM0002, the generation by low-operating cost and must-run power plants within CSPG are excluded from calculation of simple OM emission factor.*
Any comment:	*Official data*

Data / Parameter:	*Installed Capacity*
Data unit:	*MW*
Description:	*The installed capacity of different power sources within CSPG in year 2003, 2004 and 2005.*
Source of data used:	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CSPG is defined as the project boundary of the Project.* *According to the deviation accepted by the EB, the installed capacities of different power sources within CSPG are used in place of annual electricity generation for calculation of BM emission factor.*
Any comment:	*Official data*

Data / Parameter:	$F_{i,j,y}$
Data unit:	*10^4t or 10^8m^3*
Description:	*Different fossil fuel consumptions for power generation within CSPG in year 2003, 2004 and 2005.*
Source of data used:	*China Energy Statistical Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CSPG is the project boundary of the Project.*
Any comment:	*Official data*

Data / Parameter:	NCV_i
Data unit:	*MJ/t or MJ/10^3m^3*
Description:	*Average low calorific values of different fuels for electricity generation.*
Source of data used:	*China Energy Statistical Yearbook 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China-specific values are adopted.*
Any comment:	*Official data*

Data / Parameter:	$EF_{CO2,i}$
Data unit:	*tC/TJ*
Description:	*Emission factors of fuels for electricity generation.*
Source of data used:	*Table 1.3 and Table 1.4, Volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*IPCC world-wide default values are adopted.*
Any comment:	*IPCC data*

Data / Parameter:	$OXID_i$
Data unit:	
Description:	*Oxidation rates of fuels for power generation.*
Source of data used:	*Table 1.3 and Table 1.4, Volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*IPCC world-wide default values are adopted.*
Any comment:	*IPCC data*

Data / Parameter:	*Best efficiency level of thermal power*
Data unit:	
Description:	*The efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.*
Source of data used:	*Notification on Determining Baseline Emission Factors of China Power Grid*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*According to the deviation accepted by EB, the efficiency level of the best technology commercially available in the national grid of China is used as a conservative value for the calculation of BM emission factor.*
Any comment:	*Official data*

B.6.3. Ex-ante calculation of emission reductions:

>>

Baseline emissions

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid*[27] issued by Chinese DNA on Aug. 9th, 2007, the OM emission factor ($EF_{OM,y}$) of CSPG is 1.0119 tCO_2e/MWh, and the build margin emission factor ($EF_{BM,y}$) of CSPG is 0.6748 tCO_2e/MWh. The detailed calculations and data are listed in Annex 3.

The baseline emissions factor (EF_y) of CSPG is calculated with formula (10) in part B.6.1 as follow:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} = 0.84335 \text{ tCO}_2\text{e/MWh}$$。

Annual net electricity output to CSPG of the Project is 98.73GWh. Based on the emission factors in the previous step, the baseline emission of the Project can be calculated with formula (11) in part B.6.1 as follow:

$$BE_y = EG_y \times EF_y = 83{,}263 \text{ tCO}_2\text{e}$$

[27] http://cdm.ccchina.gov.cn

Project emissions

As a newly built run of river hydropower project, $PE_y = 0$.

Leakage

As described in part B.6.1, the leakage of the Project (L_y) is 0 tCO_2e.

Emission reductions

The emission reductions *ERy* by the Project during a given year y are the difference between baseline emissions (*BEy*), project emissions (*PEy*) and emissions due to leakage (*Ly*), as follows:

$ER_y = BE_y - PE_y - L_y$ = 83,263tCO_2e。

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

>>

The renewable crediting period is adopted for the Project. An estimation of emission reductions over the first 7-year crediting period from Nov.1st, 2008 to Oct.31st, 2015 is 582,841 tCO_2e.

Year	Estimation of emission reductions generated by the Project activity (tCO_2e)	Estimation of baseline emission reductions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2008	0	83,263	0	83,263
2009	0	83,263	0	83,263
2010	0	83,263	0	83,263
2011	0	83,263	0	83,263
2012	0	83,263	0	83,263
2013	0	83,263	0	83,263
2014	0	83,263	0	83,263
Total(tCO_2e)	**0**	**582,841**	**0**	**582,841**

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

>>

B.7.1 Data and parameters monitored:

Data / Parameter:	*EGy*
Data unit:	*GWh*
Description:	*The net electricity supplied to the grid by the Project annually.*
Source of data to be used:	*Calculated as EGy-ex subtracted by EGy-im.*
Value of data	*98.73 (estimated)*
Description of measurement methods and procedures to be applied:	*Please refer to section B.7.2.*
QA/QC procedures to be applied:	*Please refer to section B.7.2.*
Any comment:	

Data / Parameter:	*EGy-ex*
Data unit:	*GWh*
Description:	*The Electricity supplied to the grid by the Project annually.*
Source of data to be used:	*Measured by Gateway Meter.*
Value of data	*98.73 (estimated)*
Description of measurement methods and procedures to be applied:	*Please refer to section B.7.2.*
QA/QC procedures to be applied:	*Please refer to section B.7.2.*
Any comment:	

Data / Parameter:	*EGy-im*
Data unit:	*GWh*
Description:	*The electricity imported from the grid annually.*
Source of data to be used:	*Measured by Gateway Meter.*
Value of data	*0 (estimated)*
Description of measurement methods and procedures to be applied:	*Please refer to section B.7.2.*
QA/QC procedures to be applied:	*Please refer to section B.7.2.*
Any comment:	

B.7.2 Description of the monitoring plan:

>>

In this PDD, emission factor of the Project is determined ex-ante. Therefore the net electricity supplied to the grid by the Project is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring of the net electricity output of the Project.

1. Implementation of the monitoring plan

The Project owner will take the responsibility of the monitoring plan implementation.

The staff from operational and financial departments will undertake the monitoring tasks including watching metering equipments daily, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, reporting to company administrator or supervisor.

The staff concerned will receive training on monitoring to ensure the implementation of this monitoring plan before project operation. In the following years within the crediting period, relevant training will also be carried out based on real situation.

2. Monitoring of the net electricity supplied to the grid by the Project

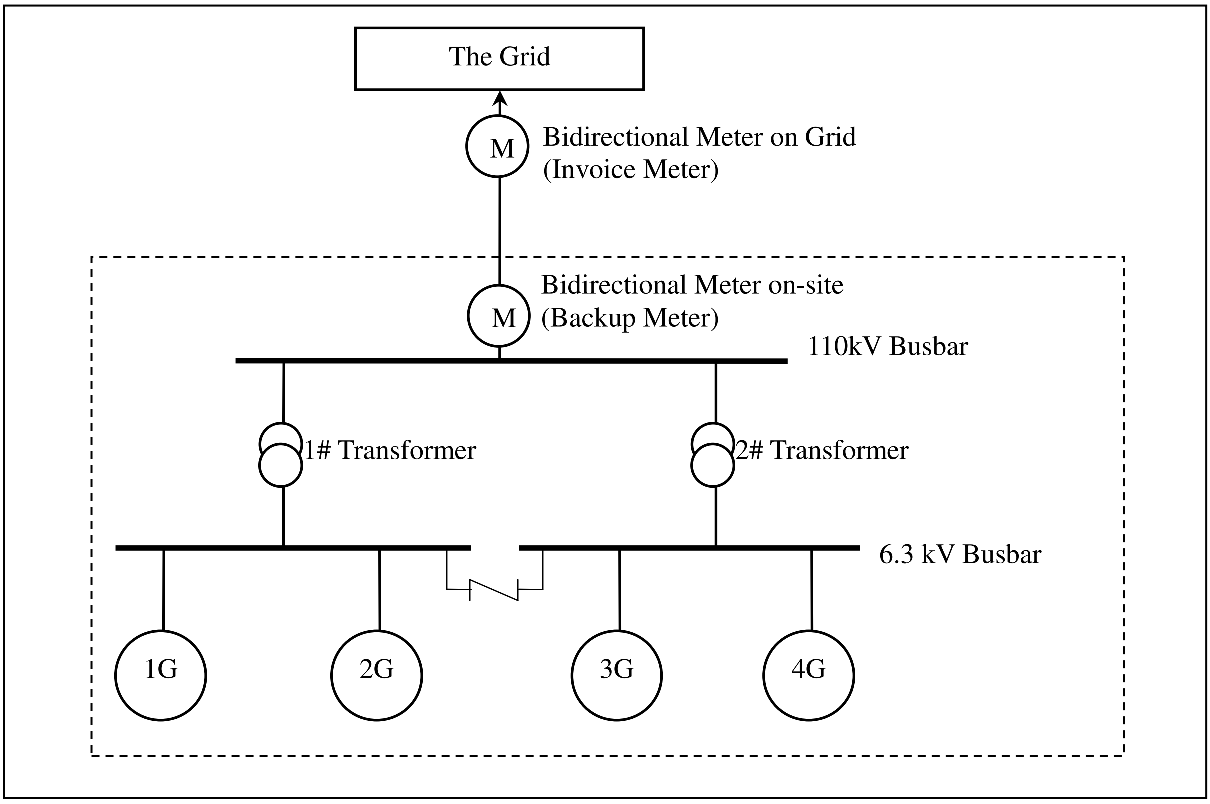

Figure 4.Grid connection Diagram

The net electricity supplied to the grid by the Project is calculated as the electricity exported to the grid subtracted by the electricity imported from the grid. The electricity exported to and imported from the grid will be continuously monitored through metering equipments with the accuracy level of 0.5s installed in the project site. The duty-staff will watch the operation status of metering equipments everyday on site. Furthermore, designated staff will be responsible for data collecting and complete the daily report to other superior staffs for checking in the end of every month during crediting period. The data from these records will be analyzed and classified into the monthly report which will be reported to company administrator or supervisor.

All the relevant data records will be kept by the Project owner during the crediting period and two years after for verification.

3. Quality assurance and quality control

The quality assurance and quality control procedures involves of data monitoring, recording, maintaining and archiving, and monitoring equipment calibration.

The electricity generated by the Project and supplied to CSPG will be monitored through metering equipment at the Project site. The monitoring data will be cross-checked against relevant electricity sales receipts and/or records from the grid for the purpose of quality control. Since the data to be monitored are consist with the data required during project operation by the project owner and the grid company, the Power Purchase Agreement between these two parties can be used as reference.

Calibration of Meters & Metering should be implemented according to national standards and rules (such as *DL/T448-2000, the Technical Management Rules for Electric Power Measuring Installations*) annually. And all the records should be documented and maintained by the project owner for verification.

Erroneousness and accidents occurred during monitoring process will be recorded and reported to company administrator or supervisor. Consequently, the corrective resolution will be adopted to avoid it in future. During the period that the invoice meter works abnormally the emission reduction should be calculated based on the monitoring records from the backup meter.

4. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually.

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)

>>

Date of completion: 30/07/2008.

Name of person/entity determining monitoring methodology:

Cleanergy Investment Service (BJ) Co., Ltd

Tel: 0086-10-83914567

Fax: 0086-10-83914555

Add: North of FL 11, Capital Times Square, 88 Xichang'an Street, Beijing, P.R.China

Cleanergy Investment Service (BJ) Co., Ltd is not one of the 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:

25/08/2006 (the date of restarting construction)

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

20 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:

01/11/2008 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:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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

According to the FS report and EIA report, environmental impacts possibly caused by the Project and protect measures adopted by the project owner are analyzed as follows:

Wastewater

Wastewater will be generated by constructing and living activities during the construction and operation of the Project. As pollutants in the wastewater resulting from production activities are primarily suspending particulates, which are not toxic. All the wastewater would be treated to reach *wastewater effluent standard* (GB8978-1996) before discharge.

Air pollution and Noise

The Project will bring noise and emit exhaust gas and mill dust during the construction period. The Project owner will mitigate the impact on the workers from the exhaust gas, noise and mill dust by means of appropriately arrangement of the workers' living quarters and labor protection measures. There are no villagers living nearby so that the impact of noise and dust to local residents can be ignored.

Solid waste

The solid waste includes the engineering waste residue during the construction period and the domestic garbage during the construction and operation period. The solid waste will be deposited in six specified dumping sites so as to bring insignificant impact to environment.

Ecological impacts

Because of frequent anthropic activities in the construction district, there have no rare wild animal inhabitants. The adverse impacts on fishery production are insignificant because of a reasonable ecological discharge ($0.25m^3/s$). Therefore the impacts on the vegetation of reservoir area and catchment area are insignificant

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:

>>
In conclusion, the Project has not significant impacts on local environment and the EIA of the Project has been approved by the local environmental protection authority in June, 2006.

SECTION E. Stakeholders' comments

>>

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

1. First Investigation

In Jan. 2006, a survey of local residents was carried out in the area the Project may influence during the preparations for the Project. The survey was conducted by a third-party consulting institute and was approved by Environmental Protection Bureau of Nujiang Prefecture.

The investigation was implemented by means of questionnaire consists of a brief introduction of the Project and 10 questions concerning social and environmental influence of the Project. The investigated stakeholders mainly lived in the region near the hydropower station. The investigation had taken full account of the public advice of different location, ages, civilizations and occupations. Detailed information of respondents is listed as follows:

Table5 Information of informants in the first investigation

Genders	**Male**		**Proportion**	**Female**	**Percentage**	
	37		77%	11	23%	
Ages	**≤25**		**26-40**	**41-60**	**>60**	
	18		18	12	-	
Educational level	**Senior high school and below**			**Above senior high school**		
	40			8		
Vocation	**Researcher**	**Government employee**	**Farmer**	**Self-employer**	**Worker**	**Others**
	2	8	33	2	3	-

2. Second Investigation

In Dec. 2007, the staff from local government was entrusted to conduct another investigation in order to make sure of the stakeholders' attitude and comments to the measures taken to protect environment and the progress of compensation for land occupation by the Project. The second investigation was implemented by means of questionnaire as well. An emphasis was laid on residents whose land has been requisitioned by the Project. The public advice from different location, ages, civilizations and occupations have been taken into account. Detailed information of respondents is listed as follows:

Table6 Information of informants in the second investigation

Genders	**Male**		**Proportion**	**Female**	**Percentage**	
	29		73%	11	27%	
Ages	**≤25**		**26-40**	**41-60**	**>60**	
	7		21	8	4	
Educational level	**Junior high school and below**			**Above senior high school**		
	31			9		
Vocation	**Government employee**	**Doctor**	**Student**	**Farmer**	**Worker**	**Others**
	4	2	2	28	2	2

E.2. Summary of the comments received:
>>

1. First Investigation

Major investigated issues in the first investigation are listed below:

- ✧ The possible socio-economic impacts of the Project,
- ✧ The possible environmental impacts of the Project,
- ✧ The possible impacts on people's living standard,
- ✧ The overall attitude toward the Project, and
- ✧ Other suggestions.

Totally 48 questionnaires returned out of 50 with 96% response rate. Following is a summary of the key findings based on returned questionnaires.

- ✧ All of those investigated individuals and parties expressed supportive attitude to construction of the Project. It is indicated that the Project will be a stimulative to local economic development.
- ✧ The impact of construction of the Project on local air, surface water and sound environment was believed insignificant according to results of the investigation.
- ✧ The concerns of the stakeholder for construction of the Project focused on land occupation.

2. Second Investigation

Major investigated issues in the first investigation are listed below:

- ✧ The overall attitude toward the Project construction,
- ✧ The socio-economic impacts of the Project,
- ✧ The environmental impacts of the Project,
- ✧ The progress of compensation for land occupation, and
- ✧ Other suggestions.

Totally 40 questionnaires returned out of 42 with 95% response rate. Following is a summary of the key findings based on returned questionnaires.

- ✧ All of those investigated residents expressed supportive attitude to the Project.
- ✧ It is considered by investigated stakeholders that the Project construction has increased their family income and improved local traffic.
- ✧ The main concerns of the stakeholder for the Project focused on noise during project construction.
- ✧ All the residents whose land was requisitioned have obtained jointly accepted compensation from the project owner.

E.3. Report on how due account was taken of any comments received:
>>
There were no negative comments received. The Project owner will pay sufficient attention to the comments and suggestions of stakeholders and will put all of the measures listed in the EIA into effect during construction and operation period, so as to achieve environmental benefits, social benefits and economic benefits.

The Project owner has signed *land expropriation agreement* with residents influenced by the Project in the assistance and supervision of local government. The standard for compensation has been determined according to related statute, local regulations and negotiation with local residents. At present the work of compensation for land requisition has completed under supervision of local government. The Project owner will also make efforts to minimize the impact to the production and living of local residents.

The noise from project construction is temporary and will not exist after project completion. Many measures of labor protection regarding the major public concerns have been adopted by the Project owner such as application of noise proof to the workers and appropriate arrangement of worker's living quarters.

The project owner will keep regular communication with the public regarding main concerns to construction and operation of the Project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>
No public funding from Annex I Parties is involved in the Project.

Annex 3

BASELINE INFORMATION

Data recommended in the *Notification on Determining Baseline Emission Factor of China's Grid* for the CSPG are adopted for the Project.

Table A1. Thermal power generation data within the CSPG in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	143351000	5.5	135,466,695
Guangxi	17079000	8.43	15,639,240
Guizhou	43295000	7.4	40,091,170
Yunnan	19055000	8.01	17,528,695
Total			208,725,800

Data source: China Electric Power Yearbook 2004.

Table A2. Thermal power generation data within the CSPG in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	169389000	5.42	160,208,116
Guangxi	20143000	8.33	18,465,088
Guizhou	49720000	7.06	46,209,768
Yunnan	24322000	7.56	22,483,257
Total			247,366,229

Data source: China Electric Power Yearbook 2005.

Table A3. Thermal power generation data within the CSPG in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	176453000	5.58	166606923
Guangxi	25023000	7.95	23033672
Guizhou	58430000	7.34	54141238
Yunnan	27281000	6.94	25387699
Total			269169531

Data source: China Electric Power Yearbook 2006.

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid*, Table A4 shows the low calorific values, emission factors and oxidation rates of fuels consumed for electricity generation that are to be used in the following OM emission factor calculation and BM emission factor calculation.

Table A4. Data of fuels consumed for electricity generation

Fuel type	Low calorific value	Emission factor (tC/TJ)	Oxidation rate
Raw coal	20908 kJ/kg	25.80	1
Cleaned coal	26344 kJ/kg	25.80	1
Other washed coal	8363 kJ/kg	25.80	1
Coke	28435 kJ/kg	29.20	1
Crude oil	41816 kJ/kg	20.00	1
Gasoline	43070 kJ/kg	18.90	1
Kerosene	43070 kJ/kg	19.60	1
Diesel	42652 kJ/kg	20.20	1
Fuel oil	41816 kJ/kg	21.10	1
Other petroleum products	38369 kJ/kg	20.00	1
Natural gas	38931 kJ/m^3	15.30	1
Coke over gas	16726 kJ/m^3	12.10	1
Other coal gas	5227 kJ/m^3	12.10	1
LPG	50179 kJ/m^3	17.20	1
Refinery gas	46055 kJ/m^3	15.70	1

Data sources: China Energy Statistical Yearbook 2006 edition, P287;

Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA

Table 1.3 and Table 1.4, Volume 2, "2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A5. Calculation of simple OM emission factor of the CSPG in 2003

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or 1000m^3) H	Emission[28] (tCO_2e) I
Coal	10^4t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20908	175993455.05
Cleaned coal	10^4t	0.05	0	0	0	0.05	25.8	100	26344	1246.07
Other washed coal	10^4t	0	0	36.38	20.37	56.75	25.8	100	8363	448971.84
Coke	10^4t	0	0	0	0.5	0.5	29.2	100	28435	13449.76
Coke oven gas	10^8m^3	0	0	0	0.04	0.04	12.1	100	16726	2968.31
Other coal gas	10^8m^3	3.21	0	0	11.27	14.48	12.1	100	5227	335797.81
Crude oil	10^4t	6.85	0	0	0	6.85	20	100	41816	210055.71
Gasoline	10^4t	0.02	0	0	0	0.02	18.9	100	43070	596.95
Diesel	10^4t	31.9	0	0	0.76	32.66	20.2	100	42652	1031759.27
Fuel oil	10^4t	627.22	0.3	0	0	627.52	21.1	100	41816	20301304.48
LPG	10^4t	0	0	0	0	0	17.2	100	50179	0.00
Refinery gas	10^4t	2.85	0	0	0	2.85	15.7	100	46055	87592.00
Natural gas	10^8m^3	0	0	0	0	0	15.3	100	38931	0.00
Other petroleum products	10^4t	11.35	0	0	0	11.35	20	100	38369	319357.98
Other energy	10^4tce	93.21			22.35	115.56	0	100	0	0.00
Net electricity import from the Central China Grid (MWh)						11100				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.797442				
Total emission of CSPG (tCO_2e)						198755407				
Fossil power supply of CSPG (MWh)						208736900				

Data sources: China Energy Statistical Yearbook 2004 Edition.

[28] If the unit of the fuel is 10^4 t, then I=E×F×G×H×44/12/10^4; if the unit of the fuel is 10^8 m^3, then I=E×F×G×H×44/12/10^3. The same about the calculation of I in Table A6 and Table A7.

Table A6. Calculation of simple OM emission factor of the CSPG in 2004

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or $1000m^3$) H	Emission (tCO_2e) I
Coal	10^4t	6017.7	1305	2643.9	1751.28	11717.88	25.8	100	20908	231767573.55
Cleaned coal	10^4t	0.21	0	0	0	0.21	25.8	100	26344	5233.50
Other washed coal	10^4t	0	0	0	0	0	25.8	100	8363	0.00
Coke	10^4t	0	0	0	0	0	29.2	100	28435	0.00
Coke oven gas	10^8m^3	0	0	0	0	0	12.1	100	16726	0.00
Other coal gas	10^8m^3	2.58	0	0	0	2.58	12.1	100	5227	59831.38
Crude oil	10^4t	16.89	0	0	0	16.89	20	100	41816	517932.98
Gasoline	10^4t	0	0	0	0	0	18.9	100	43070	0.00
Diesel	10^4t	48.88	0	0	1.83	50.71	20.2	100	42652	1601975.28
Fuel oil	10^4t	957.71	0	0	0	957.71	21.1	100	41816	30983494.25
LPG	10^4t	0	0	0	0	0	17.2	100	50179	0.00
Refinery gas	10^4t	2.86	0	0	0	2.86	15.7	100	46055	87899.34
Natural gas	10^8m^3	0.48	0	0	0	0.48	15.3	100	38931	104833.40
Other petroleum products	10^4t	1.66	0	0	0	1.66	20	100	38369	46707.86
Other energy	10^4tce	79.42	0	0	0	79.42	0	100	0	0.00
Net electricity import from the Central China Grid (MWh)						10951240				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.826448				
Total emission of CSPG (tCO_2e)						274226117				
Fossil power supply of CSPG (MWh)						258317469				

Data sources: China Energy Statistical Yearbook 2005 Edition

Table A7. Calculation of simple OM emission factor of the CSPG in 2005

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or 1000m^3) H	Emission (tCO_2e) I
Raw Coal	10^4t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442601.85
Clean Coal	10^4t				0.15	0.15	25.8	100	26344	3738.21
Other washed coal	10^4t			10.39	33.88	44.27	25.8	100	8363	350237.59
Coke	10^4t	4.79			8.05	12.84	29.2	100	28435	345389.71
Coke oven gas	10^8m^3				0.79	0.79	12.1	100	16726	58624.07
Other coal gas	10^8m^3	1.87			15.96	17.83	12.1	100	5227	413485.84
Crude oil	10^4t	10.91				10.91	20	100	41816	334555.88
Gasoline	10^4t	0.68				0.68	18.9	100	43070	20296.31
Diesel	10^4t	31.96	2.02		1.81	35.79	20.2	100	42652	1130638.84
Fuel oil	10^4t	887.21				887.21	21.1	100	41816	28702703.26
LPG	10^4t					0	17.2	100	50179	0.00
Refinery gas	10^4t	4.92				4.92	15.7	100	46055	151211.46
Natural gas	10^8m^3	0.93				0.93	15.3	100	38931	203114.71
Other petroleum products	10^4t	1.7				1.7	20	100	38369	47833.35
Other energy	10^4tce	104.66	133.15		59.72	297.53	0	100	0	0.00
Net electricity import from the Central China Grid (MWh)						96363000				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.771225				
Total emission of CSPG (tCO_2e)						369521975				
Fossil power supply of CSPG (MWh)						365532531				

Data sources: China Energy Statistical Yearbook 2006 Edition

The simple OM emission factor is weighted average value of simple OM emission factors of CSPG in 2003,2004,2005, as fellows:

$$EF_{OM,y} = (369521975 + 274226117 + 198755407)/(365532531 + 258317469 + 208736900)$$
$$= 1.011911 \ tCO_2e/MWh$$

Table A8 is data of the efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors with reference to the *Notification on Determining Baseline Emission Factors of China Power Grid* issued by Chinese DNA.

Table A8. The data of efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors

	Parameter	**Efficiency of supplying electricity**	**Fuel emission factor (tc/TJ)**	**Oxidation rate**	**Emission factor (tCO_2e/MWh)**
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	36.53%	25.8	0.98	0.9136
Gas-fired power plant	$EF_{Gas,Adv}$	45.87%	15.3	0.995	0.4381
Oil-fired power plant	$EF_{Oil,Adv}$	45.87%	21.1	0.99	0.6011

Data sources: Notification on Determining Baseline Emission Factors of China Power Grid

Table 1.3 and Table 1.4, Volume 2, "2006 IPCC Guidelines for National Greenhouse Gas Inventories"

Table A9. Data for calculating the thermal power emission factors

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total E=A+B+C+D	NCV (MJ/t or 1000m^3) F	Emission factor (tC/TJ) G	Oxidation Rate H	Emission (tCO_2e) I =E*F*G*H *44/12/100
Raw coal	10^4t	6696.47	1435	3212.31	1975.55	13319.33	20908	25.8	1	263442602
Cleaned coal	10^4t	0	0	0	0.15	0.15	26344	25.8	1	3738
Other washed coal	10^4t	0	0	10.39	33.88	44.27	8363	25.8	1	350238
Coke	10^4t	4.79	0	0	8.05	12.84	28435	29.2	1	345390
Sub-total										264141967
Crude oil	10^4t	10.91	0	0	0	10.91	41816	20	1	334556
Gasoline	10^4t	0.68	0	0	0	0.68	43070	18.9	1	20296
Kerosene	10^4t	0	0	0	0	0	43070	19.6	1	0
Diesel	10^4t	31.96	2.02	0	1.81	35.79	42652	20.2	1	1130639
Fuel oil	10^4t	887.21	0	0	0	887.21	41816	21.1	1	28702703
Other oil products	10^4t	1.7	0	0	0	1.7	38369	20	1	47833
Sub-total										30236028
Natural gas	10^7m^3	9.3	0	0	0	9.3	38931	15.3	1	203115
Coke oven gas	10^7m^3	0	0	0	7.9	7.9	16726	12.1	1	58624
Other coal gas	10^7m3	18.7	0	0	159.6	178.3	5227	12.1	1	413486
LPG	10^4t	0	0	0	0	0	50179	17.2	1	0
Refinery gas	10^4t	4.92	0	0	0	4.92	46055	15.7	1	151211
Sub-total										826436
Total										**295204431**

Data sources: China Energy Statistical Yearbook 2006..

Calculate with data provided in Table A8, A9 and formula (4)~(6), the value for

$$\lambda_{Coal} = 89.48\% ,$$

$$\lambda_{Oil} = 10.24\% ,$$

$$\lambda_{Gas} = 0.28\% ,$$

Then

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

$$= 0.9117 \text{ tCO}_2\text{e/MWh}$$

Table A10. Installed capacity of the CSPG in 2003

	Guangdong	Guangxi	Yunnan	Guizhou	Tianshengqiao	Total
Thermal power (MW)	27231.4	3190.1	3556.8	6465.8	0	40444.1
Hydro power (MW)	8107.2	4525.2	6543.2	3713.7	2520	25409.3
Nuclear power (MW)	3780	0	0	0	0	3780
Wind power and Other (MW)	83.4	0	0	0	0	83.4
Total (MW)	39202	7715.3	10100	10179.5	2520	69716.8

Data source: China Electric Power Yearbook 2004.

Table A11. Installed capacity of the CSPG in 2004

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	30172.9	4378.1	4306.9	7801.8	46659.7
Hydro power (MW)	8584.6	5040.4	7058.6	6896.5	27580.1
Nuclear power (MW)	3780	0	0	0	3780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	42621	9418.5	11365.5	14698.3	78103.3

Data source: China Electric Power Yearbook 2005.

Table A12. Installed capacity of the CSPG in 2005

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	35182.6	4931.2	4758.4	9634.8	54507
Hydro power (MW)	9035.7	6085.3	7993.1	7233	30347.1
Nuclear power (MW)	3780	0	0	0	3780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	48081.7	11016.5	12751.5	16867.8	88717.5

Data source: China Electric Power Yearbook 2006.

Table A13. Calculation of BM emission factor of the CSPG

	Installed capacity in 2003 (MW) A	Installed capacity in 2004 (MW) B	Installed capacity in 2005 (MW) C	Capacity additions from 2003 to 2005 (MW) D=C-A	Share in total capacity additions
Thermal power	40444.1	46659.7	54507	14062.9	74.01%
Hydro power	25409.3	27580.1	30347.1	4937.8	25.99%
Nuclear power	3780	3780	3780	0	0.00%
Wind power and Other	83.4	83.4	83.4	0	0.00%
Total	69716.8	78103.3	88717.5	19000.7	100.00%
Share in total installed capacity of 2005	78.58%	88.04%	100%		

$$EF_{BM,y} = 0.9117 \times 74.01\% = 0.6748 \ \ tCO_2e/MWh。$$

Annex 4

MONITORING INFORMATION

Please refer to section B.7. No need to complement more information here.