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

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / Crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: Yunnan Province Luxi City Wanma River 2nd Level Hydropower Station
Version: 4.0
Date: 06/11/2009

Revision History of the PDD

Version	Date	Comments
Version 1.0	23/04/2008	Complete version of the PDD, prepared for the host country approval process
Version 2.0	19/09/2008	Revised PDD; prepared for GSP
Version 3.0	17/03/2009	Revised PDD according to Draft Validation Report
Version 3.1	27/04/2009	Revised PDD according to the first comments
Version 3.2	23/06/2009	Revised PDD according to the second comments
Version 3.3	07/07/2009	Revised PDD according to the third comments
Version 3.4	04/08/2009	Revised PDD according to the fourth comments
Version 4.0	06/11/2009	Revised PDD after the first completeness check

A.2. Description of the project activity:

Yunnan Province Luxi City Wanma River 2nd Level Hydropower Station (hereafter referred to as "the project") is located upstream of Wanma River, in Zhongshan Town, Luxi City, Dehong Dai-Jingpo Autonomous Prefecture (hereafter referred to as "Dehong Prefecture"), Yunnan Province, China. It is a diversion type run-of-river hydropower station, which is constructed and operated by Luxi City Qinrui Wanma River Power Exploring Co., Ltd.[1] The installed capacity of the project is 18.9MW, and the surface area of the new reservoir at full water level is 0.02km^2, and the power density is corresponding to be 945W/m^2. The average annual theoretical utilization hours of the project are 5,080hours, the average annual theoretical electricity generation is 96,012MWh[2], and the annual net electricity supplied to the grid is 83,590MWh[3].

[1] The project owner acquired the development right through the local government approval (document No. DZF[2007]58) on April 26, 2007. The Wanma River is the first grade branch on the right bank of the Nujiang River, and the project is the second level hydropower station on the Wanma River. The dam is about 160m downstream from the conjunction of Wanma River and Gantanxiang River, a tributary of Wanma River, and the power house is 7,071m downstream from the dam, is located on the right bank of the Wanma River.

[2] calculated as: Annual theoretical power generation = Total installed capacity * Annual theoretical utilization hours = 18.9MW * 5,080h = 96,012MWh

[3] calculated as: Annual net power supplied to the grid = Annual theoretical power generation * Coefficient of effective electricity * (1 – Rate of power consumption by plant). Rate of power consumption by plant = 0.5%, which is determined based on the *Regulation of Development Programming of Electrical Power in the Region Mainly Supplied by Rural Hydropower* (SL22-92, published by the Ministry of Water Resources of China). Considering the grid load characteristics, the coefficient of effective electricity of 87.5% is employed by the project, because: based on the *Economic Evaluation Code for Small Hydropower Projects* (Document No. SL16-95, published by the Ministry of Water Resources of China), for run-of-river without regulation abilities (the grid will only take part of the electricity generated in rainy season and night), the coefficient of effective electricity should choose 70%-80%, the 87.5% used by the project is conservative; in addition, the project connected to the Dehong Prefecture Grid where hydropower generation consists of nearly 100%, and due to the limited absorption ability, the Grid Company is not able to buy all of the electricity that could potentially be generated by the plants during the rainy season and

The construction of the project activity mainly consists of a dam, diversion channel, pressure forebay, and power house, which will employ three units of CJA475-W-130/2×13.5 turbines and three units of SFW6300-10/2150 generators matched with the three turbines. The electricity generated by the project will be transmitted to the Dehong Prefecture Grid via the Zhongshan Transformer Substation, then to the Yunnan Grid and finally to the South China Power Grid.

The electricity generated by the project should have been supplied by the South China Power Grid prior to the start of the implementation of the project activity, which is the same as the baseline scenario.

The project will transmit renewable hydropower to the South China Power Grid, substitute for relevant generation from fuel-fired power plant of the South China Power Grid (main emission: CO_2), and consequently reduce Greenhouse Gas emissions amount to 72,824tCO_2e annually.

Contribution to sustainable development:

The hydropower is a renewable clean energy project without exhausting the fossil fuel. The development of the project is in compliance with the developing objective of the Chinese energy industry, and it will contribute to the sustainable development of the energy industry, especially that the electricity industry. The main contribution includes:

- Reducing reliance on exhaustible fossil fuel;
- Reducing the emission of pollutant resulting from burning fossil fuel;
- Supplying the electricity for local producing and living;
- Providing employment opportunities, increasing incomes and improving quality of life.

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)
Peoples Republic of China (host)	Luxi City Qinrui Wanma River Power Exploring Co., Ltd. (as the project owner)	No
Japan	Electric Power Development Co., Ltd. (as the CERs 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.		

More detailed contact information on project participants are given in Annex 1.

(continued, Footnote 3)
valley power consumption load periods, so during these periods, the projects have to stop operation, and about 19.02%~28.3% of total potential annual power generation cannot be generated (*Feasibility Study Report*, page No. 4-19). Hence, the coefficient of effective electricity of 87.5% is conservative. Even if a coefficient of effective electricity of 100% is applied in the project, the post-tax project IRR would be lower than the benchmark of 10%. Therefore annual net power supplied to the grid = 96,012MWh * 87.5% * (1-0.5%) = 83,590MWh.

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:

Zhongshan Town, Luxi City, Dehong Prefecture

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

The project is located in Zhongshan Town, Luxi City, Dehong Prefecture, Yunnan Province, China. The dam is about 160m downstream from the conjunction of Wanma River and Gantanxiang River, a tributary of Wanma River, and the geographical coordinates of the dam is longitude of 98°39'18"E and the latitude of 24°08'21"N. The power house, which is 7,071m downstream from the dam, is located on the right bank of the Wanma River and the geographical coordinates of the power house is longitude of 98°39'40"E and the latitude of 24°11'35"N.

The map indicating the location of the project site is provided in Figure A.1:

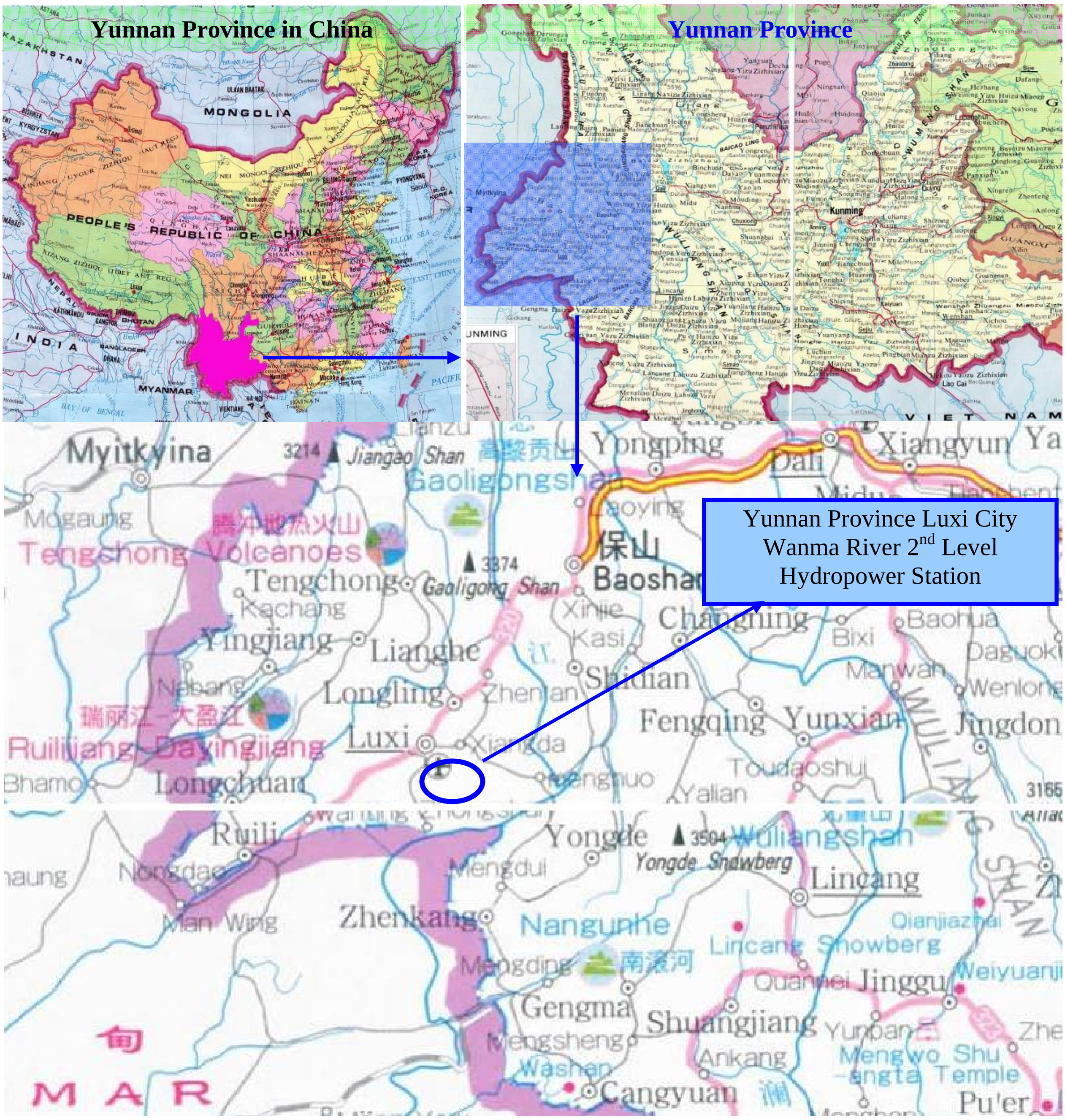


Figure A.1 the Location of Yunnan Province Luxi City Wanma River 2nd Level Hydropower Station

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

Sectoral Scope: Scope Number 1; Energy industries (renewable -/ non-renewable sources)

The project activity falls under the category described under CDM as “Sectoral Scope Number 1: Energy Industries – Renewable Sources”.

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

The scenario existing prior to the start of the implementation of the project activity (the same as baseline scenario):

The electricity generated by the project should have been supplied by the South China Power Grid prior to the start of the implementation of the project activity, which is the same as the baseline scenario. The South China Power Grid is dominated by electricity generated by thermal power plants[4], whose by-products are GHGs (main emissions: CO_2).

The project scenario:

Total installed capacity of the project is 18.9MW and the surface area of the new reservoir at full water level is 0.02km^2, therefore the power density is 945W/m^2, much more than 10W/m^2. According to the methodology ACM0002 (Version 07), the project emission can be ignored.

The project is a diversion run-of-river hydropower station, which mainly consist of a dam, diversion channel, forebay, penstock, and power house. The elevation of the dam top is 1,073m. The elevation of the forebay is 1,066.4m. The elevation of the turbine generators is 699.5m. The rated water head of the project after water head loss is 360.8m. The rated water flow of the penstock is 6.33m^3/s. The project will employ three units CJA475-W-130/2×13.5 hydro turbines and three units SFW6300-10/2150 generators matched with the three units of turbines.

The key technical parameters are shown in Table A.1:

Table A.1 Technical parameters of the equipments

	Parameter	Value	Data source
Turbine	Units	3	*Equipment Technological Agreement*
	Model	CJA475-W-130/2×13.5	
	Manufacturer	Chongqing Yunhe Hydropower Equipments Co., Ltd.	
	Rated Water Head	350.0m	
	Rated Rotational Speed	600r/min	
	Rated Output	6.635MW	
	Rated efficiency	89%	
	Lifetime	20 years	
	Manufacture Date	September 2008	Nameplates of the equipments
Generator	Units	3	*Equipment Technological Agreement*
	Model	SFW6300-10/2150	
	Manufacturer	Chongqing Yunhe Hydropower Equipments Co., Ltd.	
	Rated Output	6.3MW	
	Rated Voltage	6.3kV	
	Rated Rotational Speed	600 r/min	
	Efficiency	96%	
	Lifetime	20 years	
	Manufacture Date	September 2008	Nameplates of the equipments

Note: the lifetime of the equipments, 20 years, is sourced from the FSR.

The electricity generated by the project combined the electricity generated by other three hydropower stations, which are also developed by the same project owner, and then the combined electricity

[4] See table 1 of Annex 3. Electricity generated by thermal power plants constitutes for 70.25% of the total electricity generated in the South China Power Grid.

transmitted to the Zhongshan Transformer Substation and connected to the Dehong Prefecture Grid, then to the Yunnan Grid, and finally to the South China Power Grid. The project will employ 10 meters in the project site to measure the electricity supplied to the grid by the project and the electricity supplied to the project from the grid to the project, and finally to obtain net electricity supplied by the project. (See details in Section B.7.2)

The project will have a limited impact on the local environment as most of the impacts are temporary and the project will employ measures to minimize the impacts. More detailed information regarding the impact on the environment is provided in Section D.1 of this PDD.

There is no technology transfer due to all the technology employed is domestic.

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

The project activity employs the renewable crediting period (7 years×3), and the estimation of the emission reductions during the first crediting period (from October 2009 to September 2016) is presented in Table A.2. Estimated emission reductions throughout the first crediting period are 509,768tCO_2e.

Table A.2 the Estimation of the Emission Reductions in the Crediting Period

Years	Annual estimation of emission reductions in tCO_2e
Year 1: 01/10/2009-30/09/2010	72,824
Year 2: 01/10/2010-30/09/2011	72,824
Year 3: 01/10/2011-30/09/2012	72,824
Year 4: 01/10/2012-30/09/2013	72,824
Year 5: 01/10/2013-30/09/2014	72,824
Year 6: 01/10/2014-30/09/2015	72,824
Year 7: 01/10/2015-30/09/2016	72,824
Total estimated reductions (tCO_2e)	509,768
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO_2e)	72,824

A.4.5. Public funding of the project activity:

There is no official funding from Annex I parties available to the project, which can be demonstrated by the project financing.

Project financing [5]
Self-raised capital[6]: 60,000,000Yuan RMB
Long term loan[7]: 60,000,000Yuan RMB
(the interest rate is the floating interest rate according to China Central Bank)

[5] The capital raised will be increased if the investment of the project increases.
[6] The registered capital of the project owner is 60,000,000Yuan RMB, with reference to the business licence of the project owner.
[7] Loan contract with the Bank of China signed on May 5, 2008.

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:

Baseline methodology:

Approved consolidated baseline methodology ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 07.*

The *"Tool to calculate the emission factor for an electricity system", Version 01.1* is used to calculate the emission factor.

The *"Tool for the demonstration and assessment of additionality", Version 05.2* is used to demonstrate and assessment the additionality.

The methodology and tools can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The baseline and monitoring methodology ACM0002 is applicable to the project, because the project meets all the applicability criteria stated in the methodology:

1. The project activity is connected to the South China Power Grid, and the electricity is generated from hydro power plant;
2. The installed capacity of the project is 18.9MW, and the reservoir surface area at full water level is $0.02km^2$. The project activity results in new reservoir and the power density of the power plant is $945W/m^2$, which is greater than $4W/m^2$;
3. The geographic and system boundaries for the South China Power Grid can be clearly identified and the information on the characteristics of the grid is available.
4. The specific project activity does not involve fuel switching from fossil fuels;

Therefore, the baseline methodology is applicable to the project activity.

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

According to the definition of project boundary by ACM0002, the spatial extent of the project boundary includes the project power plant and all power plants connected to the electricity system that the project is connected to.

The electricity system is defined according to *"Tool to calculate the emission factor for an electricity system"*.

In this specific case, the power generated by the project will be transferred to the South China Power Grid. The South China Power Grid is a larger regional grid, which consists of four sub-grids: Yunnan, Guizhou, Guangdong, and Guangxi Grids. According to the guidance given above, and considering the substantial inter-grid power exchange throughout the South China Power Grid, it is justifiable to identify the South China Power Grid as the correct project boundary for this specific project. As there is net import power from the Central China Power Grid, the Central China Power Grid will be included into project boundary.

Table B.1 Emissions sources included in or excluded from the Project Boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source. According to ACM0002, the emission can be ignored for conservative purpose.
		N_2O	No	Minor emission source. According to ACM0002, the emission can be ignored for conservative purpose.
Project Activity	Emissions of CH_4 from the reservoir	CO_2	No	Minor emission source. According to ACM0002, the emission can be ignored.
		CH_4	No	The power density of the project is 945W/m^2, which is far greater than 10W/m^2. According to ACM0002, CH_4 emissions are not considered.
		N_2O	No	Minor emission source. According to ACM0002, the emission can be ignored.

The below flow diagram physically delineates the project activity and its relevant information.

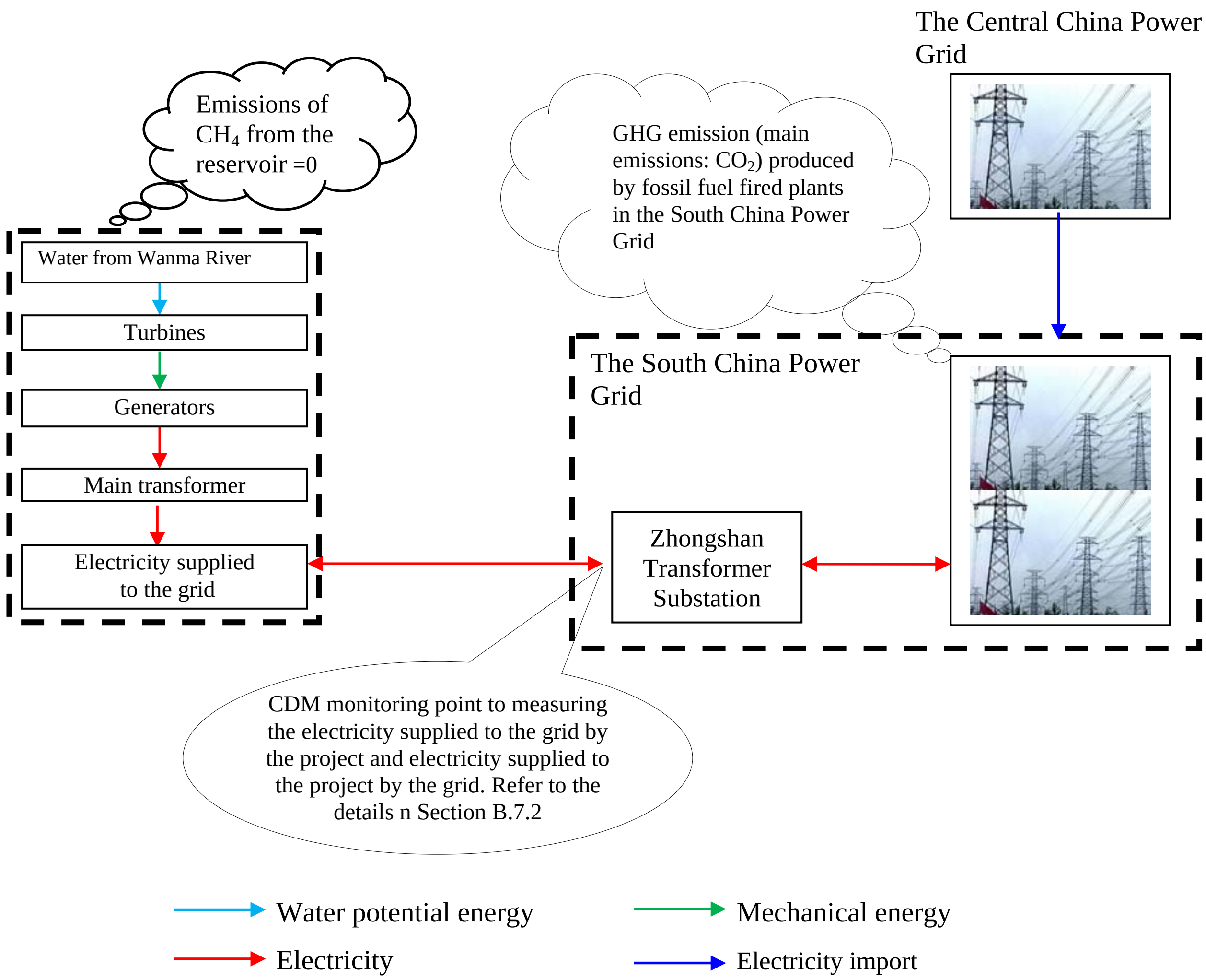


Figure B.1 Project Boundary

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

The project activity is the installation of a new grid-connected renewable power plant/unit, and the electricity generated will be transmitted to the South China Power Grid through the Yunnan Grid. The South China Power Grid is regional Grid which consists of four sub-grids: Yunnan, Guizhou, Guangdong, Guangxi Grids. According to ACM0002, the baseline scenario of the project is:

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

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

The *Feasibility Study Report* (FSR) was completed in May 2007 by Dehong Prefecture Water Conservancy and Electric Power Survey and Design Institute (hereinafter referred to as "the Institute"). It substantiates that the IRR of the project was lower than the benchmark of 10%[8] and the project lacks financial attraction. However, based on the suggestion from the Institute and CDM information from the website (http://cdm.ccchina.gov.cn/web/index.asp), the project owner knew the CDM revenues can improve the IRR of the project. Therefore the project owner made Directorate Decision and decided to apply for CDM project on June 7, 2007, and submitted the support request letter to the local government on CDM application on June 12, 2007. During this period, the project started to look for CDM consulting companies to assist the CDM application, and sent the Commission Letter on CDM application to Beijing Tianqing Power International CDM Consulting Co., Ltd. (hereinafter referred to as "Beijing Tianqing") on June 22, 2007. Subsequently, the project owner received supporting letter from the local government on July 2, 2007. The project owner and Beijing Tianqing signed the PDD Development Agreement on September 10, 2007 and Beijing Tianqing started the document collecting for PIN and draft PDD writing. Afterwards, the project owner finally signed the Purchase Contract of Turbines and Generators on October 8, 2007 (**the earliest starting date of the project activity**). Therefore, it is obvious that the project owner was aware about CDM revenues before the investment decision of the project and CDM has played a decisive role in the successful implementation of the project.

Considering the important role of CDM revenues on the implementation of the project, the project owner required the Beijing Tianqing to submit the PIN and draft PDD for guaranteeing the project registration in time. The project owner and Beijing Tianqing signed the PDD Development Agreement on September 10, 2007. Then based on the requirement of the project owner, Beijing Tianqing started to write PIN and PDD and then submitted them to the project owner several months later. During this period, in order to meet the requirement of CDM application, the Stakeholders Consulting Meeting was held on January 9, 2008. At the same time, Beijing Tianqing introduced the project to Electric Power Development Co., Ltd. and after simple due diligence, the Letter of Intent (LoI) with Electric Power Development Co., Ltd. was signed on January 15, 2008. Considering the efficiency and quality of the PIN and draft PDD, and the LoI signed with the buyer, the project owner signed the CDM Cooperation Contract with the project owner on March 12, 2008.

After the negotiation, the buyer and the project owner signed the ERPA on August 14, 2008. At the same period, in August 2008, the project was submitted to China DNA for CDM application approval[9], and China DNA approved the project as a CDM project, which has been announced on the China DNA website[10]. On October 8, 2008, the project was submitted for GSP. On November 5 and 6 2008, the project was on-site validated. Since then, the CDM application work was going on smoothly.

Therefore, the real and concrete actions to secure registration as a CDM project activity have been continuously taken in parallel with its implementation.

It is obvious that CDM has played a decisive role in the implementation of the project. The main events related to the consideration of CDM in the decision to proceed with the project activity are illustrated in the table below. An overview of key events is given in Table B.2.

[8] The benchmark will be demonstrated in the investment analysis section.

[9] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1902.pdf
The time when the project was submitted to China DNA for CDM application is prior to the time of the bulletin of China DNA audit meeting is August 18, 2008

[10] http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new3212.pdf

Table B.2 Overview of Key Events of the Project Activity

Date	Key Events
05/2007	The FSR of the project was completed, and in the FSR, the IRR is lower than the benchmark, therefore, the Institute suggested the project owner to apply for CDM to improve financial attraction of the project.
07/06/2007	The project owner seriously considered CDM revenue, and the Directorate Decision was made to apply for CDM project.
12/06/2007	The project owner submitted the support request letter to the local government on CDM application.
22/06/2007	The project owner sent Commission Letter on CDM application to Beijing Tianqing.
02/07/2007	The project owner received the local government supporting letter.
27/07/2007	The FSR of the project was approved by local Development and Reform Committee
10/09/2007	The project owner and Beijing Tianqing signed the PDD Development Agreement.
08/10/2007	The Purchase Contract of Turbines and Generators was signed.(**the earliest starting date of the project activity**)
24/12/2007	The construction contract was signed.
09/01/2008	Stakeholders Consulting Meeting was held for CDM application.
15/01/2008	LoI with Electric Power Development Co., Ltd. was signed.
21/01/2008	The project started construction.
12/03/2008	The project owner and Beijing Tianqing signed the CDM Cooperation Contract.
08/2008	The project was submitted to China DNA for CDM application approval
14/08/2008	ERPA with Electric Power Development Co., Ltd. was signed.
02/09/2008	China DNA approved the project as a CDM project on the China DNA website.
08/10/2008	The GSP was started from 08/10/2008 to 06/11/2008
28/10/2008	Paper pattern China LoA
05/11/2008~ 06/11/2008	On-site validation
30/04/2009	The project will start commissioning.
07/2009	The project will start Operation.

The additionality of the project activity is demonstrated using the *“Tool for the Demonstration and Assessment of Additionality”* as follows:

<u>Step 1. Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations</u>

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

This methodological step requires a number of sub-steps, the first of which is the identification of realistic and credible alternatives to the project activity. There are only a few alternatives that are prima facie realistic and credible in the context of the South China Power Grid:

1. The specific hydropower activity, without being registered as a CDM project activity;
2. Thermal power plant with equivalent annual power generation;

3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent annual power is supplied by the South China Power Grid.

There is lack of tide, wave and geothermal power [11] in the project area. In addition, the project site is out of the region with abundant wind power [12]. Moreover, solar energy power generation cost is too high to gain investment attraction [13], which cannot be industrialized under the recent technology conditions. Besides, no biomass power plant with a similar scale to the project has previously been built in the region where the project is located, and biomass power plants face some barriers, such as high investment [14], lacking of operating experience and low benefit [15], are necessary to apply for CDM for retaining normal operation. Lastly, there is no electricity generation of Yunnan province utilizing other renewable energy resources than hydropower listed in the *China Electric Yearbook* 2004~2007. Therefore, the alternative 3 is not feasible.

Sub-Step 1b. Consistency with Mandatory Laws and Regulations

In 2006, the average utilizing hours of thermal power plants could reach 5,633 hours [16]. If considered the thermal power plant with the equivalent annual power generation, the installed capacity should be 17MW. However, according to the Notice on Strictly Prohibiting the Installation of thermal Generators with the Capacity of 135MW or below issued by the General Office of the State Council, thermal power plants under 135MW are prohibited to construct [17].Therefore, the Alternative 2 does not comply with Chinese relevant laws and regulations; thus it is not a feasible baseline scenario.

In summary, the proposed activity is not the only scheme, which is in compliance with the Chinese relevant laws and regulations and the project is not compelled to enforce by Chinese or local relevant laws and regulations. Thus it has the assumption condition to additionality.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The additionality tool provides three investment analysis options which are: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since this specific project has the revenues from the sales of electricity and the fourth alternative isn't a specific investment project, we choose option III, i.e. benchmark analysis to this specific project.

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

The *Feasibility Study Report* was completed by the Institute based on the Chinese *Economic Evaluation Code for Small Hydropower Project* (SL16-95) (hereafter referred to as "the document SL16-95"). Based on the benchmark IRR rate from the document SL16-95, the post-tax project IRR of electric power

[11] Restricted to geographical conditions
[12] http://www.in-en.com/newenergy/news/china/2007/05/INEN_96042.html
[13] http://usstock.jrj.com.cn/2008/07/041106973549.shtml
http://www.bmlink.com/bst/21904/
Presently solar power generation cost is higher than 3~5yuan/kWh. It deprives the feasibility of commercial solar power generation investment.
[14] http://ac.agri.gov.cn/ac/ViewContent.do?id=4affaa20110219f101116d279548047d&year=2007&month=3&right=!ENCODEtkc1vlOItllg1Oe.
[15] http://www.86ne.com/Biomass/200712/Biomass_103227.html
[16] China Electric Power Yearbook 2007, page No.20
[17] Notice on Strictly Prohibiting the Installation of thermal Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.

projects with a total installed capacity below 50MW should not be lower than the threshold of 10%. Therefore, we calculate post-tax project IRR for investment analysis.

The document SL16-95 belong to the Professional Standards of People's Republic of China which was approved and published by the Ministry of Water Resources of the People's Republic of China on June 2, 1995 and began to take effect on July 1, 1995[18]. In this document, the small hydropower project is defined as: the station with installed capacity no more than 50MW. In 2002, the Ministry of Water Resources of the People's Republic of China issued the "Bulletin of Valid Hydropower Technical Standard", which confirmed the document SL16-95,is still in validity and enforceable[19]. Additionally, this benchmark is still in effect in 2008.[20]

In addition, since 1995, the institutes on hydropower aspect in China generally apply the document (SL16-95) to make out Feasibility Study Reports (FSRs), Preliminary Design Reports (PDRs), and relevant reports.

The installed capacity of the project is 18.9MW, which lower than 50MW. Therefore, the benchmark of 10% in the document SL16-95 is applicable to the project.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

All input values used for IRR calculation are from the approved FSR, which was completed by the Institute in May 2007, and the Institute has obtained C grade in water conservancy industry, electricity industry (hydropower) and a C grade in engineering investigation industry (engineering survey), issued by the Construction Bureau of Yunnan Province. In addition, the FSR was completed before investment decision (October 8, 2007, the earliest starting date of the project); therefore, the period of time between the finalization of the FSR and the investment decision is sufficiently short. As the FSR has been completed by an independent and certified institute and approved by local government, and the period of time between the FSR and the investment decision is sufficiently short, the FSR, therefore, can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation.

According to the document SL16-95, the input values in the investment analysis should use the "current" fixed data. The "current" means the time of making investment decision.

The basic parameters for calculation key financial indexes are provided in Table B.3:

Table B.3 the Basic Financial Parameters of the project

Parameters	Value	Source
Installed capacity (MW)	18.9	*FSR*, page No.16-1~16-17
Annual net electricity supplied to the grid (MWh)	83,590	
Static total investment (Yuan RMB)	98,126,900	
Grid price (Yuan RMB/kWh, with VAT)	0.171	
VAT (%)	6	

18 http://www.cws.net.cn/guifan/bz/SL16-95/

19 http://www.ches.com.cn/jishubiaozhun/001.htm

20 http://www.giwp.org.cn/index.do?act=mess&modu=160&mess=361 confirmed by Water Resources and Hydropower Planning and Design General Institute of the Ministry of Water Resources of the People's Republic of China

Annual depreciation rate (%)	4.8	
Depreciation period (years)	20	
Residual value (%)	4	
Fair value of project activity assets at the end of the assessment period (Yuan RMB)	3,925,100	
Corporate income tax (%)	25	
Annual operating cost (Yuan RMB)	2,345,900[21]	

The post-tax project IRR of the project activity is provided in Table B.4.

Table B.4 Post-tax project IRR of the project activity

	post-tax project IRR
Without CDM revenue	7.46%[22]
With CDM revenue	12.56%[23]

From Table B.4 we can find that the post-tax project IRR is 7.46% without CDM revenue. Based on the benchmark revenue rate in the financial evaluation of the document SL16-95, the post-tax project IRR should not be lower than the threshold of 10%. Therefore, the project faces obvious financial barriers without CDM revenue. However, the post-tax project IRR will reach 12.56% with CDM revenues (CERs price is €8.50/tCO_2e [24], €1=10Yuan RMB), which is higher than 10%. Therefore, the CDM revenue can improve the economical attraction of the project.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

The sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. The following parameters are assumed to be critical assumptions:

- Annual net electricity supplied to the grid
- Grid price
- Static total investment
- Annual operating cost

Variations of ±10%[25] have been considered in the critical assumptions. Table B.5 summarizes the results of the sensitivity analysis, while Figure B.2 provides a graphic depiction.

Table B.5 Impact of Variations in Critical Assumptions on post-tax project IRR

[21] Based on the Guidance on the *Assessment of Investment Analysis* (EB41, Annex 45), the cost of financing expenditures (i.e. loan repayments and interest) should not be included in the calculation of project IRR. Therefore, the PDD applies the Static Total Investment other than Dynamic Total Investment to calculate post-tax project IRR. Correspondingly, the annual operating cost is different from that in the FSR.

[22] Post-tax project IRR in the PDD without CDM differs from those in the FSR because of the reason described in the previous footnote. The difference in the total investment results between the IRR calculation of the PDD and the FSR in the difference in the annual operating cost and corporate income tax, and consequently the post-tax project IRR in the PDD is different from that of the FSR.

[23] Post project IRR in the PDD with CDM differs from those in the FSR because of CERs calculation, CERs price, and loan interest (as described above).

[24] ERPA

[25] fluctuation of ±10% refers to FSR, which is also the traditional sensitivity analysis range in China

	-10%	-5%	0%	5%	10%
Annual net electricity supplied to the grid	6.07%	6.77%	7.46%	8.14%	8.80%
Grid price	6.07%	6.77%	7.46%	8.14%	8.80%
Static total investment	8.82%	8.11%	7.46%	6.86%	6.31%
Annual operating cost	7.70%	7.58%	7.46%	7.34%	7.22%

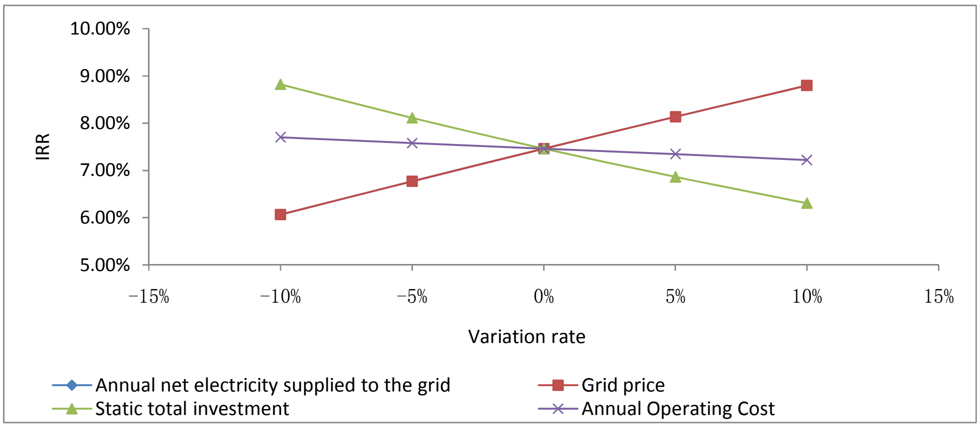


Figure B.2 The post-tax project IRR Sensitivity Analysis with changes of Annual net electricity supplied to the grid, Grid price, Static total investment, and Annual operating cost

The benchmark analysis showed that the post-tax project IRR of this project without CDM revenues is substantially below the benchmark of 10%. Changes in annual operating cost have little impact on the post-tax project IRR. Changes in the grid price, annual net electricity supplied to grid and the static total investment have a more significant impact on the post-tax project IRR, but with maximum variations of 10% the post-tax project IRR remains below the benchmark.

- With an increase in annual net power supplied to grid by 10%, the post-tax project IRR of the project is 8.80%, less than 10%. When annual net power supplied to grid is increased by 19.3%, the post-tax project IRR of the project can outreach benchmark of 10%. However, the annual power generation, as well as the installed capacity and the annual utilization hours of the project is calculated according to the hydrological data of more than 35 years[26] and will not impose significant changes in normal situations. Therefore, it is impossible to increase annual net power supplied to grid to improve post-tax project IRR.
- With an increase in the grid price by 10%, the post-tax project IRR of the project is 8.80%, less than 10%. When the grid price is increased by 19.3%, the post-tax project IRR of the project can surpass the benchmark of 10%. It is unlikely that the grid price will increase by 20%, because: The local government regulates the grid price of 0.20Yuan RMB/kWh in dry season (from January to May) and 0.15Yuan RMB/kWh in flood season (from June to December) (*Regulation of Dehong Government on Grid Price Adjustment of Dehong Power Grid*, No. [2003]367), with an average grid price of 0.171Yuan RMB/kWh, which is the same as the grid price in the FSR. In addition, the government of China has to make the grid price steady since the grid price is related tightly to the national economy and livelihood of people. Furthermore, as analyzed in the *FSR*, the power

[26] *Feasibility Study Report*, Chapter 2, Hydrological Conditions

supply exceeds the electricity demand;[27] therefore, the grid price will not increase after the project starts operation considering the balance of electricity supply and demand. Therefore, it is very unlikely for the project to become commercially attractive through an adjustment of the grid price.

- With a decrease in the static total investment by 10%, the post-tax project IRR is only 8.82%, less than 10%. When static investment is economized by 17.4%, the post-tax project IRR of the project can reach benchmark of 10%. However, the possibility that this assumption occurs is zero because the actual static total investment till February 2009 is 106,920,000 Yuan RMB[28] which has already exceeded the expected value of 98,126,900 Yuan RMB in FSR. Thus it is impossible to improve the economic attraction due to the increase in static total investment.
- With a decrease in the annual operating cost by 10%, the post-tax project IRR would only rise by 0.24% which is very little. And even if the annual operation cost is cut to be zero, the post-tax project IRR of the project can't reach benchmark of 10%. Therefore, it is impossible to adjust annual operational cost to raise the post-tax project IRR significantly.
- In addition, in order to further demonstrate the above conclusion, the fluctuations of grid price and annual operation cost have been considered. According to the data from the year 2001 to 2007 of 'Statistical Yearbook of China 2008', the annual increase rate of electricity price is about 2.2% on average, while the annual increase rate of operating cost is calculated with annual increasing rate of payroll, annual increase rate of material purchase price, and annual increase rate of fixed assets investment price. According to the data from the year 2001 to 2007 of 'Statistical Yearbook of China 2008', the annual increasing rate of payroll was about 15.8%, annual increase rate of material purchase price was about 4.5%, and annual increase rate of fixed assets investment price was about 2.2%. Based on these data, the annual increase rate of the operating cost is about 5.6% (Weighted Mean Value). By applying the annual increase rate of electricity price and the annual increase rate of operating cost, the IRR without CER revenue would be 8.57%, which is lower than benchmark. Therefore, it is impossible to improve the financial attraction through adjust the grid price or annual operation cost.

The results of the sensitivity analysis therefore confirm that the project faces significant economic and financial barriers.

In conclusion, without the consideration of the revenue from CERs, the conclusion that the project activity lacks commercial attraction is evident, so the specific project is in shortage of commercial attraction.

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 Additionally*, projects are considered "similar" in case they are located in the "same county/region", are of "similar scale", and "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc".

Yunnan Province, with an area of 394,000 km^2, is comparatively and considerably larger than many countries. According to the requirements of common practice, the projects with similar conditions, such as investment conditions and natural conditions (including geographical conditions, climate conditions, development conditions and so on), are necessary to be analyzed. Projects located in different provinces of

[27] *Feasibility Study Report*, page 4-21~4-26
[28] *Financial Statements* of the project

the South China Power Grid do not have the similar investment conditions [29] and natural conditions [30, 31, 32, 33, 34]. Therefore, the PDD selects geographical area, i.e. Yunnan Province, as a common practice region.

We have selected hydropower stations with a similar installed capacity and have taken a wide range of installed capacities (15[35]-50MW [36]). In addition, there are other projects with a similar scale which are (or were) under construction or operation in Yunnan Province and are benefiting from or applying for CDM support [37]. According to the "*Tool for the demonstration and assessment of additionality*", these projects are not to be included in this analysis.

Therefore, we list projects hydropower stations which have been finished construction located in Yunnan Province but not benefiting from or applying for CDM support between 15MW and 50MW in Table B.6.

Table B.6 Existing hydropower stations similar to the project

Name of hydropower plant	Installed Capacity (MW)	Start Operation	Location	Project owner/largest stockholder
Luoze River Hydropower Project	25	1987[38]	Zhaotong County	-
Supa River Sanjiangkou Hydropower Project	30	1993[39]	Baoshan City Tengchong	-
Yisa River Hydropower Project	26.6	1994[40]	Yuxi City Yuanjiang County	-
Laohushan II Hydropower Project	25	1998[41]	Chuxiong Perefeture	-

[29] Yearbook of China Water Resources 2006
[30] http://www.hydrochina.com.cn/zgsd/zgsd_zy.jsp
[31] http://www.hydrochina.com.cn/shuigis/province/provincedetail.jsp?provinceID=17
[32] http://www.hydrochina.com.cn/shuigis/province/provincedetail.jsp?provinceID=21
[33] http://www.hydrochina.com.cn/shuigis/province/provincedetail.jsp?provinceID=16
[34] http://www.hydrochina.com.cn/shuigis/province/provincedetail.jsp?provinceID=22
[35] According to UNFCCC, the project below 15MW is defined as the small-scale project. And according to *Tool for the demonstration and assessment of additionality*, If necessary data/information of some similar projects are not accessible for PPs to conduct this analysis, such projects can be excluded from this analysis" (Additionality tool version 5.2). In the Yearbook of China Water Resources 2006 and 2007, the official authority statistics, there are no any hydropower project with installed capacity below 15MW, thus projects with installed capacity lower than 15MW were not analysed in PDD.
[36] Almanac of China's Water Power (2005), page 141. Chinese government classifies hydropower stations between 0.5MW and 50MW (including 0.5MW and excluding 50MW) as small scale projects. Besides, the document SL16-95 provides a special 10% project IRR industry benchmark for small scale hydropower stations (below 50MW)
[37] Yunnan Mengjiahe Kachang Muwen Hydro Power Station
http://cdm.unfccc.int/Projects/Validation/DB/8QGLWZ8TP3ZOPPROVKQ2MNLWFO8EVT/view.html
Yunnan Lamenga 2nd Level Hydropower Station
http://cdm.ccchina.gov.cn/website/cdm/pdf/Item/Item293.pdf
[38] http://211.84.112.124/kns50/Navi/Catalog.aspx?NaviID=4&YearID=N2006110131&BaseID=YZTNJ&Field=%E7%BC%96%E5%8F%B7&Value=N2006110131&NaviLink=%E4%BA%91%E5%8D%97%E7%9C%81-%2Fkns50%2FNavi%2Flist.aspx%3FNaviID%3D4%26Field%3D%25E6%2595%25B4%25E5%2588%258A%25E5%2588%2586%25E7%25B1%25BB%26Value%3D0225%26GroupBy%3DBaseID%7C%E6%98%AD%E9%80%9A%E5%B9%B4%E9%89%B4-%2Fkns50%2FNavi%2Fitem.aspx%3FNaviID%3D4%26BaseID%3DYZTNJ
[39] http://cdm.unfccc.int/UserManagement/FileStorage/WW0ONO7SW2DC8LE537BK8TEFP3FS2N
[40] http://slx.zjwchc.com/sdz/sdz1/604.htm
[41] http://www.yn.gov.cn/yunnan,china/72626041549488128/20050415/25579.html

Hongshiyan Hydropower Station	44	1999[42]	Yiliang County	-
Jiren River Hydropower Station	30	2001[43]	Diqing prefecture Shangri-La County	-
Nanting River Hydropower Station	34	2004	Wenshan Prefecture Maguan County	Wenshan Electric Power Co., Ltd.[44] (State owned)
Mengdianhe II Hydropower	30	2004	Dehong Prefecture Yingjiang County	Yingjiang Mengdian River Second Level Power Station Co., Ltd.
Xiashilong Hydropower Station	25	2005	Wenshan Prefecture Guangnan County	Guangnan Xiyangjiang Hydropower Development Co., Ltd.
Laodukou Hydropower Station	37.5	2005	Qujing City Luoping County	Yunan Luoping Laodukou Power Co., Ltd.
Wuni River Hydropower Station	30	2005	Baoshan City Longling County	Yunnan Baoshan Supahe Hydropower Development Co., Ltd.
Houqiao Hydropower Station	48	2005	Baoshan City Tengchong County	Yunnan Baoshan Binlangjiang Hydropower Development Co., Ltd.
Yanziya Hydropower Station	25	2005	Dali Prefecture Heqing County	Heqing Xinyuan Yanggongjiang Power Co., Ltd.
Maomaotiao Hydropower Station	40	2005	Wenshan Prefecture Malipo County	Maomaotiao Power Co., Ltd.
Xima Xingyun Aluminium Factory Hydropower Station	26	2005	Dehong Prefecture Yingjiang County	Yunnan Yingjiang Xingyun Co., Ltd.
Chongjianghe II Phase (Expansion) Hydropower Station	48	2006	Diqing Prefecture Yulong County	Guodian Diqing Shangri-la Generating Limited Liability Company

Note: All above hydropower stations come from public data source---*Yearbook of China Water Resources 2006 and 2007*. There are not any hydropower stations with installed capacity from 15MW to 25MW in the *Yearbook of China Water Resources 2006 and 2007*; therefore the hydropower stations listed in the above table are the all available stations in our range.

In February 2002, the *Electric Power System Reform Blue Print* has been promulgated by State Council. The reform missions proposed in the *Electric Power System Reform Blue Print* chiefly include: to detach power generation entities from grid companies and to reorganize plant and grid business, to introduce competition mechanism and to build a competitive and open power market, and to change the former situation that all power is purchased by the state owned grid enterprises. The aim of the reform is to break through monopolization and accomplish competition mechanism. Since the *Electric Power System Reform Blue Print* has been promulgated, the power market has undergone a far-reaching transformation. Before the reform, the government investment electricity generation projects, take charge the electricity transmission and control the electricity sales. The electricity generation investment actions were government behaviors.[45] After the reform, electricity generation enterprises were separated from the government and the grid company, and electricity generation investment actions are no longer government behaviors. The competition mechanism was introduced to the electricity generation industry. The financing environment is different from the financing environment before the reform. The financing environment is

[42] http://www.7c.gov.cn/color/DisplayPages/ContentDisplay_455.aspx?contentid=9204
[43] http://www.zhongguook.com/news/web/shangri-la/2004-03/1079363260.html
[44] http://business.sohu.com/20051228/n241172999.shtml

[45] http://www.ce86.com/a/gongxue/dl121/200210/22-13747.html

different from the financing environment before the reform.[46] The investment climate transformation in the electricity generation is far-reaching. According to the *Tool for the demonstration and assessment of additionality* (Version 05.2), projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Of these projects, 6 projects, Luoze River Hydropower Project, Supa River Sanjiangkou Hydropower Project, Yisa River Hydropower Project, Laohushan II Hydropower Project, Hongshiyan Hydropower Station and Jiren River Hydropower Station, which started operation before the year 2002 (when the *Electric Power System Reform Blue Print* has been promulgated) was invested under distinct investment climate and are not similar with the project.

Furthermore, Xima Xingyun Aluminium Factory Hydropower Station is the captive station of Yunnan Yingjiang Xingyun Co., Ltd [47], and Chongjianghe II Phase (Expansion) Hydropower Station is an expansion project in an existing power plant[48]. Therefore the two projects are not similar with the project based on the facts that the former station is not connected to the grid and the other is not a new project. So these stations are excluded. Thus, it is rational to compare the project with the remaining 8 hydropower stations.

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

These projects have some significant advantages over the project to guarantee their operation. The essential distinctions between the project and the similar project are analyzed as follows:

- The investment per kilowatt of **Nanting River Hydropower Station**, **Mengdianhe II Hydropower Station, Maomaotiao Hydropower Station** and **Xiashilong Hydropower Station** are compared with that of the project 5,192Yuan RMB/kW[49] as follows:

Table B.7 comparison of investment per kilowatt between the project and the similar projects

	Investment per kilowatt	Lower than the investment per kilowatt of the project
Nanting River Hydropower Station	4,529Yuan RMB/kW[50]	12.8%
Mengdianhe II Hydropower Station	4,000Yuan RMB/kW[51]	23.0%
Maomaotiao Hydropower Station	3,000Yuan RMB/kW[52]	42.2%
Xiashilong Hydropower Station	4,320Yuan RMB/kW[53]	16.8%

The investment per kilowatt of the 4 similar projects listed in the Table B.7 is significantly lower than that of the project, which causes the similar projects to be more financially attractive.

[46] http://www.hnjmw.gov.cn/prog/infor/publish/MsgView_kxfzg.jsp?MsgID=6387, http://www.lnjn.gov.cn/market/fenxiyuce/goule/2003/1/30621.shtml, http://money.163.com/editor/stock_online/010607_49002.html
[47] http://xxgk.yn.gov.cn/canton_model2/newsview.aspx?id=182977
[48] http://www.yn.xinhuanet.com/newscenter/2006-05/09/content_6932319.htm
[49] The total investment of the project is 105,442,600Yuan. *Feasibility Study Report*
[50] http://news.cnfol.com/050104/101,1281,1167291,00.shtml
[51] http://www.bofcom.gov.cn/dhzrmzfgzxxw/3973020404489977856/20060921/67281.html
[52] http://www.ynws.gov.cn/docdetail_new.asp?id1=20050321081428
[53] *Feasibility Study Report* of Xiashilong Hydropower Station

- The annual theoretical utilization hours of **Yanziya Hydropower Station** is compared with that of the project 5,080h as follows:

Table B.8 comparison of annual theoretical utilization hours between the project and the similar projects

	Annual theoretical utilization hours	Higher than the investment per kilowatt of the project
Yanziya Hydropower Station	6,000h[54]	18.1%

The annual theoretical utilization hours of the similar project listed in the Table B.8 is significantly higher than that of the project, which causes the similar project to be more financially attractive.

- The grid price of **Laodukou Hydropower Station, Wuni River Hydropower Station** and **Houqiao Hydropower Station** are compared with that of the project 0.171Yuan/kWh as follows:

Table B.9 comparison of grid price between the project and the similar projects

	Grid price	Higher than the grid price of the project
Laodukou Hydropower Station	0.2 Yuan RMB/kWh [55]	17.0%
Wuni River Hydropower Station	0.205Yuan RMB/kWh [56]	19.9%
Houqiao Hydropower Station	0.205 Yuan RMB/kWh	19.9%

The grid price of the 3 similar projects listed in the Table B.9 is significantly higher than that of the project, which allows the causes projects to be more financially attractive.

- To confirm the distinctions between the similar projects and the project, the benchmark analysis can be used in the common practice analysis. Considering that the post-tax project IRR is used in the benchmark analysis, the post-tax project IRRs of the similar projects are estimated. The parameters of the similar projects are determined as follows: (1) The key parameters, i.e. installed capacity, annual utilization hours, investment per kilowatt, and grid price, are the actual parameters of the similar projects. (2) The other parameters could be extrapolated with those of the project, i.e. the annual operational cost of the similar projects can be estimated by that of the project multiply the times of the installed capacity. (3) The VAT rate, additional urban construction tax rate, education surcharges rate, corporate income tax rate, annual depreciation rate, construction period, and operational period are the same as those of the project. Furthermore, the IRR calculation method is the same as that of the project.[57] Because of data availability, there are five project which satisfies the post-tax project IRR estimation:

Table B.10 post-tax project IRRs of the similar projects

Similar projects	Post-tax project IRR
Mengdianhe II Hydropower Station	16.40%
Xiashilong Hydropower Station	19.06%
Laodukou Hydropower Station	12.22%

[54] http://www.globefinance.net/Control?infoID=355973
[55] http://www.topcj.com/html/2/KPGG/20070214/45241.shtml
[56] http://www.ynpower.com.cn/information/510.whtml

[57] For the data source of the parameters and detailed IRR calculation method, please see the common practice IRR calculation.

Wuni River Hydropower Station	13.91%
Houqiao Hydropower Station	10.62%

As demonstrated above, the post-tax project IRR is the threshold, which determines whether the project is financially attractive or unattractive. The estimated post-tax project IRRs of the similar projects are all higher than the benchmark (10%). These similar projects are financially attractive. Because the post-tax project IRR of the project is lower than the benchmark, the project is financially unattractive. Therefore, the project is additional.

The project is financially unattractive which would prevent the implementation of the proposed project activity without CDM. If the project could not be implemented, the equivalent electric power would be supplied by the South China Power Grid, which is highly dependent on fossil fired power plants, leading higher GHG emissions. Hence, the proposed project activity isn't the baseline scenario and additionality is evident.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project emissions

According to ACM0002, for hydropower project activities that result in new reservoirs and hydropower project activities that result in the increase of existing reservoirs, project proponents shall account for project emissions, estimated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad \text{(Equation B.1)}$$

Where,

Cap_{PJ} = installed capacity of the hydropower plant after the implementation of the project activity (W);

Cap_{BL} = installed capacity of the hydropower plant before the implementation of the project activity (W);

A_{PJ} = area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2);

A_{BL} = area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).

(a) If PD is greater than $4W/m^2$ and less than or equal to $10W/m^2$,

$$PE_y = \frac{EF_{Res} \times TEG_y}{1000} \qquad \text{(Equation B.2)}$$

Where,

PE_y = Emissions from reservoir expressed as tCO_2e/year.

EF_{Res} = the default emission factor for emissions from reservoirs, and the default value as per EB 23 is 90kg CO_2e/MWh.

TEG_y = total electricity produced by the project activity, including the electricity supplied to the grid and electricity supplied to internal loads, in year y (MWh).

(b) if PD is greater than $10W/m^2$,

$$PE_y = 0$$

The project is a new hydropower station with a new reservoir, Cap_{BL} =0, A_{BL} =0; when the project finishes construction, Cap_{PJ} =18,900,000W, A_{PJ} =20,000m^2, the power density is:

$$PD = \frac{18,900,000 - 0}{20,000 - 0} = 945W/m^2$$

The power density of the project is 945W/m^2, greater than 10W/m^2. According to ACM0002, $PE_y = 0$.

Baseline emissions

According to ACM0002 (version 07), baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y} \qquad \text{(Equation B.3)}$$

Where,

EG_y = Electricity supplied by the project activity to the grid (MWh);

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh); this value is taken as zero for new power plants;

$EF_{grid,CM,y}$ = Combined Margin CO_2 emission factor for South China Power Grid in year *y*.

According to ACM0002, the calculation of emission factor should use the methodology tool "*Tool to calculate the emission factor for an electricity system*". Baseline emission of the project activity substitutes electricity generated by the power plants in an electricity system is determined by calculating the "Operating Margin" (OM) and "Build Margin" (BM) as well as the "Combined Margin" (CM).

The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2e/MWh	Combined Margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,BM,y}$	tCO_2e/MWh	Build Margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,OM,y}$	tCO_2e/MWh	Operating Margin CO_2 emission factor for grid connected power generation in year *y*

According to the *2008 Baseline Emission Factors for Regional Power Grids in China* renewed by the Director Office of National Climate Change Coordination of NDRC (China DNA) on July 18, 2008, the OM emission factor is 1.0608tCO_2e/MWh, and the BM emission factor of 0.6816tCO_2e/MWh. Therefore, the Combined Baseline emission factor of the South China Power Grid corresponds to **0.8712tCO_2e/MWh**.

Project participants shall apply the following six steps:

STEP 1. Identify the relevant electric power system
STEP 2. Select of 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) emission factor

The Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$) calculation for the South China Power Grid is calculated as follows:

STEP 1. Identify the relevant electric power system

The project employs the delineation of the project electricity system and connected electricity system published by China DNA. The electricity generated by the project is connected to the South China Power Grid. The South China Power Grid includes the Guangdong, Guangxi, Yunnan and Guizhou grids. Therefore, the project selects the South China Power Grid for the calculation of Operating Margin emission factor.

There is net imported electricity to the South China Power Grid from Central China Power Grid. For the purpose of determining the Operating Margin emission factor, the tool provides four options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 tCO_2e/MWh, or
(b) The weighted average Operating Margin(OM) emission rate of the exporting grid, determined as described in step 3(d) below; or
(c) The simple Operating Margin emission rate of the exporting grid, determined as described in step 3(a), if the conditions for this method, as described in step 2 below, apply to the exporting grid; or
(d) The simple adjusted Operating Margin emission rate of the exporting grid, determined as described in step 3(b) below.

The PDD will choose option (b).

STEP 2. Select an Operating Margin (OM) method

The *"Tool to calculate the emission factor for an electricity system"* offers four options for the calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$):

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

According to China Electric Power Year Book (2003-2007), from 2002 to 2006, in the composition of gross annual generation power for the South China Power Grid, the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation is as following: 32.98% in 2002, 31.06% in 2003, 29.95% in 2004, 30.94% in 2005, 29.75% in 2006 respectively[58], obviously far lower than 50%. Based on these considerations, the OM has been calculated according to the Simple OM. The "ex-ante vintage" will be employed for OM calculation of the project.

According to *"Tool to calculate the emission factor for an electricity system"*, the Simple OM has been employed to calculate the OM.
For simple OM, the emission factor can be calculated using either of the two following data vintages:

- 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 for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

[58] calculated as Table 1, Annex 3

- Ex post option: The year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y.

The Ex ante data vintage will be used for OM calculation of the project, 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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. The *"Tool to calculate the emission factor for an electricity system"* offers three options for the calculating the Simple OM.

- Based on data on fuel consumption and net electricity generation of each power plant/unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. As the fuel consumption data for each power plant/unit is not available in china, neither Option A nor Option B is reasonable. At the same time, the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, so the project uses Option C for calculating the simple OM emission factor, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \quad \text{(Equation B.4)}$$

Where

$EF_{grid,OMsimple,y}$ =Simple Operating Margin CO_2 emission factor in year *y* (tCO_2e/MWh);

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

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

$EF_{CO_2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (CO_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).

The Operating Margin emission factors for 2004, 2005 and 2006 are calculated. The three-year average is calculated as a 3-year generation-weighted average of the emission factors. The Operating Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity.

STEP 4. Identification of the cohort of power units to be included in the Build Margin

According to the tool to calculate the emission factor for an electricity system, the sample group m consists of:

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

(2) 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.[59]

In China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts the following deviation in methodology application (See details in Step 5)

The tool to calculate the emission factor for an electricity system provides the following two options for calculation of $EF_{grid,BM,y}$:

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

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

The PDD choose Option 1 to calculate without requirement to monitor and recalculate the emissions factor during the crediting period.

STEP 5. Calculation of the Build Margin emission factor

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \text{(Equation B.5)}$$

Where

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

$EF_{EL,m,y}$ =CO_2 emission factor of power unit *m* in year *y* (tCO_2e/MWh).

Taking notice of this situation, EB accepts [60] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the Build Margin, i.e. the

[59] If 20% falls on part capacity of a plant, that plant is fully included in the calculation.

[60] This is in accordance with the “Request for guidance: Application of AM0005 and AMS-I.D in China”, a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM. This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. 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 there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:

- First, according to the statistical data of the most recent one year, determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in COAL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}} \quad \text{(Equation B.6)}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad \text{(Equation B.7)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad \text{(Equation B.8)}$$

Where
$FC_{i,m,y}$ = the amount of fuel *i* consumed by power plant/unit *m* in year *y* (mass or volume unit);
$NCV_{i,y}$ = the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit);
$EF_{CO2,i,y}$ = the CO_2 emission factor of fossil fuel *i* in year *y;*
Coal, *Oil* and *Gas* =solid fuel, liquid fuel and gas fuel respectively.
See details of calculation in Annex 3 Table 13.

Sub-step 2: Calculate the emission factor of fuel-based generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad \text{(Equation B.9)}$$

Where

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ =the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency. See details of calculation in Annex 3 Table 14.

A coal-fired power plant with a total installed capacity of 600 MW is assumed to be the commercially available best practice technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 329.94gce/kWh, which corresponds to an efficiency of 37.28% for electricity generation. For gas and oil power plants a 200 MW combined cycle power plant with a specific fuel consumption of 252gce/kWh, which corresponds to an efficiency of 48.81% for electricity generation, is selected as commercially available best practice technology in terms of efficiency[61].

The main parameters used for calculation of the thermal power plant emission factors $EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are provided in Annex 3.

Sub-step 3: Calculate the Building Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad \text{(Equation B.10)}$$

Where

CAP_{Total} = the total capacity addition;

$CAP_{Thermal}$ = the total thermal (coal, oil and gas) power capacity addition.

As mentioned above, the Build Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity.

The data resources for calculating $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
   Source: *China Electric Power Yearbook* 2003-2007, *China Energy Statistical Yearbook* 2007
2. Power imports of the South China Power Grid from the Central China Power Grid;
   Source: *China Electric Power Yearbook 2005; Abstract of Electric Power Industry Statistics 2005-2006*
3. Fuel consumption and the net caloric value of thermal power plants
   Source: *China Energy Statistical Yearbook* 2005-2007
4. Carbon emission factor of each fuel
   Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 Energy, Table 1.3 of Page 1.21-1.22 in Chapter one.

STEP 6. Calculate of the Combined Margin emission factor

The baseline emission factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

[61] *"2008 Baseline Emission Factors for Regional Power Grids in China"*, which has been renewed by the China DNA (Director Office of National Climate Change Coordination of National Development and Reform Committee)

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y}$$ (Equation B.11)

According to the calculation the Operating Margin emission factor ($EF_{grid,OM,y}$) of the South China Power Grid is **1.0608tCO_2e/MWh** and the Build Margin emission factor ($EF_{grid,BM,y}$) is **0.6816tCO_2e/MWh**. The defaults weights for hydropower projects during the first crediting period are used as specified in the tool to calculate the emission factor for an electricity system.

$$w_{OM} = 0.5 ; w_{BM} = 0.5$$ [62]

Using above mentioned values the Combined Baseline emission factor of the South China Power Grid corresponds to **0.8712tCO_2e/MWh.**

Leakage

The project is newly built, and its all energy generating equipment is new. Therefore, according to ACM0002, leakage is not to be considered.

Emission Reductions

The emission reductions ER_y by the project activity during a given year y calculation is as follows:

$$ER_y = BE_y - PE_y - LE_y$$ (Equation B.12)

Of which:

BE_y is baseline emissions during a given year y, the baseline emissions is calculated by:

$$BE_y = EG_y \times EF_{grid,CM,y}$$ (Equation B.13)

Where

EG_y =the net electricity supplied by the project activity to the grid, in MWh, calculated by:

$$EG_y = EG_{s,y} - PR_{g,y}$$ (Equation B.14)

Of which: $EG_{s,y}$ is the power supplied to the grid;

$PR_{g,y}$ is the electricity use of power plant supplied by the grid.

$EF_{grid,CM,y}$ =baseline emissions factor, in tCO_2e/MWh;

PE_y =project emissions during a given year y. For the power density is 945W/m^2, greater than 10 W/m^2, according to the methodology ACM0002: $PE_y = 0$;

LE_y =leakage, according to ACM0002, no leakage calculation is required. Hence $LE_y = 0$.

Therefore, the emission reductions are equal to the baseline emissions, namely,

$$ER_y = BE_y = EG_y \times EF_{grid,CM,y}$$ (Equation B.15)

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

[62] $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period.

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Generation of Power Sources *j* in years *y* (2002-2006, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2003-2007* *China Energy Statistical Yearbook 2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$GEN_{import,y}$
Data unit:	MWh
Description:	The Power Transmitted from the Central China Power Grid to the South China Power Grid in years *y* (2004-2006)
Source of data used:	*China Electric Power Yearbook 2005* *Abstract of Electric Power Industry Statistics 2005-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the OM

Data / Parameter:	PR_y
Data unit:	%
Description:	The rate of electricity consumption of thermal power plants in years *y* (2004-2006 including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$FC_{i,y}$
Data unit:	$10^4t/10^8m^3$
Description:	The Fuel *i* Consumption of project electricity system in years *y* (2004-2006, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data

Any comment:	To calculate OM and BM

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ fuel in a mass or volume unit
Description:	The $NCV_{i,y}$ of Fuel *i* (mass or volume unit) in year *y*
Source of data used:	*China Energy Statistical Yearbook 2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	tC/GJ
Description:	The *Emission Factor of* Fuel *i* (mass or volume unit) in year *y*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{best,coal}$
Data unit:	%
Description:	The optimum commercial, coal-fired power supply efficiency
Source of data used:	*China DNA: 2008 Baseline Emission Factor for Regional Power Grids in China-2008 the calculation of baseline BM emission factor for Regional Power Grids in China*
Value applied:	37. 28%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$EF_{best,oil/gas}$
Data unit:	%
Description:	The optimum commercial, oil and gas power supply efficiency
Source of data used:	*China DNA: 2008 Baseline Emission Factor for Regional Power Grids in China-2008 the calculation of baseline BM emission factor for Regional Power Grids in China*
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The Install Capacity of Power Sources j in years y (2004-2006, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate BM

Data / Parameter:	CAP_{BL}
Data unit:	W
Description:	Installed capacity of the hydropower plant before the implementation of the project activity.
Source of data used:	*Feasibility Study Report*
Value applied:	0W
Justification of the choice of data or description of measurement methods and procedures actually applied :	The project is a new hydropower station. According to ACM0002, this value is zero.
Any comment:	To calculate project emission

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).
Source of data used:	The most conservative value
Value applied:	0 m^2
Justification of the choice of data or description of measurement methods and procedures actually applied :	The A_{BL} is not zero as the original submergence of the river, but it can be treated as zero according to ACM0002 in order to calculate the power density conservatively.
Any comment:	To calculate project emission

Data / Parameter:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data used:	EB23
Value applied:	90 $kgCO_2e/MWh$
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value as per EB23 is 90 $kgCO_2e/MWh$
Any comment:	/

Data / Parameter:	GWP_{CH4}

Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	21 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value for the first commitment period is 21 tCO_2e/tCH_4.
Any comment:	/

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

According to section B.6.1, the baseline emission factor of the project is 0.8712tCO_2e/MWh in the first crediting period. And the annual net electricity supplied by the project activity to the grid is 83,590MWh. Therefore, BE_y during the first crediting period is to be calculated as follows:

$$BE_y = EG_y \times EF_y = 72{,}824 tCO_2e \qquad \text{(Equation B.16)}$$

Hence the emission reductions due to the project are equal to the baseline emissions, and annual emission reductions are 72,824tCO_2e during the first crediting period.

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

The total emission reductions of the project are 509,768tCO_2e during 7 years crediting period.

Table B.11 Estimate of Emission Reductions Due to the Project

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline Emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
Year 1:01/10/2009-30/09/2010	0	72,824	0	72,824
Year 2:01/10/2010-30/09/2011	0	72,824	0	72,824
Year 3:01/10/2011-30/09/2012	0	72,824	0	72,824
Year 4:01/10/2012-30/09/2013	0	72,824	0	72,824
Year 5:01/10/2013-30/09/2014	0	72,824	0	72,824
Year 6:01/10/2014-30/09/2015	0	72,824	0	72,824
Year 7:01/10/2015-30/09/2016	0	72,824	0	72,824
Total(tCO_2e)	0	509,768	0	509,768

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

B.7.1. Data and parameters monitored:

Three other hydropower stations will transmit electricity to the grid through power house of the project: Saigan River Hydropower Station, Wanma River 1st Level Hydropower Station, and Wanma River 3rd Level Hydropower Station (refer to the details in the section B.7.2.). In order to calculate the emission reductions, considering the actual circumstances of the project, the following data need to be monitored:

(1) Electricity supplied to the grid by the four hydropower stations in total in year y ($EG_{s,1,y}$), electricity

produced by the three generators of the project in year y (respectively $EG_{s,3,y}$, $EG_{s,4,y}$, and $EG_{s,5,y}$), electricity transmitted to the grid by the Saigan River Hydropower Station, Wanma River 1st Level Hydropower Station, and Wanma River 3rd Level Hydropower Station in year y (respectively $EG_{s,6,y}$, $EG_{s,7,y}$, and $EG_{s,8,y}$);

(2) Electricity use of plant consumption of the project in year y ($PR_{g,y}$);

(3) Installed capacity of the project (Cap_{PJ});

(4) Surface area of the reservoir at full water level (A_{PJ});

(5) The total electricity produced by the project (TEG_y).

According to the two data (1) and (2), the electricity supplied to the grid by the project ($EG_{s,y}$) will be calculated by the calculation method described in the section B.7.2, and consequently the net electricity supplied by the project to the grid will be calculated by ($EG_y = EG_{s,y} - PR_{g,y}$). It is conservative to calculate the net electricity supplied by the project to the grid by subtracting $PR_{g,y}$ (All the plant consumption $PR_{g,y}$ will be assumed as the power supplied by the grid) from $EG_{s,y}$, other than subtracting electricity supplied to the project by the grid from $EG_{s,y}$, because electricity supplied to the project by the grid is always less than $PR_{g,y}$.

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Electricity supplied to the grid by the project in the years y
Source of data to be used:	Calculated via electricity monitoring data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	84,070MWh
Description of measurement methods and procedures to be applied:	Calculated and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be annually calibrated according to the relevant national electric industry standards and regulations; electricity supplied to the grid by the project will be double checked according to electricity transaction bills.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PR_{g,y}$
Data unit:	MWh
Description:	Electricity use of plant consumption of the project in the years y
Source of data to be used:	Measured by meters
Value of data applied for the purpose of calculating expected emission	480MWh[63]

[63] 0.5% of the total electricity produced by the project and in the verification period, the actual monitoring data will be employed.

reductions in section B.5	
Description of measurement methods and procedures to be applied:	Recorded and calculated on a monthly basis
QA/QC procedures to be applied:	The meters will be annually calibrated according to the relevant national electric industry standards and regulations.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied by the project to the grid in the years y
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	Net electricity supplied by the project to the grid is 83,590MWh annually calculated by the equation: $EG_y = EG_{s,y} - PR_{g,y}$
Description of measurement methods and procedures to be applied:	Calculated according to the above measured parameters and recorded on a monthly basis
QA/QC procedures to be applied:	Calculated value, no further QA/QC procedures
Any comment:	/

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	The installed capacity of the project after the implementation of the project activity.
Source of data to be used:	Generators' nameplate
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	18,900,000W
Description of measurement methods and procedures to be applied:	On-site check the nameplates of the generators
QA/QC procedures to be applied:	/
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of 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:	20,000m^2
Description of measurement methods and procedures to be applied:	Annual measured by Nikon DTM-352c Total Station.
QA/QC procedures to be applied:	/
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	TEG_y
Data unit:	MWh
Description:	Total electricity produced by the project in year y
Source of data to be used:	Measured by meters
Value of data applied for the purpose	The electricity produced by the project is estimated to be 96,012MWh

of calculating expected emission reductions in section B.5	annually according to FSR
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis.
QA/QC procedures to be applied:	The meters will be annually calibrated according to the relevant national electric industry standards and regulations.
Any comment:	Refer to B.7.2. Description of the monitoring plan

B.7.2. Description of the monitoring plan:

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner is responsible for the implementation of the monitoring plan, and the Grid Company cooperates with the project owner.

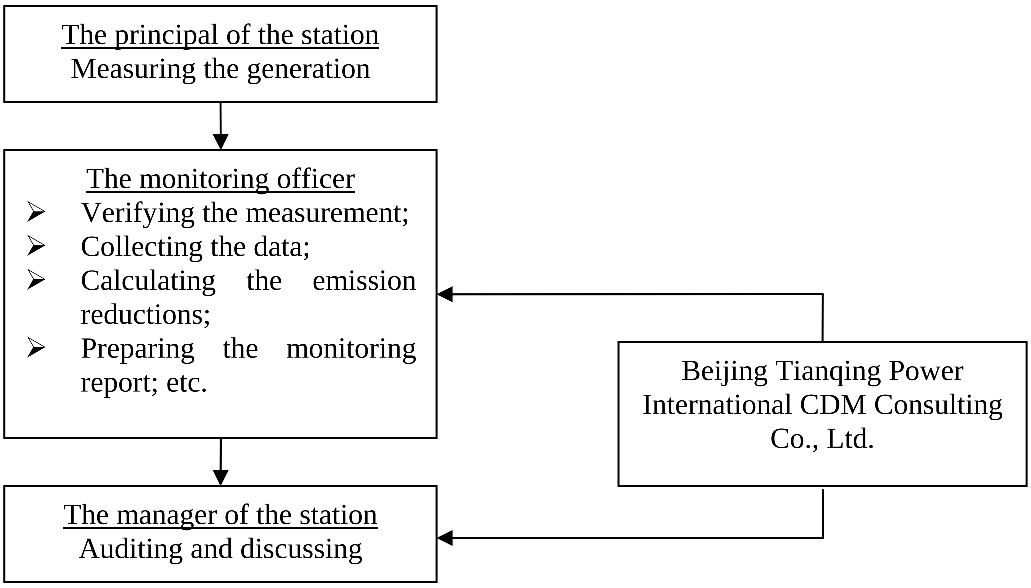
1. Monitoring objective

The main monitoring objectives are:
(1) Electricity supplied to the grid by the project,
(2) Electricity use of plant consumption of the project,
(3) Installed capacity of the project after the implementation of the project activity,
(4) Area of the reservoir measured in the surface of water, after the implementation of the project activity, when the reservoir is full, and
(5) The total electricity produced by the project.
The monitor objectives (1) and (2) are used to calculate the net electricity supplied by the project to the grid.

2. Monitoring Organization

The project owner will appoint a monitoring officer who will be responsible for verification of the measurement, collection of electricity transaction bills and electricity invoices, and the calculation of the emission reductions. The monitoring officer will prepare operational reports of the project, recording the daily operation of the project including operating periods, power generation; electricity supplied to the grid by the project, electricity supplied to the project from the grid, equipment defects, etc. The monitoring reports will be reviewed by the manager of the station.

The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting Co., Ltd.



The monitoring staff will be trained as following:

Monitoring staff training will be conducted by Beijing Tianqing Power International CDM Consulting Co., Ltd. before the project is registered. The monitoring staff training will include monitoring equipment, monitoring program, monitoring data, monitoring report, etc.

3. Monitoring Equipment and program

3.1 Electricity monitoring

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448-2000)* the electric energy metering will be properly configured, and the metering equipment will be checked by both the project owner and the Grid Company before operation.

Three other hydropower stations transmit electricity to the grid through power house of the project, as described in the following table:

Table B.12 Information of the other three hydropower stations

	Connection point	Status
Saigan River Hydropower Station	6.3kV side of the Main Transformer 1	Operation period. The current purpose of this hydropower station is to supply electricity for the construction of the project.
Wanma River 1st Level Hydropower Station	35kV side of the Main Transformer 1	Design stage
Wanma River 3rd Level Hydropower Station	On the 110kV transmission line.	Design stage

Under these circumstances, eight electric energy meters are required, whose locations are shown in Figure B.3 and technical requirements and data monitored are listed in Table B.13.

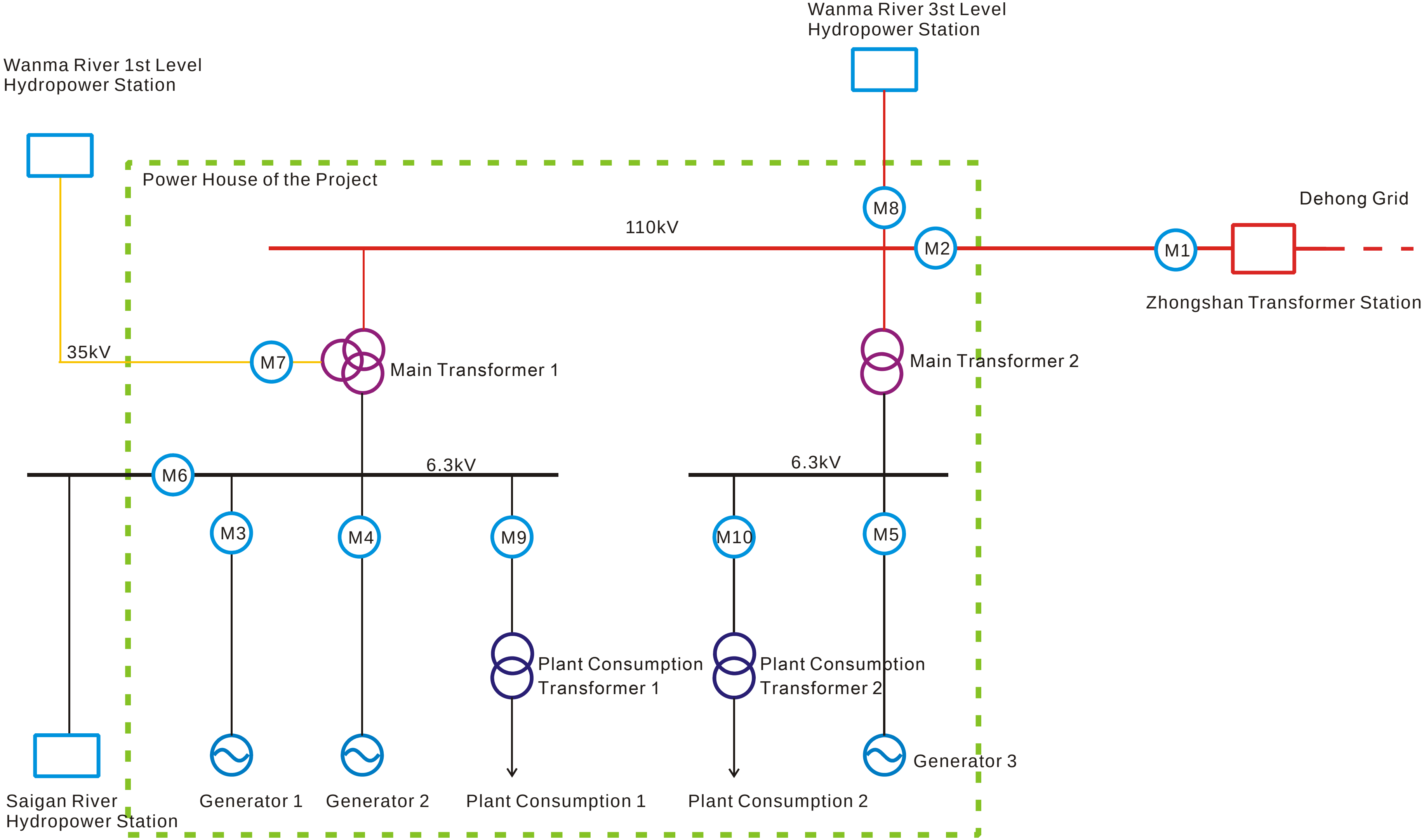


Figure B.3 power connection diagram

Table B.13 Required meters

<table>
<tr><th>Meter</th><th>Location</th><th>Key specifications</th><th>Responsibility</th><th colspan="2">Monitored Data</th></tr>
<tr><td>M1</td><td>Entrance to the Zhongshan Transformer Substation</td><td>0.5 or more accurate</td><td>The Grid Company</td><td colspan="2" rowspan="2">$EG_{s,1,y}$</td></tr>
<tr><td>M2</td><td>Backup meter for M1, exit of the power house of the project</td><td>0.5 or more accurate</td><td>The project owner</td></tr>
<tr><td>M3</td><td>Exit of Generator 1</td><td>0.5 or more accurate</td><td>The project owner</td><td>$EG_{s,3,y}$</td><td rowspan="3">TEG_y</td></tr>
<tr><td>M4</td><td>Exit of Generator 2</td><td>0.5 or more accurate</td><td>The project owner</td><td>$EG_{s,4,y}$</td></tr>
<tr><td>M5</td><td>Exit of Generator 3</td><td>0.5 or more accurate</td><td>The project owner</td><td>$EG_{s,5,y}$</td></tr>
<tr><td>M6</td><td>Entrance of the Saigan River Hydropower Station to the power house of the project</td><td>0.5 or more accurate</td><td>The project owner</td><td colspan="2">$EG_{s,6,y}$</td></tr>
<tr><td>M7</td><td>Entrance of the Wanma River 1st Level Hydropower Station to the power house of the project, at the 35kV side of the Main Transformer 2</td><td>0.5 or more accurate</td><td>The project owner</td><td colspan="2">$EG_{s,7,y}$</td></tr>
<tr><td>M8</td><td>Entrance of the Wanma River 3rd Level Hydropower Station to the power house of the project</td><td>0.5 or more accurate</td><td>The project owner</td><td colspan="2">$EG_{s,8,y}$</td></tr>
<tr><td>M9</td><td rowspan="2">Respectively at the 6.3kV side of the 2 Plant Consumption Transformers</td><td rowspan="2">0.5 or more accurate</td><td rowspan="2">The project owner</td><td colspan="2" rowspan="2">$PR_{g,y}$</td></tr>
<tr><td>M10</td></tr>
</table>

Note:

Before the operation of Wanma River 3rd Hydropower Station is started, M8 is unnecessary to install and $EG_{s,8,y}$ *is zero, and before the operation of Wanma River 1st Hydropower Station is started, M7 is unnecessary to install and* $EG_{s,7,y}$ *is zero.*

Electricity supplied to the grid by the four hydropower stations in total ($EG_{s,1,y}$) is separated into 4 parts as per the electricity supply of each station, and Electricity supplied to the grid by the project in year y is to be calculated as follow:

$$EG_{s,y} = EG_{s,1,y} \times \frac{EG_{s,3,y} + EG_{s,4,y} + EG_{s,5,y}}{(EG_{s,3,y} + EG_{s,4,y} + EG_{s,5,y}) + EG_{s,6,y} + EG_{s,7,y} + EG_{s,8,y}} \quad \text{(Equation B.17)}$$

All the plant consumption $PR_{g,y}$ will be assumed as the power supplied by the grid for conservative purpose.

Therefore, the net electricity supplied by the project to the grid is calculated by the equation: $EG_y = EG_{s,y} - PR_{g,y}$.

The total electricity produced by the project will be recorded and calculated as: $TEG_y = EG_{s,3,y} + EG_{s,4,y} + EG_{s,5,y}$.

3.2 Data of installed capacity and area of the reservoir measured in the surface of the water

Installed capacity will be checked every year according the nameplates of generators.
The area of the reservoir measured in the surface of the water will be surveyed every year with a Nikon DTM-352c Total Station. The Nikon DTM-352c Total Station provides an area survey method, which can calculate automatically the area. The distance surveying accuracy of the Nikon DTM-352c Total Station is 2mm.

4. Data Collection

The Grid Company is responsible for operation monitoring of the meter M1, while the project owner is responsible for operation monitoring of the other seven meters, and guarantee these measuring equipments are in normal operation and completely sealed.

The electricity recorded by the seven meters will suffice for the purpose of invoice and emission reduction verification as long the seven meters' fault is within the permissible tolerance. The main monitoring process is as follows:

- i The project owner and Grid Company read and check meters and record the data on a designated day of every month;
- ii The project owner calculates electricity supplied to the grid by the project using the calculation method specified above, and provides the calculation results to the Grid Company;
- iii The Grid Company provides the electricity transaction bills indicating electricity supplied to the grid by the project and electricity supplied to the project by the grid;
- iv The Grid Company pays the bills and the project owner provides electricity invoices of the project to the Grid Company. A copy of the invoice is stored by the project owner, together with a record of the payment by the Grid Company;
- v The project owner records the net electricity supplied by the project to the grid;
- vi The project owner keeps the records of the eight meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the meters M1 and Mn (n=3…10) exceeds the allowable tolerance or the meters malfunction, alternative conservative calculation methods will be employed in these months, as described in the following table:

Table B.14 Alternative conservative calculation methods in the period when meters are inaccurate

Inaccurate meter	Alternative conservative calculation methods
M1	Employ the reading data from M2, excluding the maximum historical line loss
M3	Employ the minimum historical reading data from M3
M4	Employ the minimum historical reading data from M4
M5	Employ the minimum historical reading data from M5
M6	Employ the maximum historical reading data from M6
M7	Employ the maximum historical reading data from M7
M8	Employ the maximum historical reading data from M8
M9	Employ the maximum historical reading data from M9
M10	Employ the maximum historical reading data from M10

As soon as one or more meters are discovered to exceed the allowable tolerance or malfunction, back-up meter(s) with the same technical specifications will be installed to substitute for the inaccurate meter(s). If the project owner and the Grid Company fail to reach an agreement concerning the correct reading, then the matter will be submitted for arbitration according to agreed procedures.

The meter readings and surveying results will be readily accessible for the DOE.

5. Calibration

The calibration of electric energy meter should be carried out annually. After calibration, all meters should be sealed. All meters shall be jointly inspected and sealed on behalf of the project owner and Grid Company, and shall not be accessible by either party except in the presence of the other party or its accredited representatives.
All the meters installed shall be tested by the qualified metrical organization co-authorized by the project owner and Grid Company within 10 days after:

- i The detection of a difference larger than the allowable error in the readings of meters;
- ii Repair the meter caused by the failure of operation.

The calibration of Nikon DTM-352c Total Station should be carried out annually.

6. Data Management

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk or CD-ROM. In addition, a hard copy printout will be archived. In addition, the project owner will collect electricity transaction bills and electricity invoices for the power delivered to the grid as a cross-check. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. sales invoice).

Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor’s reference, monitoring results will be indexed. All paper-based information will be stored by the project owner.

All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

7. Monitoring Report

The project owner will keep sale and purchasing invoices, and will prepare a monitoring plan at the end of the year, including measuring of electricity including electricity supplied to the grid by the project and electricity supplied to the project from the grid, audit report, calculation report of emission reduction, repair and calibration record of the monitoring equipments, installed capacity checked according the nameplates of generators, and the area of the reservoir measured in the surface surveyed with a Nikon DTM-352c Total Station.

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: 06/11/2009
Name of persons determining the baseline:

Alex Yang, General Manager, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-62199416; 62199417

Fax: +86-10-62166196; 62164780
Email: alexyang@tqcdmchina.com
(Not Project Participant)

Richard Tan, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-62199416; 62199417
Fax: +86-10-62166196; 62164780
Email: richardtan@tqcdmchina.com
(Not Project Participant)

Sarah Wei, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-62199416; 62199417
Fax: +86-10-62166196; 62164780
Email: sarahwei@tqcdmchina.com
(Not Project Participant)

Tracy Yuan, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-62199416; 62199417
Fax: +86-10-62166196; 62164780
Email: tracyyuan@tqcdmchina.com
(Not Project Participant)

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:

08/10/2007 (signature date of the Purchase Contract of Turbines and Generators, which is the earliest starting date of the project activity and earlier than the CDM-PDD for GSP by the DOE.)

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

The expected operational lifetime of the project activity is 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:

01/10/2009 (The crediting period will not commence prior to the date of registration)

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:

According to relevant environmental laws and regulations, an environmental impact assessment has been carried out, and the environmental impact assessment report has been approved by the Environmental Protection Bureau of Dehong Prefecture. The main assessment conclusions are provided below:

1、 Impact on the Air environment quality

The main air pollutant is dust produced during cement transportation, concrete mixing and rock excavation within the construction period. Some measures, such as, cement hermetic transportation, automatic concrete mixing system, and aspersion will be adopted to alleviate the impact.

2、 Impact on the water environment

The main water pollutant consists of industrial wastewater and domestic wastewater. The industrial wastewater comes from engineering excavation, sand-gravel screening and sand-gravel processing in construction period. All industrial wastewater will be recycled or discharged after sedimentation, acid-adding and other treatments. Besides measured adopted above, domestic wastewater will be gathered and disinfected.

3、 Noise impact on the environment

The noise is mainly caused by construction machines and transportation vehicles. Since the closest habitation is quite far from the construction site, the noise will only affect construction workers. Sound proof buildings and distribution of earplugs and other labour protection methods will be taken to alleviate the negative impact of noise on workers.

4、 Impact of solid waste on the environment

The solid waste includes construction waste and domestic waste. The construction waste will be gathered and piled up in 6 waste fields. Some proper protecting measures will be taken at the same time to avoid water and soil loss. The domestic waste will be collected, classified and land-filled nearby to avoid the environment pollution.

5、 Impact on water and soil loss

The water and soil loss is mainly caused by dam construction and residue piling-up. Some measures such as limiting construction field to avoid vegetation destruction, avoiding constructing during storm season; covering work surfaces, building drainage ditches and water retaining walls, recovering vegetation after the end of construction period etc. will be adopted to alleviate this problem. Otherwise, during the construction of road, deep section digging and other measures such as: levelling roadbed and greening along the road will also be taken to avoid water and soil loss.

6、 Impact on the ecological environment

There is no protected flora or fauna on national or provincial level in the evaluation area of the project. Impacts of construction on biodiversity will be limited. Otherwise, ecological water of $0.266m^3/s$ will be discharged to avoid dehydration of river between the dam and powerhouse during the dry seasons, and thus negative impacts of the project on the aquatic environment will be alleviated

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 project participants and the host party involved think this specific project will bring little negative environmental impact and it is unnecessary to take further actions to eliminate the environment impacts.

SECTION E. Stakeholders' comments

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

In order to know the opinions and advices on this project from all stakeholders and provide benefit to the residents of the areas which probably will be affected directly by the project, the project owner had distributed questionnaires for local residents to investigate suggestions from them on the construction of the project, including the impact on society, economy and life.

A special stakeholder consultation meeting was organized at the boardroom of Luxi City Qinrui Wanma River Power Exploring Co., Ltd. at 9:00～11:00 on January 9th, 2008, to investigate opinions of all the potential stakeholders, such as local residents and so on, aiming at collecting advice on the influence imposed on the local society, economy, daily life etc. for the project broadly. In order to make the potential stakeholders receive information of the meeting, Luxi City Qinrui Wanma River Power Exploring Co., Ltd posted bulletins for the meeting of stakeholders around the project site where the local residents often visit, and published a bulletin for the meeting of stakeholders on the newspaper of *Dehong United News* and via the website of www.tqcdmchina.com on January 7th, 2008. In the bulletin, the companies noticed all the potential stakeholders with the detailed information on the project. During the meeting, the project owner and the consultant invited the participants in the meeting to express their comments and concerns over the project and CDM. The representatives asked following questions focusing on CDM and the project, and then they got satisfied answers from experts. The followings are the questions that the questionnaires and the stakeholder consultation meeting referred:

1. Is there any situation of lacking electricity?
2. What are the local residents live on?
3. Which negative impact on local will be caused by the construction? Such as electric consumption or migrating?
4. Will the construction of the power station lead to noise and drinking water pollution? How far is the power station from the nearest local residents?
5. What kinds of resources are used for daily life? What is the main income for local citizens? After the construction of the station, is there any increase in the income for local citizens? If yes, how to increase the income?
6. Before the construction of the project, what is the site used for? Whether the local residents have some following questions, such as tilled land reduction and so on? If there are such kinds of questions, have they been solved? Whether the standard of compensation has been complied with the national policy?
7. Will the project bring any negative impacts on survival environment of local animals, fish, and vegetable and so on?
8. Whether the construction of the reservoir will affect the local ecological environment? If it will, are there any remedies?
9. Does the construction of the project involve resettlement?
10. Do you agree on the construction of the project?
11. What're the attitudes of citizens and government toward the CDM project? Support or oppose?

E.2. Summary of the comments received:

Additionally, some residents were investigated who may be impacted by the proposed project. 44 investigation questionnaires were sent out and 44 investigation questionnaires came back, of which, about

30% are female, 100% of them graduated from junior high school or inferior, about 98% are elder than twenty years old, and the investigation results are as following:

- About 64% of the investigated residents think the lack of electricity seriously exist in local area, and the other 36% of the investigated residents think the lack of electricity fairly exist in local area.
- 100% of the investigated residents deem the construction of the project will bring benefit to local transportation condition.
- 100% of the investigated residents deem the construction of the project will bring benefit to local communication condition.
- 100% of the investigated residents deem the hydropower station will bring benefit to their lives.
- 100% of the investigated residents deem the hydropower station will not cause negative impacts on local residents.
- 100% of the investigated residents deem the hydropower station doesn't cause negative impact on environment.
- 100% of the investigated residents deem the construction of the project does not involve resettlement.
- 100% of the investigated residents agree on the construction of the project.
- 100% of the investigated residents and the government support the CDM project.

There were 24 residents and government staff attended the stakeholders meeting. The project owner made a meeting minute. The list of stakeholders who attended the meeting has been shown in Table E.1.

Table E.1 List of Stakeholders who attended the meeting

NO.	Organization	Name
1	Local People’s Government	Shan Guo
2	Local People’s Government	Maoyong Chen
3	Local People’s Government	Maozhi Li
4	Local Development and Reform Committee	Shanming Zuo
5	Local Land Resources Bureau	Shaohui Wang
6	Local Water Resources Bureau	Jinping Cai
7	Local Environment Protect Bureau	Kongkan Bao
8	Local Environment Protect Bureau	Jie Fan
9	Beijing Tianqing Power International CDM Consulting Co. Ltd.	Yunhong Zhou
10	Local water resources expert	Yuejin Luo
11	Local water resources expert	Piannan Yang
12	Local water resources expert	Yanhong Li
13	The project owner	Ziheng Li
14	The project owner	Xinshan Yan
15	The project owner	Guoda Huang
16	The project owner	Chaojin Yang
17	The project owner	Liang Wang
18	Local Resident	Congen Yang
19	Local Resident	Yunxue Zhou
20	Local Resident	Yungui Kong
21	Local Resident	Yunhuan Hou
22	Local Resident	Congliang Yang
23	Local Resident	Yunlan Yang
24	Local Resident	Jiande Chu

From the questionnaires and stakeholder consultation meeting, we can find that all the local government and residents agree on the construction of the project. All stakeholders think that the construction will not

bring negative influence on ecological environment. The project will make best use of local water resource, mitigate the electricity supplying shortage. Meanwhile, the project will facilitate the demand of electricity for local residents, generate electricity to substitute for firewood, and the environment could be protected. At the same time, the construction of the project will bring more employment opportunities that increase the income of local residents and improve the living standard. In summary, there is no negative impact brought by the project.

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

According to questionnaires and stakeholders consultation meeting, all the stakeholders support the construction of the project. All the stakeholders think the project will not bring negative influence on ecological environment and will benefit local electricity supply and increase the income of local residents. No extra action is necessary to be taken to solve the comments received other than actions listed in the *Environment Impact Assessment*.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

Organization:	Luxi City Qinrui Wanma River Power Exploring Co., Ltd.
Street/P.O.Box:	No.3, Bingwu Road
Building:	/
City:	Luxi City, Dehong Dai-Jingpo Autonomous Prefecture
State/Region:	Yunnan Province
Postcode/ZIP:	678400
Country:	People's Republic of China
Telephone:	+86-692-8886807
FAX:	+86-692-2122159
E-Mail:	dhqrlzh@126.com
URL:	/
Represented by:	Liang Wang
Title:	Board Chairman
Salutation:	Mr.
Last Name:	Li
Middle Name:	/
First Name:	Ziheng
Department:	/
Mobile:	+86-13988227376
Direct FAX:	+86-692-2122159
Direct tel:	+86-692-8886807
Personal e-Mail:	dhqrlzh@126.com

The Buyer

Organization:	Electric Power Development Co., Ltd.
Street/P.O.Box:	15-1, Ginza 6-Chome, Chuo-ku
Building:	/
City:	Tokyo
State/Region:	/
Postcode/ZIP:	104-8165
Country:	Japan
Telephone:	+81-3-3546-9375
FAX:	+81-3-3546-9531
E-Mail:	Natsuki_Tsukada@jpower.co.jp
URL:	www.jpower.co.jp/english/
Represented by:	Natsuki Tsukada
Title:	Manager
Salutation:	Mr.
Last Name:	Tsukada
Middle Name:	/
First Name:	Natsuki
Department:	Climate Change Group, Corporate Planning and Administration Dept.
Mobile:	/
Direct FAX:	+81-3-3546-9531
Direct tel:	+81-3-3546-9375
Personal e-Mail:	Natsuki_Tsukada@jpower.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no official public funding from Annex I parties used in the project activity.

Annex 3

BASELINE INFORMATION

Table 1–Power Supply data for the South China Power Grid, 2002-2006

	2002	2003	2004	2005	2006
Electricity Generation of Thermal power plant (MWh)	185,168,000	222,780,000	263,574,000	286,889,000	332,226,000
Electricity Generation of Hydro power and other plant (MWh)	91,135,000	100,369,000	112,703,000	128,520,000	140,689,000
Total Electricity Generation of the South China Power Grid (MWh)	276,303,000	323,149,000	376,277,000	415,409,000	472,915,000
the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation(%)	32.98%	31.06%	29.95%	30.94%	29.75%

Data Source: China Electric Power Yearbook, 2003-2007, China Energy Statistical Yearbook 2007.

Table 2–Power Supply data for the South China Power Grid, 2004

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	169,389,000	20,143,000	49,720,000	24,322,000
Rate of Electricity Consumption of the Power Plant (%)	5.42	8.33	7.06	7.56
Power Supplied to the Grid(MWh)	160,208,116	18,465,088	46,209,768	22,483,257
Total Supplied to Grid of the Thermal Power (MWh)	247,366,229			
Net import Power from the Central China Power Grid (MWh)	10,951,240			
The total Power for the South China Power Grid (MWh)	258,317,469			

Data Source: China Electric Power Yearbook 2005

Table 3–Power Supply data for the South China Power Grid, 2005

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	176,453,000	25,023,000	58,430,000	27,281,000
Rate of Electricity Consumption of the Power Plant (%)	5.58	7.95	6.94	7.34
Power Supplied to the Grid(MWh)	166,606,923	23,033,672	54,141,238	25,387,699
Total Supplied to Grid of the Thermal Power (MWh)	269,169,531			
Net import Power from the Central China Power Grid (MWh)	20,264,000			
The total Power for the South China Power Grid (MWh)	289,433,531			

Data Source: China Electric Power Yearbook 2006, Abstract of Electric Power Industry Statistics 2005

Table 4–Power Supply data for the South China Power Grid, 2006

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	188,429,000	27,967,000	76,039,000	39,791,000
Rate of Electricity Consumption of the Power Plant (%)	5.27	4.45	6.06	4.12
Power Supplied to the Grid(MWh)	178,498,792	26,722,469	71,431,037	38,151,611
Total Supplied to Grid of the Thermal Power (MWh)	314,803,908			
Net import Power from the Central China Power Grid (MWh)	21,730,840			
The total Power for the South China Power Grid (MWh)	336,534,748			

Data Source: China Electric Power Yearbook, 2007, China Energy Statistical Yearbook 2007, Abstract of Electric Power Industry Statistics 2006

Table 5– Calculation of average emission factor for the Central China Power Grid from 2004 to 2006

	2004	2005	2006
Total CO_2 emission of the Central China Power Grid (tCO_2e)	346,035,810	360,323,575	408,776,270
The total power supplied to the Central China Power Grid (MWh)	418,261,666	466,644,030	529,958,480
Average emission factor (tCO_2e/ MWh)	0.82732	0.77216	0.77134

Table 6–2004 data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4Tons	6,017.70	1,305.00	2,643.90	1,751.28	11,717.88
Clean coal	10^4Tons	0.21	0.00	0.00	0.00	0.21
Other washed coal	10^4Tons	0.00	0.00	0.00	0.00	0.00
Coke	10^4Tons	0.00	0.00	0.00	0.00	0.00
Coke oven gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00
Other gas	10^8 Cubic meter	2.58	0.00	0.00	0.00	2.58
Crude oil	10^4Tons	16.89	0.00	0.00	0.00	16.89
Gasoline	10^4Tons	0.00	0.00	0.00	0.00	0.00
Diesel oil	10^4Tons	48.88	0.00	0.00	1.83	50.71
Fuel oil	10^4Tons	957.71	0.00	0.00	0.00	957.71
LPG	10^4Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4Tons	2.86	0.00	0.00	0.00	2.86
Natural gas	10^8Cubic meter	0.48	0.00	0.00	0.00	0.48
Other petroleum products	10^4 Tons	1.66	0.00	0.00	0.00	1.66
Other coking products	10^4Tons	0.00	0.00	0.00	0.00	0.00
Other E (standard coal)	10^4Tons	79.42	0.00	0.00	0.00	79.42

Data Source: China Energy Statistical Yearbook 2005

Table 7– Calculation of the OM Emission Factor for the South China Power Grid (SCPG) in 2004

Fuel	Unit	Fuel Consumption in the SCPG E	Emission Factor (tC/TJ) F	Average NCV (MJ/t,km^3) G	CO_2Emission (tCO_2e) I=G*F*E*44/12/100(in mass) I=G*F*E*44/12/10 (in volume)
Raw coal	10^4Tons	11,717.88	25.80	20,908	231,767,574
Clean coal	10^4Tons	0.21	25.80	26,344	5,233
Other washed coal	10^4Tons	0.00	25.80	8,363	0
Coke	10^4Tons	0.00	29.20	28,435	0
Coke oven gas	10^8 Cubic meter	0.00	12.10	16,726	0
Other gas	10^8 Cubic meter	2.58	12.10	5,227	59,831
Crude oil	10^4Tons	16.89	20.00	41,816	517,933
Gasoline	10^4Tons	0.00	18.90	43,070	0
Diesel oil	10^4Tons	50.71	20.20	42,652	1,601,975
Fuel oil	10^4Tons	957.71	21.10	41,816	30,983,494
LPG	10^4Tons	0.00	17.20	50,179	0
Refinery gas	10^4Tons	2.86	15.70	46,055	75,825
Natural gas	10^8Cubic meter	0.48	15.30	38,931	104,833
Other petroleum products	10^4 Tons	1.66	20.00	38,369	46,708
Other coking products	10^4Tons	0.00	25.80	28,435	0
Other E (standard coal)	10^4Tons	79.42	0.00	0	0
CO_2 emission of power import from Central China Power		0.82732tCO_2e/MWh×10,951,240MWh =9,060,180tCO_2e			
Total emission (Q)		274,223,576tCO_2e			
Supply to SCPG (P)		258,317,469MWh			
OM Emission Factor (=Q/P)		1.06158tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p. 1.21-1.22.

Table 8–2005 data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4Tons	6,696.47	1,435	3,212.31	1,975.55	13,319.33
Clean coal	10^4Tons	0.00	0.00	0.00	0.15	0.15
Other washed coal	10^4Tons	0.00	0.00	10.39	33.88	44.27
Coke	10^4Tons	4.79	0.00	0.00	8.05	12.84
Coke oven gas	10^8 Cubic meter	0.00	0.00	0.00	0.79	0.79
Other gas	10^8 Cubic meter	1.87	0.00	0.00	15.96	17.83
Crude oil	10^4Tons	10.91	0.00	0.00	0.00	10.91
Gasoline	10^4Tons	0.68	0.00	0.00	0.00	0.68
Diesel oil	10^4Tons	31.96	2.02	0.00	1.81	35.79
Fuel oil	10^4Tons	887.21	0.00	0.00	0.00	887.21
LPG	10^4Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4Tons	4.92	0.00	0.00	0.00	4.92
Natural gas	10^8Cubic meter	0.93	0.00	0.00	0.00	0.93
Other petroleum products	10^4 Tons	1.70	0.00	0.00	0.00	1.7
Other coking products	10^4Tons	0.00	0.00	0.00	0.00	0.00
Other E (standard coal)	10^4Tons	104.66	133.15	0.00	59.72	297.53

Data Source: China Energy Statistical Yearbook 2006.

Table 9- Calculation of the OM Emission Factor for the South China Power Grid in 2005

Fuel	Unit	Fuel Consumption in the SCPG E	Emission Factor (tC/TJ) F	Average NCV (MJ/t,km^3) G	CO_2Emission (tCO_2e) I=G*F*E*44/12/100(in mass) I=G*F*E*44/12/10 (in volume)
Raw coal	10^4Tons	13,319.33	25.80	20,908	263,442,602
Clean coal	10^4Tons	0.15	25.80	26,344	3,738
Other washed coal	10^4Tons	44.27	25.80	8,363	350,238
Coke	10^4Tons	12.84	29.20	28,435	390,906
Coke oven gas	10^8 Cubic meter	0.79	12.10	16,726	58,624
Other gas	10^8 Cubic meter	17.83	12.10	5,227	413,486
Crude oil	10^4Tons	10.91	20.00	41,816	334,556
Gasoline	10^4Tons	0.68	18.90	43,070	20,296
Diesel oil	10^4Tons	35.79	20.20	42,652	1,130,639
Fuel oil	10^4Tons	887.21	21.10	41,816	28,702,703
LPG	10^4Tons	0.00	17.20	50,179	0
Refinery gas	10^4Tons	4.92	15.70	46,055	130,441
Natural gas	10^8Cubic meter	0.93	15.30	38,931	203,115
Other petroleum products	10^4 Tons	1.70	20.00	38,369	47,833
Other coking products	10^4Tons	0.00	25.80	28,435	0
Other E (standard coal)	10^4Tons	297.53	0.00	0	0
CO_2 emission of power import from Central China Power		0.77216 tCO_2e/MWh×20,264,000 MWh =15,647,050tCO_2e			
Total emission (Q)		310,876,215tCO_2e			
Supply to SCPG (P)		289,433,531MWh			
OM Emission Factor (=Q/P)		1.07409tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p. 1.21-1.22.

Table 10–2006 data for primary fuel input for thermal power supply to the South China Power Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	10^4Tons	7,303.19	1,490.01	4,001.54	2,735.88	15,530.62
Clean coal	10^4Tons	0.00	0.00	0.00	0.00	0.00
Other washed coal	10^4Tons	0.00	0.00	19.53	45.80	65.33
Briquettes	10^4Tons	133.75	0.00	0.00	0.00	133.75
Coke	10^8 Cubic meter	0.00	0.00	0.00	1.31	1.31
Coke oven gas	10^8 Cubic meter	0.00	0.84	0.00	2.06	2.90
Other gas	10^4Tons	0.89	0.00	0.00	19.15	20.04
Crude oil	10^4Tons	0.87	0.00	0.00	0.00	0.87
Gasoline	10^4Tons	0.00	0.00	0.00	0.00	0.00
Diesel oil	10^4Tons	29.92	1.26	0.00	3.00	34.18
Fuel oil	10^4Tons	685.85	0.09	0.00	0.00	685.94
LPG	10^4Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	0.00	0.00	0.00	0.00	0.00
Natural gas	10^8Cubic meter	7.92	0.00	0.00	0.00	7.92
Other petroleum products	10^4Tons	0.67	0.00	0.00	0.00	0.67
Other coking products	10^4Tons	0.00	0.00	0.00	0.00	0.00
Other E (standard coal)	10^4Tons	93.54	189.68	0.00	20.29	303.51

Data Source: China Energy Statistical Yearbook 2007.

Table 11- Calculation of the OM Emission Factor for the South China Power Grid in 2006

Fuel	Unit	Fuel Consumption in the SCPG E	Emission Factor (tC/TJ) F	Average NCV (MJ/t,km^3) G	CO_2Emission(tCO_2e) I=G*F*E*44/12/100 (in mass) I=G*F*E*44/12/10 (in volume)
Raw coal	10^4Tons	15,530.62	25.80	20,908	307,179,636
Clean coal	10^4Tons	0.00	25.80	26,344	0
Other washed coal	10^4Tons	65.33	25.80	8,363	516,852
Briquettes	10^4Tons	133.75	26.60	20,908	2,727,466
Coke	10^8 Cubic meter	1.31	29.2	28,435	39,882
Coke oven gas	10^8 Cubic meter	2.90	12.10	16,726	215,202
Other gas	10^4Tons	20.04	12.10	5,227	464,737
Crude oil	10^4Tons	0.87	20.00	41,816	26,679
Gasoline	10^4Tons	0.00	18.90	43,070	0
Diesel oil	10^4Tons	34.18	20.20	42,652	1,079,777
Fuel oil	10^4Tons	685.94	21.10	41,816	22,191,288
LPG	10^4Tons	0.00	17.20	50,179	0
Refinery gas	10^4 Tons	0.00	15.70	46,055	0
Natural gas	10^8Cubic meter	7.92	15.30	38,931	1,729,751
Other petroleum products	10^4Tons	0.67	20.00	38,369	18,852
Other coking products	10^4Tons	0.00	25.80	28,435	0
Other E (standard coal)	10^4Tons	303.51	0.00	0	0
Emission of electricity from the Central China Power Grid		0.77134tCO_2e/MWh×21,730,840MWh = 16,761,866tCO_2e			
Total Emission (Q)		352,951,910tCO_2e			
Supply to SCPG (P)		336,534,748MWh			
OM Emission Factor [＝Q/P]		1.04878tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p. 1.21-1.22.

Table 12-Full-wighted Ave. OM 3 years of the South China Power Grid

Years	2004	2005	2006
Total CO_2 Emission (tCO_2e)	274,223,576	310,876,215	352,951,910
Total supply (MWh)	258,317,469	289,433,531	336,534,748
Full-weighted average OM	= (274,223,576+310,876,215+352,951,910) / (258,317,469+289,433,531+336,534,748) = 1.0608tCO_2e/MWh		

Table13–Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission

Fuel		Unit	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal	Average NCV (MJ/t,km^3)	Emission Factor (tC/TJ)	CO_2 Emission (tCO_2e)	Ratio
Coal	Raw coal	10^4tons	7303.19	1,490.01	4,001.54	2,735.88	15,530.62	20,908	25.80	307,179,636	-
	Clean coal	10^4tons	0.00	0.00	0.00	0.00	0.00	26,344	25.80	0	-
	Other washed coal	10^4tons	0.00	0.00	19.53	45.80	65.33	8,363	25.80	516,852	-
	Briquettes	10^4tons	133.75	0.00	0.00	0.00	133.75	20,908	26.60	2,727,466	
	Coke	10^4tons	0.00	0.00	0.00	1.31	1.31	28,435	29.20	39,882	-
	Total	-	-	-	-	-	-	-	-	**310,463,836**	**92.35%**
Oil	Crude oil	10^4tons	0.87	0.00	0.00	0.00	0.87	41,816	20.00	26,679	-
	Gasoline	10^4tons	0.00	0.00	0.00	0.00	0.00	43,070	18.90	0	-
	Kerosene	10^4tons	0.00	0.00	0.00	0.00	0.00	43,070	19.60	0	-
	Diesel Oil	10^4tons	29.92	1.26	0.00	3.00	34.18	42,652	20.20	1,079,777	-
	Fuel oil	10^4tons	685.85	0.09	0.00	0.00	685.94	41,816	21.10	22,191,288	-
	Other petroleum products	10^4tons	0.67	0.00	0.00	0.00	0.67	38,369	20.00	18,852	-
	Other coking products	10^4tons	0.00	0.00	0.00	0.00	0.00	28,435	25.80	0	
	Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**23,316,596**	**6.94%**
Gas	Natural gas	10^7m^3	79.20	0.00	0.00	0.00	79.20	38,931	15.30	1,729,751	-
	Coke oven gas	10^7m^3	0.00	8.40	0.00	20.60	29.00	16,726	12.10	215,202	-
	Other gas	10^7m^3	8.90	0.00	0.00	191.50	200.40	5,227	12.10	464,737	-
	LPG	10^4tons	0.00	0.00	0.00	0.00	0.00	50,179	17.20	0	-
	Refinery gas	10^4tons	0.00	0.00	0.00	0.00	0.00	46,055	15.70	0	-
	Refinery gas	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2,409,690**	**0.72%**
Total		-	-	-	-	-	-	-	-	336,190,122	100%

Table14–Calculation of the Emission Factor for Coal-fired, oil-fired and Gas-fired Power

	Variable	Supply Efficiency J	Emission Factor of fuel(tc/TJ) F	Emission Factor (tCO_2e/MWh) =3.6/J/1000*F*44/12
Coal-fired	$EF_{Coal,Adv}$	37.28%	25.80	0.9135
Gas-fired	$EF_{Gas,Adv}$	48.81%	15.30	0.4138
Oil-fired	$EF_{Oil,Adv}$	48.81%	21.10	0.5706

The emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.8862 \text{ } tCO_2e/MWh.$$

Table15–The Installed Capacity of the South China Power Grid 2004

Installed Capacity	Guangdong	Guangxi	Yunnan	Guizhou	Subtotal
Thermal power(MW)	30,172.9	4,378.1	4,306.9	7,801.8	46,659.7
Hydro power(MW)	8,584.6	5,040.4	7,058.6	6,896.5	27,580.1
Nuclear power(MW)	3,780	0	0	0	3,780
Wind power and other(MW)	83.4	0	0	0	83.4
Total (MW)	42,621	9,418.5	11,365.5	14,698.3	78,103.3

Data Source: China Electric Power Yearbook 2005.

Table16–The Installed Capacity of the South China Power Grid 2005

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	35,182.6	4,931.2	4,758.4	9,634.8	54,507
Hydro power(MW)	9,035.7	6,085.3	7,993.1	7,233	30,347.1
Nuclear power(MW)	3,780	0	0	0	3,780
Wind power and other(MW)	83.4	0	0	0	83.4
Total (MW)	48,081.7	11,016.5	12,751.5	16,867.8	88,717.5

Data Source: China Electric Power Yearbook 2006.

Table17–The Installed Capacity of the South China Power Grid 2006

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	40,615	5,434	8,564	14,350	68,963
Hydro power(MW)	9,320	7,624	9,698	7,534	34,176
Nuclear power(MW)	3,780	0	0.0	0.0	3,780
Wind power and other(MW)	183	0	0.0	0.0	183
Total (MW)	53,898.9	13,058	18,262	21,884	107,102

Data Source: China Electric Power Yearbook 2007.

Table18–The Calculation of BM Emission Factor for the South China Power Grid

	2004	2005	2006	Capacity Addition Of 2004-2006	The Ratio in new addition
Thermal power(MW)	46,659.7	54,507	68,963	22,303.3	76.91%
Hydro power(MW)	27,580.1	30,347.1	34,176	6,595.9	22.75%
Nuclear power(MW)	3,780	3,780	3,780	0	0.00%
Wind power (MW)	83.4	83.4	183	99.6	0.34%
Total(MW)	78,103.3	88,717.5	107,102	28,998.7	100.00%
Ratio of installed capacity in 2006	72.96%	82.83%	100.00%	-	-

$$EF_{grid,BM,y} = 0.8862 \times 76.91\% = 0.6816 tCO_2e/MWh$$

The $EF_{grid,OM,y}$ is calculated as 1.0608tCO_2e/MWh, the $EF_{grid,BM,y}$ is calculated as 0.6816tCO_2e/MWh. And the baseline emission factor equal to the combined margin with equally weighted average of the operating margin emission factor and the build margin emission factor.

According to *Tool to calculate the emission factor for an electricity system*, the default weight of hydropower during the first crediting period is:

$w_{OM} = 0.5 \quad w_{BM} = 0.5$

So the Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) is 0.8712tCO_2e/MWh.

Annex 4

MONITORING PLAN

The monitoring plan will monitor the following data:
(1) Electricity supplied to the grid by the project,
(2) Electricity use of plant consumption of the project,
(3) Installed capacity of the project after the implementation of the project activity,
(4) Area of the reservoir measured in the surface of water, after the implementation of the project activity, when the reservoir is full, and
(5) The total electricity produced by the project.

Relative information is provided the relative information in section B.7.2.