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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Yunnan Nujiang Fugong Guquan River Hydropower Station
Version: 5
Date: 24/07/2008

Revision History of the PDD

Version	Date	Comments
Version 1	12 February 2007	Complete version of the PDD, prepared for the host country approval process
Version 2	23 April 2007	Revised PDD; prepared for validation, incorporating the latest NDRC emission factors information
Version 3	02 April 2008	Revised PDD; prepared on the basis of corrective action requests in the Validation protocol of TUV SUD.
Version 4	15 May 2008	Revised PDD; according to the latest requirement of EB 38 meeting and the second response of TUV SUD.
Version 5	24 July 2008	Revised PDD according to the second response from DOE

A.2. Description of the project activity:

Summary:

The Yunnan Nujiang Fugong Guquan River Hydropower Station (hereafter referred to as 'the project' or 'the proposed project') is located in the middle reaches of Guquan River, Fugong County, Nujiang Lisu Autonomous Prefecture, Yunnan Province, China. The project is a run-of-river hydro power station, and the installed capacity is 22MW, on the average, the project activity is expected to operate 5,351hours per year, which corresponds to an average power generation of 117,720MWh and a net electricity supply to the grid of 99,560MWh. The power generated will be connected to the local grid, then to the Yunnan Grid and finally, to the Southern Grid.

The main objective of the project is to generate power from clean renewable hydropower in Yunnan Province and contribute to the sustainability of power generation of the Southern Grid.

Contribution to sustainable development:

The project activity's contributions to sustainable development are:

- Reducing the dependence on exhaustible fossil fuels for power generation;
- Reducing air pollution by replacing coal-fired power plants with clean, renewable power;
- Bridging the gap between power supply and demand and reducing the deficiency of the local grid;
- Reducing the adverse health impacts from air pollution;
- Reducing the emissions of greenhouse gases, to combat global climate change;
- Contributing to local economic development through employment creation and improving the local energy generation infrastructure.

This project fits with the Chinese government objective to reduce the dependence on exhaustible fossil fuels for power generation, make the energy sector in general and the power sector in particular more sustainable.

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）
People's Republic of China (host)	Fugong Hongyuan Hydropower Development Co., Ltd. (as the project owner)	No
Germany	RWE Power AG. (as the CERs buyer)	No

For more detailed contact information on participants in the project activities, please refer to Annex 1.

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:

Shangpa Town, Fugong County, Nujiang Lisu Autonomous Prefecture

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

The proposed project activity is located in the middle reaches of Guquan River, which is the branch of Nujiang River, in Fugong County, Nujiang Lisu Autonomous Prefecture, Yunnan Province, China. The proposed project is located 143km from Liuku Town and 749km from Kunming City. The project will construct two intake dams, of which, No.1 dam is 0.8km downriver from the junction of Wuke River and Mozhimo River and the exact location of it is at the longitude of 98°48'10"E and the latitude of 26°51'15"N; and No.2 dam is 1.25km downriver from the junction of Qianshuijia River and Jiajidu River and the exact location of it is at the longitude of 98°48'37"E and the latitude of 26°50'48"N. The workshop is upper 2.2km from the junction of Qianshui River and Nujiang River, and the exact location of the work shop is at the longitude of 98°50'52"E and the latitude of 26°51'26"N.

The location of the station is shown in Fig.A.1.

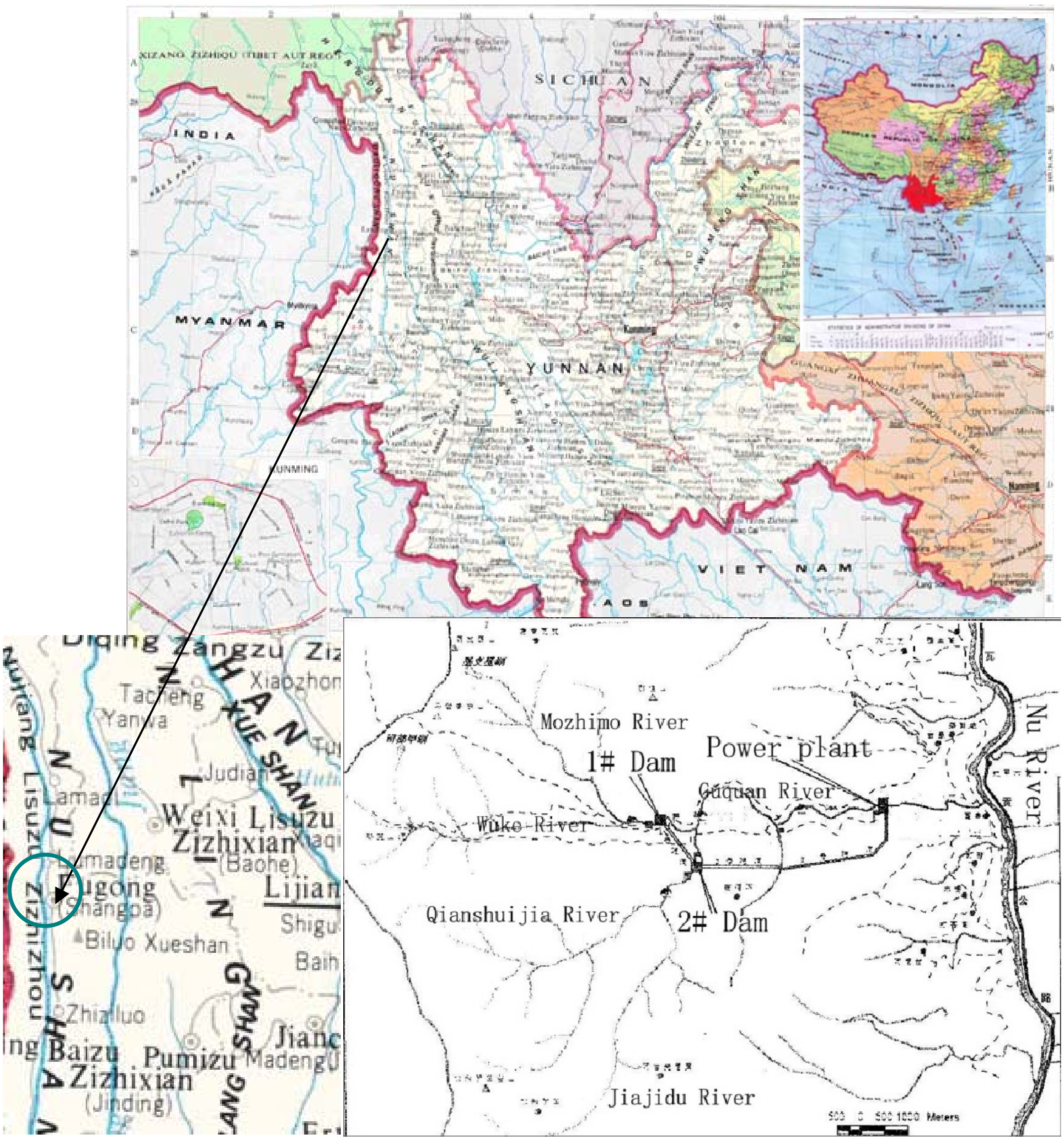

Table A.1 the Location of Yunnan Fugong Guquan River Hydropower Station

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

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 construction of the project consists mainly of intake dam, flushing gate, intake gate, diversion tunnel, sediment pool, forebay, penstock, workshop and booster station. The project is a run-of-river diversion type hydropower station and the total installed capacity is 22MW. The turbines and generators adopted are

produced by the Kunming Electrical Machine Co., Ltd. The specific technical data of the turbines and generators is listed is Table A.1.

Table A.1 Technical data of the turbine / generator units

Turbine Unit	**Amount**	**Type**	**Rated Capacity**	**Rated flow rate**	**Designed hydraulic head**
	2	CJA475-L-165/2×12	10.363MW	2.03m^3/s	580m
Generator Unit	**Amount**	**Type**	**Rated Capacity**	**Rated rotate speed**	**Rated voltage**
	2	SF11-10/2860	11MW	600γ/min	6.3kV

The project owner employs some experts with over twenty years of experience in operating a hydropower plant and also employs some other people, who will get trained by the experts, to operate and maintain the station. Additionally, the employees of the project also had undergone training by the manufacturer of the turbines and generators, so the project is well prepared. During the operation phase, if there are some new participants to operate the station, they will also get training from the experts of the station.

In matters of CDM monitoring process, the monitoring officer will receive training on monitoring methodologies, procedures and information archiving from Beijing Tianqing Power International CDM Consulting Co., Ltd. (hereinafter referred to as "Beijing Tianqing"). Thereafter, the monitoring officer will train the staff in charge for CDM monitoring.

A time schedule of the implementation of the project is given in table A.2.

Table A.2: Overview of key events in the development of the project

Date	Key Event
January 2005	Feasibility Study Report
March 2005	Environment Impact Assessment Report
March 2005	Simple Economic Analysis Report (namely draft version for Supplementary Economic Evaluation for Feasibility Study Report)
April 2005	A board meeting was hold to decide to commission the Yunnan Lingyu Survey and Design Institute do Supplementary Economic Evaluation for Feasibility Study Report
3 April 2005	A board meeting was hold to decide that the proposed project should applying for CDM[1]
11 April 2005	The project owner signed development contract with CDM developer (the Power Enterprises Association of Dehong Prefecture) and started preparation of CDM application
11 April 2005	The project owner applying the local government support them apply CDM[2]
19 May 2005	Approval of Environmental Impact Assessment
20 May 2005	Get the reply from local government that they support the project owner apply CDM for the proposed project[3]
20 May 2005	Agreement between the project owner and generator manufacturer had been signed

[1] The board meeting was hold to apply CDM because the low investment attraction of Guquan project.
[2] To make sure apply CDM smoothly, the project owner gave an application to local government so that they can support the Guquan project apply CDM.
[3] Published by Nujiang Lisu Autonomous Prefecture Government, show that they support Guquan project apply CDM.

16 June 2005	Approval of Feasibility Study Report
16 July 2005	Start main construction[4]
28 December 2005	Approval of the Supplementary Economic Evaluation for Feasibility Study Report
10 July 2006	The Power Enterprises Association of Dehong Prefecture can not fulfil their responsibility because they were lack of experience on CDM project application. The project owner signed development contract with CDM developer (Beijing Tianqing) and started preparation of CDM application
March 2007	The buyer signed Letter of Intent for the CDM project with the project owner
May 2007	The project received LOA of Chinese DNA on Chinese DNA Website
July 2007	The buyer signed ERPA for the CDM project with the project owner
2 July 2007	The PDD has been started to GSP
23 December 2007	The station started operation[5]

The above events clearly demonstrate that the Project owner was aware about the potential for CDM before the start of the CDM activity, and that it played a crucial role in overcoming the barriers towards the implementation of the proposed project activity.

About the detailed description for the timeline, please see the Sub-step 2c of section B.5.

The power generated in the station will be connected to 110kV the Shangpa transformer substation in Fugong County, then to the Nujiang Grid before Latudi switching station is finished; after the construction of Latudi switching station completed, the power will be connected to the 110kV Latudi switching station, then to the Nujiang Grid, to the Yunnan Grid and finally to the Southern Grid.

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

The project activity uses the renewable crediting period (7 years×3), and the estimation of the emission reductions during the first crediting period (01/11/2008-31/10/2015) is presented in Table A.3. Estimated Emission Reductions throughout the first crediting period are 587,748tCO_2e.

Table A.3 the Estimation of the Emission Reductions in the first Crediting Period

Years	Annual estimation of emission reductions in tones of CO_2e
01/11/2008-31/10/2009	83,964
01/11/2009-31/10/2010	83,964
01/11/2010-31/10/2011	83,964
01/11/2011-31/10/2012	83,964
01/11/2012-31/10/2013	83,964
01/11/2013-31/10/2014	83,964
01/11/2014-31/10/2015	83,964
Total estimated reductions (tones of CO_2e)	587,748

[4] Approved by Yunnan Lingyu Survey and Design Institute of water resources and Hydropower, Water Conservancy Bureau of Nujiang Lisu Autonomous Prefecture and DRC of Nujiang Lisu Autonomous Prefecture.
[5] The Operating Notice published by the Fugong Hongyuan Hydropower Development Co., Ltd.

Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	83,964

A.4.5. Public funding of the project activity:

There is no public funding from Annex I countries available to the project.

SECTION B. Application of a baseline and monitoring methodology:

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

Baseline methodology:

Approved consolidated baseline methodology ACM0002 (Version 6): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

The methodology draws upon Version 05 of the "Tool for the demonstration and assessment of additionality"

Monitoring methodology:

Approved consolidated monitoring methodology ACM0002 (Version 6): "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

Reference: UNFCCC website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

This project satisfies all the methodology ACM0002 applicable conditions, that is:
1 The project is a capacity addition from a renewable energy source, i.e. water resource. The electricity capacity addition is from a run-of-river hydropower station;
2 The proposed project activity does not involve fuel switching from fossil fuels;
3 The geographic and system boundaries for the relevant electricity grid can be clearly identified (The Southern Grid).

Therefore, the baseline methodology is applicable to this 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 project boundary includes the project site and the electricity system where Guquan River hydropower station is connected to.

In this specific case, the station is connected to the Yunnan Grid and finally, to the Southern Grid. The Southern Grid is a larger regional grid, which consists of four sub-grids: Guangdong, Guangxi, Yunnan and Guizhou. According to the above guidance, and considering the substantial inter grid power exchange throughout the Southern Grid, it is justifiable to identify the Southern Grid as the correct project boundary for this specific project.

Table B.1 Description of How the Sources and Gases Included in the Project Boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Thermal power plants in the Southern Grid	CO_2	Included	According to ACM0002 methodology, it is only necessary to account for CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity are considered.
		CH_4	Excluded	According to methodology ACM0002, without CH_4 emission.
		N_2O	Excluded	According to methodology ACM0002, without N_2O emission.
Project Activity		CO_2	Excluded	According to ACM0002 methodology, no CO_2 emissions are considered for hydro power projects.
		CH_4	Excluded	The hydro electric power project is a run-of-river hydropower station, According to methodology ACM0002, without CH_4 emission.
		N_2O	Excluded	According to ACM0002 methodology, no N_2O emissions are considered for hydropower projects.

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

Following baseline scenario options have been identified as realistic and credible alternatives to the project activity:

1. The proposed 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 electricity is supplied by the Southern Grid.

The baseline scenario options described above are discussed individually considering relevant laws and regulations, as well as investment analysis.

Scenario 1: the proposed hydropower activity, without being registered as a CDM project activity,

The first scenario is in compliance with Chinese relevant laws and regulations. The attractiveness of the project without CDM revenues is measured by conducting an Internal Rate of Return (project IRR post-tax) analysis. According to the section B.5, The project IRR post-tax of the project is 8.26% without CDM revenue which is lower than the benchmark rate of 10% (benchmark for the project IRR post-tax, the same as the following)[6]. Therefore, the project faces obvious finance barriers without CDM revenue. Hence, the first scenario is not feasible, and it is not the baseline scenario.

[6] The hydropower NO.[1995]186 documents of the Ministry of Water Resources of the People's Republic of China is The Revision of Economic Evaluation Code for Small Hydropower Project(SL16-95). A small hydropower project is: a station with installed capacity is lower than 25MW and the building, revising, expansion, rebuilding of it's corresponding Grid. Middle scale stations under 50MW in the country can follow these regulations. Based on the List of technical standards currently in effect of water resources published by the Ministry of Water Resources of the People's Republic of China, the No [1995]186 document is still hold good.

Scenario 2: Thermal power plant with equivalent annual power generation,

There is a great difference in the utilization hours and stability of water resources supply between a thermal power plant and a hydropower plant with equivalent installed capacity. As a result, there is a great gap between the power generation capacity and supply reliability of thermal power and hydropower. If we consider the capacity that can be generated by the same annual electricity generation as the alternative scenario for the proposed project, the installed capacity of the thermal plant would be less than 22MW. However, according to Chinese regulations, construction of fossil fuel fired power plants whose installed capacity is less than 135MW is prohibited in China[7]. Therefore, the second scenario does not comply with Chinese relevant laws and regulations and is not a feasible alternative.

Scenario 3: Other renewable energy power plant with equivalent annual power generation,

There are no enough wind resources[8], solar sources, wave and tidal sources or geothermal sources in this area. The technology of biomass sources power is not mature and the cost is very high. Furthermore, no biomass sources power plant has previously been built in this area. The economic return of other renewable power plants with similar amount of capacity should be of little attractiveness. The third scenario is therefore not feasible nor the baseline scenario.

Scenario 4: The equivalent annual electricity is supplied by the Southern Grid.

It is in compliance with Chinese relevant laws and regulations and does not face economic barriers.

Conclusion:

From the above analysis we can conclude that the fourth scenario is the only plausible alternative to the project activity. Therefore, the baseline scenario of this project is:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources without the proposed project activity.

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 additionality of the project activity is demonstrated using the steps described in *the Tool for the Demonstration and Assessment of Additionality (version 5)* as developed by the EB. We will argue and demonstrate that:

Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Sub-Step1a. 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 available and credible in the Southern Grid:

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

[7] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.
[8] http://www.newenergy.org.cn/html/2006-2/2006217_7650.html

3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent annual electricity is supplied by the Southern Grid.

There are no enough wind resources, solar sources, wave and tidal sources or geothermal sources in this area. The technology of biomass sources power is not mature and the cost is very high. Furthermore, no biomass sources power plant has previously been built in this area. The economic return of other renewable power plants with similar amount of capacity should be of little attractiveness. The third scenario is therefore not feasible.

Sub-Step1b. Consistency with mandatory laws and regulations

As discussed in section B.4, according to Chinese regulations, construction of fossil fuel fired power plants whose installed capacity is less than 135MW is prohibited in China[9], therefore, the second alternative, thermal power plant with equivalent annual power generation, is not in compliance with Chinese relevant laws and regulations, so it is not a feasible alternative. While the first, third and fourth alternatives are in compliance with Chinese relevant laws and regulations but not the project that the laws and regulations enforce to construct.
However, we excluded the third alternatives as an available alternative since the renewable resource is unavailable and some technology barriers. Please find more details under sub-step 1a.

From the above analysis, the proposed activity is not the only scheme which is in accordance with Chinese relevant laws and regulations, so it presents the necessary conditions for additionality.

<u>Step 2 Investment Analysis</u>

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). The project activity will produce economic benefits (from electricity sales) other than CERs income and the fourth scenario is not a specific project. So, the project activity uses the benchmark analysis (Option III).

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

According to *Tool for the Demonstration and Assessment of Additionality (Version 05),* we can choose project IRR or equity IRR to do the investment analysis. The benchmark is project IRR post-tax, for making consistent between the project IRR post-tax we calculate and the benchmark, we choose project IRR post-tax to do financial analysis of the project activity.

Based on the benchmark revenue rate in the financial evaluation of the Chinese *Economic evaluation code for small hydropower projects*, the project IRR post-tax of an electric power project's total investment should not be lower than the threshold of 10%.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III) (this part will be completed once the figure provided by the project owner)

The project faces a barrier to implementation due to the poor returns on investment. In Jan. 2005, the project owner commissioned *Yunnan Lingyu Survey and Design Institute of water resources and Hydropower* to do the Feasibility Study Report, during the investigation period, the project owner was told that the project returns is low due to the high investment, bad geologic condition and difficult transportation condition. In order to know about the return of the project clearly, based on reply for the FSR from the project owner and a notice for local grid price and coefficient of effective electricity published by

[9] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.

local grid company in February 2005, the *Yunnan Lingyu Survey and Design Institute of water resources and Hydropower completed a Simple Economic Analysis Report* (namely draft version for Supplementary Economic Evaluation for Feasibility Study Report) for the project owner in March 2005 (before CDM decision in April 2005), the project IRR post-tax is 8.26%, which is low. In order to get an approval from the Local DRC, the project owner held a board meeting [10] to decide to ask the *Yunnan Lingyu Survey and Design Institute of water resources and Hydropower* do a formal investment analysis (namely Supplementary Economic Evaluation for Feasibility Study Report), and the final result shows that the project IRR post-tax is 8.26%, which is lower than the benchmark. The board held a meeting again and decided that the project must apply CDM as a precondition of investing the project and the project owner issued a CDM projects application request to the local government (for getting the CDM support approval from the government) in April 2005, the both dates are earlier than the earliest starting date of the project, i.e. May 20, 2005 (Equipment Purchase Agreement, on the same day, the project owner got the approval from local government to apply for CDM), and then the construction of the project has been started on July, 16, 2005. It can be concluded that: the project owner was in an early stage aware about the potential of CDM to support its activities. CDM has played a decisive role in the successful implementation of the project.

At the beginning (in April 2005), the project owner started to contract with some CDM developers (including Beijing Tianqing), and prepared to choose appropriate developer to start CDM application. After simple research, the project owner consigned the Power Enterprises Association of Dehong Prefecture to assist the CDM applying work on April 11, 2005, and the Power Enterprises Association of Dehong Prefecture began to prepare the applying work for CDM application and look for the buyer since then. On 12th October 2005, the<Clean Development Mechanism Management Regulation> has been promulgated by NDRC formally, and on 25th November 2005 the Chinese government gave further guidance and clarification on the CDM implementation procedures "Measures for Operation and Management of Clean Development Mechanism Projects in China". This facilitated the interest of CER buyers in CDM projects in China. At the same time, the project owner got all relevant approvals for the project, and the Power Enterprises Association of Dehong Prefecture began the PDD drafting and relevant material documents collection. But due to lack of English professionals and capable PDD writers, the Power Enterprises Association of Dehong Prefecture can not fulfil their responsibility on CDM project application. Therefore the project owner signed development contract with CDM developer (Beijing Tianqing) and started preparation of CDM application on July 10, 2006. From then on, Beijing Tianqing began to write PIN for looking for appreciate buyer, and after several months, RWE expressed their interest and started to make due diligence for the project. At the same time, the Beijing Tianqing started to write PDD for the project, and after the stakeholder consultation meeting in January 2007, the completed PDD has been submitted to Chinese DNA in February 2007.

At the same time the due diligence has been completed and after friendly negotiation, the buyer signed Letter of Intent for the project in March 2007 with the project owner. And then the project received LOA of Chinese DNA on Chinese DNA Website in May 2007.

And then the buyer started to look for DOE for the project's validation, after serious investigation, the DOE has been consigned and the PDD has been started GSP on July 2, 2007. At the same time, the buyer signed ERPA for the project in July 2007 with the project owner.

In Table A.2, we summarize an implementation schedule of the project, illustrating the main events leading up to the start of operations. The events in the Table A.2 clearly demonstrate that the project owner was aware about the potential of CDM revenues before the starting activities of the project activity,

[10] The content of the meeting is to decide to commission the Yunnan Lingyu Survey and Design Institute do investment analysis.

and that it played a crucial role in overcoming the barriers towards the implementation of the proposed project activity.

The basic parameters for calculation key financial indexes are provided in Table B.2, all figures are from the Supplementary Economic Evaluation.

Table B.2 the Basic Financial Parameter of the Project (€1=10 Yuan RMB)

Installed Capacity	Annual Power supplied to Grid	Static Total Investment	Estimated Grid Price (with VAT)	Value-added Tax	Corporate Income Tax	Operation Period	Annual Operation Cost
22MW	99,560MWh[♣]	€9,937,420	€0.0153/kWh	6%	33%	20years	€246,730

Note: all data come from Feasibility Study Report---Supplement Economic Evaluation, which has been approved by the local DRC.

The project IRR post-tax of this project is only 8.26% without CDM revenue. Based on the benchmark revenue rate in the financial evaluation of Chinese *Economic Evaluation Code for Small Hydropower Projects*, the project IRR post-tax of small hydropower project total investment should not lower than the threshold of 10%. So the project faces obvious finance barriers without CDM revenue.

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

We chose the following parameters to conduct a sensitivity analysis in order to confirm whether the conclusion of low economic attraction still exists when the key hypothesis is reasonably changed:

1. Static total investment
2. Annual operation cost
3. Grid price
4. Power supplied to the grid

Variations of ±10% (according to the approved Feasibility Study Report---Supplement Economic Evaluation) have been considered in the critical assumptions. Table B.3 summarizes the results of the sensitivity analysis, while Figure B.1 provides a graphic depiction.

Table B.3 Impact of Variations in Critical Assumptions on project IRR post-tax

	-10%	-5%	0%	5%	10%
Grid Price	6.92%	7.55%	8.26%	8.96%	9.56%
Static Total Investment	9.70%	8.95%	8.26%	7.62%	7.03%
Annual Operation Cost	8.56%	8.41%	8.26%	8.11%	7.96%
Power Supplied to the Grid	6.93%	7.60%	8.26%	8.91%	9.54%

[♣]The average power generation is 117,720MWh and a net electricity supply to the grid is 99,560MWh. According to the Feasibility Study Report---Supplement Economic Evaluation, the coefficient of effective electricity is 85%, therefore the effective power generated is 117,720MWh *0.85=100,060MWh, and the power used by power plant is 0.5%, therefore the power suuplied to the grid is 100,060MWh*(1-0.5%)=99560MWh. In addition, the coefficient of effective electricity of 85% come from the *Circular for Hydropower Stations from local Grid Company* (in the notice, the local average coefficient of effective electricity is 83.59%, published before CDM consideration and investment decision), and the 85% also can be proved by the actual coefficient of effective electricity in *electricity balance sheet*, and the document *SL16-95*.

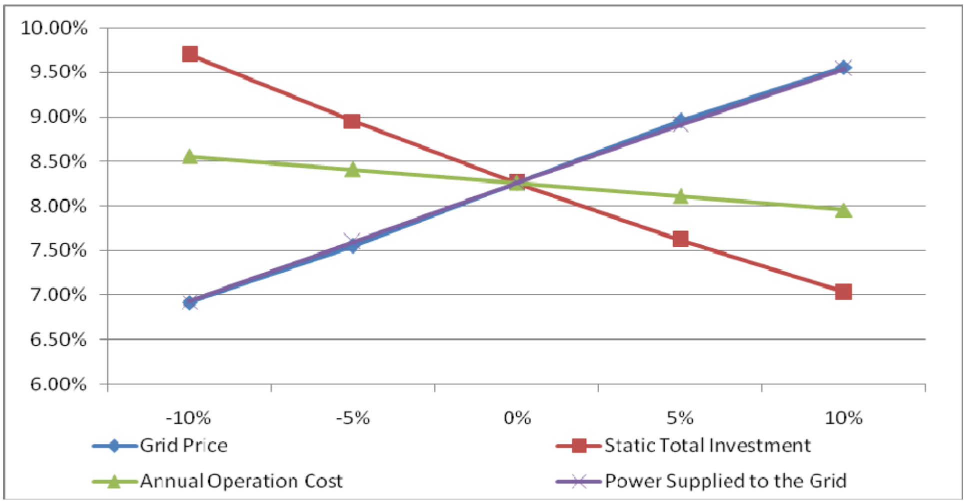

Fig B.1 the project IRR post-tax Sensitivity Analysis when Grid Price, Static Total Investment, Annual Operation Cost or Power Supplied to the Grid changed

Fig.B.1 shows that none of variations can raise the project IRR post-tax of the proposed project higher than the threshold of 10%. Therefore, the results of the sensitivity analysis confirm that the project faces significant economic and financial barriers without CDM revenue, so the first alternative lacks economic attraction.

On the other hand, the whole investment project IRR post-tax will increase greatly when the project receives the CERs revenues. If we take the CERs price as €8/tCO_2e [11] into account, the project IRR post-tax of the project reaches 12.30% (above the 10% benchmark), thus the repayment of capital and interest will be raised and the financial situation will be improved. It is obvious that the benefits come from the CDM which helps release the financing pressure that would otherwise obstruct the project activity.

Step 3. Barrier Analysis

The project employed above investment analysis to prove the additionality, not used the barrier analysis.

Step 4 Common Practice Analysis

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

Yunnan Province with an area of 39.4 ten thousand 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

[11] The Chinese DNA has set a minimum price necessary to obtain host country approval for CDM projects. Although the minimum price has not been published, commonly €8/tCO_2e is regarded as the minimum price the NDRC will accept. The CER price agreed for this project is either equal to or above €8/tCO_2e, but is considered a commercial secret.

provinces of the South China Power Grid do not have the similar investment conditions [12] and natural conditions [13] [14] [15] [16]. In addition, Guangxi Zhuang Autonomous Region is an autonomous region, which has more different conditions [17] from normal provinces like Yunnan, Guangdong and Guizhou provinces, which located in the South China Power Grid. Therefore, the PDD selects Yunnan Province as a geographical area for the common practice.
Therefore, for the common practice, we have analyzed all hydropower projects in Yunnan Province with installed capacities between 0.5MW [18] and 50MW [19] that have started operations. 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". We have selected hydropower stations with a similar installed capacity and have taken a wide range of installed capacities (0.5MW-50MW).

Therefore, we have analyzed hydropower projects located in Yunnan Province between 0.5MW and 50MW in Table B.4.

Table B.4. Existing hydropower plants similar to the proposed activity

Name of hydropower plant	Installed Capacity (MW)	Start Operations	Location	Project owner/largest stockholder
Luoze River Hydropower Project	25	1987[20]	Zhaotong County	State owned
Supa River Sanjiangkou Hydropower Project	30	1993[21]	Baoshan City Tengchong	State owned
Yisa River Hydropower Project	26.6	1994[22]	Yuxi City Yuanjiang County	State owned
Laohushan II Hydropower Project	25	1998[23]	Chuxiong Perefeture	State owned
Hongshiyan Hydropower Station	44	1999[24]	Yiliang County	State owned
Jiren River Hydropower Station	30	2001[25]	Diqing prefecture Shangri-La County	Diqing Electric Power Co., Ltd. (State investment)
Nanting River Hydropower Station	34	2004	Wenshan Prefecture Maguan County	Wenshan Electric Power Co., Ltd.[26] (State owned)

[12] Yearbook of China Water Resources 2006
[13] http://www.checc.cn/zgsd/zgsd_zy.jsp
[14]http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=17
[15]http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=22
[16]http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=21
[17]http://www.gov.cn/test/2005-07/29/content_18338.htm
[18] Almanac of China's Water Power (2005), page 141.
[19] Almanac of China's Water Power (2005), page 141.
［20］http://www.sp.com.cn/zgsd/tjzl/yunnan.htm
［21］http://www.ynsph.com.cn/
［22］http://slx.zjwchc.com/sdz/sdz1/604.htm
［23］http://www.yn.gov.cn/yunnan,china/72626041549488128/20050415/25579.html
［24］http://www.7c.gov.cn/color/DisplayPages/ContentDisplay_455.aspx?contentid=9204
［25］http://www.zhongguook.com/news/web/shangri-la/2004-03/1079363260.html
［26］http://business.sohu.com/20051228/n241172999.shtml

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 Xinangjiang Hydropower Development Co., Ltd.
Laodukou Hydropower Station	37.5	2005	Qujing City Luoping County	Yunan Luoping Laodukou Power Co., Ltd.
Wunihe 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. There are no any hydropower stations with installed capacity from 0.5MW to 15MW in the Yearbook of China Water Resources 2006, therefore the hydropower stations listed in the above table are the all available stations in our range.*

Of these projects, 6 projects, Luoze River Hydropower Project, Supahe Sanjiangkou Hydropower Project, Yisa River Hydropower Project, Laohushan II Hydropower Project, Hongshiyan Hydropower Station and Jiren River Hydropower Station started operated before 2002, they were developed by the state under a power system environment that is substantially different from the current power system environment, because, the first Power System Reform Blue Print has been published by State Council in February 2002, and the reform content mainly include: Power plants separating from the power grid, reforming enterprises for power plants and power grids; bidding to power grid, building a competitive and open power market initially; changing the current situation of all power purchased by the state owned grid enterprises.[27] So they are not similar with the proposed project. Furthermore, Xima Xingyun Aluminium Factory Hydropower Station is the captive station of Yunnan Yingjiang Xingyun Co., Ltd [28], and Chongjianghe II Phase (Expansion) Hydropower Station is an expansion project in an existing power plant [29]. Therefore the two projects are not similar with the project as the former station is not connected to the grid and the other is not a new project. So this station is excluded. Therefore, we analyzed the left 8 projects

In addition, other projects with a similar scale which were under construction or operation in Yunnan Province are applying for CDM project status [30].

[27]Power System Reform Blue Print, published by State Council, February 10, 2002.
［28］http://0871.und.cn/small/cpybase.do?companyid=D658A7E06D9B41318F44FBF1B0E6C0E7
[29] http://www.gdxds.com.cn/Colligate.asp?classid=17
［30］http://cdm.unfccc.int/Projects/Validation/index.html and
Chinese DNA web site: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1774.pdf

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

From the above analysis, eight projects are similar with the proposed project.

- ✧ Nanting River Hydropower Station was developed by stated-owned entity---Wenshan Electric Power Co., Ltd. (hereafter referred to as "Wenshan Company") was founded in 1997, whose main business is power generation and grid (Wenshan Grid) and it has abundant experience in hydropower industry. The Wenshan Company made initial public offering in 2004 (South China Power Grid Company is the biggest stakeholder of the Wenshan Company), and it was the first Electric Power Listed Companies of Yunan Province. [31]
- ✧ Laodukou Hydropower Station was developed by state holding entity---Yunan Luoping Laodukou Power Co., Ltd., whose stakeholder of Luoping Zinc & Electricity Co., Ltd.[the same as 49] is a stated-owned and listed company with powerful ability [32].
- ✧ Wunihe Hydropower Station was developed by state holding entity---Yunnan Baoshan Supahe Hydropower Development Co., Ltd., whose all stakeholders of Baoshan State Asset Operation Co., Ltd., Yunnan Development Investment Co., Ltd. and Baoshan Electricity Co., Ltd. are all stated-owned company with powerful ability[33][34][35].
- ✧ Houqiao Hydropower Station was developed by stated-owned entity---Yunnan Baoshan Binlangjiang Hydropower Development Co., Ltd. [the same as 53], whose all stakeholders[36] of Baoshan Electricity Co., Ltd., Kunming Reconnaissance and Design Institute and Yunnan Machinery Import & Export Co., Ltd. are all stated-owned company with powerful ability[37][38][39]
- ✧ Yanziya Hydropower Station was developed by state holding entity---Heqing Xinyuan Yanggongjiang Power Co., Ltd [the same as 46]. whose stakeholder of Dianxi Electric Bureau (Dali Electric Power Supply Bureau) is similar as Wenshan Company, its' main business is power generation and grid (Dali Grid) and it has abundant experience in hydropower industry[40][41].
- ✧ Wunihe Hydropower Station [42] and Houqiao Hydropower Station [43] mentioned are connected to the *West-East Electricity Transmission Projects* (the *West-East Electricity Transmission Project*, which is a government sponsored project offering favourable conditions to electricity suppliers participating in the project with the aim to secure transmission of power from West China to East China.)

Based on the factors, the above companies have better financing conditions; face fewer barriers than privately owned project entities.

In addition,

- ✧ Nanting River Hydropower Station with annual operation hours of 6,464h[44], Xiashilong Hydropower Station with annual operation hours of 5,533h[45], Yanziya Hydropower Station with annual operation

[31] http://www.wsdl.com.cn/introduce/
[32] http://www.p5w.net/today/200804/t1589770.htm
[33] http://mkt.und.cn/small/cpybase.do?companyid=6DF66BA0B8044174AEAC16B104ECD94C
[34] http://www.ynsph.com.cn/
[35] http://www.nut168.com/mrmq/mq/1559.html
[36] http://www.khidi.com:8083/ShowMess.asp?ArticleID=934
[37] http://www.nut168.com/mrmq/mq/1559.html
[38] http://www.khidi.com:8083/BMWeb/kmyjj/qygs.asp
[39]http://www.ymc.com.cn/EN/about.htm
[40]http://www.chinapower.com.cn/companyproduct/enterprise1front.asp?target=brief&enterpriseid=ent1003264
[41] http://www.smeyndl.gov.cn/readnews.asp?newsid=1798
[42] http://www.leica-geosystems.com.cn/newsdetail.asp?l3=0&nid=469
[43] http://www.baoshan.cn/4034/2005/10/25/707@277291.htm
[44] Yearbook of China Water Resources 2006, p577

hours of 6,000h[46], Wunihe Hydropower Station with annual operation hours of 5,750h[47], which are all higher than the proposed project of 5,351;

- Nanting River Hydropower Station belong to the South China Power Grid Company (because South China Power Grid Company is the biggest stakeholder of the Wenshan Company, therefore the Nanting River Hydropower Station has a higher price), therefore, the difference of the electricity sale price and cost price is the grid price of 0.178 Yuan RMB/kWh (without VAT) for the project [48]; Laodukou Hydropower Station with grid price of 0.2Yuan RMB/kWh(with VAT) [49]; Maomaotiao Hydropower Station with grid price of 0.25Yuan RMB/kWh(with VAT) [50]; Xiashilong Hydropower Station with grid price of 0.225Yuan RMB/kW(with VAT) [51]; Yanziya Hydropower Station with grid price of 0.21Yuan RMB/kW(with VAT) [52]; Houqiao Hydropower Station with grid price of 0.173Yuan RMB/kW(with VAT) [53]; Wunihe Hydropower Station with grid price of 0.205Yuan RMB/kW(with VAT) [54], which are all much higher than the project of 0.1443 Yuan RMB/kWh (without VAT, the 0.153 Yuan RMB/kWh is the price of the project with VAT)
- Nanting River Hydropower Station with unit investments of 4,136 Yuan RMB/kW[55]; Luoshuidong Hydropower Station with unit investments of 4,300 Yuan RMB/kW [56]; Maomaotiao Hydropower Station with unit investments of 3,300 Yuan RMB/kW[57]; Xiashilong Hydropower Station with unit investments of 4,060 Yuan RMB/kW[58]; Mengdianhe II Hydropower Project with unit investments of 3,832 Yuan RMB/kW[59], which are all lower than the project of 4,517 Yuan RMB/kW;
- The project IRR post-tax of the specific project is only 8.26%, which is much lower than Mengdianhe II Hydropower Project, i.e. 14% [60].

Furthermore:

- The cost of materials, equipments and labourers were also comparatively lower than for the proposed project activity. For the proposed project, it have to pay more for transportation the materials and equipments because the dam site is on the top of the mountain and there is no highway to the dam site, the project owner just can use horse or labourer transport the materials and equipments.

Therefore, the above stations were more attractive than the project.

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[45] Feasibility Study Report for Xiashilong Hydropower Station
[46] http://www.heqing.gov.cn/DefaultStyle/DefaultStyle_NewPage.aspx?PageId=24495&TagControlID=24502&LibInfoID=25536
[47] http://www.ynsph.com.cn/
[48] Investment Strategy Report on Electric Power Industry 2005, http://www.gsstock.com/yfzx/041206dlbg.pdf
[49] http://www.topcj.com/html/2/KPGG/20070214/45241.shtml
[50] http://www.788111.com/f10/600995/f10_newscontent/2/174050602171.html
[51] Power Purchase Agreement for Xiashilong Hydropower Station
[52] http://www.bofcom.gov.cn/bofcom/432911834190708736/20070124/103037.html
[53] The Approval for Houqiao Hydropower Station
[54] http://www.ynpower.com.cn/information/510.svc
[55] Annual Report of Wenshan Company 2006, http://www.hfzq.com.cn/start/Info_Content.aspx?fromTable=gsyw&guid={D6946660-046C-4081-AB55-F73C1240D0B8}
[56]http://www.7c.gov.cn/color/DisplayPages/ContentDisplay_455.aspx?contentid=9180
[57] http://www.ynws.gov.cn/docdetail_new.asp?id1=20050321081428
[58] Feasibility Study Report for Xiashilong Hydropower Station
[59] The FSR of Mengdianhe II Hydropower Project
[60] The FSR of Mengdianhe II Hydropower Project

It is clear from the investment and the barrier analysis that the proposed project, like other similar projects benefiting from or applying for CDM support, does not benefit from the same economic advantages as the projects listed in Table B.4. Therefore, the project is additional.

Conclusion:
In general, the project faces several barriers which would prevent the implementation of the proposed project activity without CDM. CDM helps to overcome these barriers. If the project is not implemented, the power will be supplied by the Southern Grid. Hence, the proposed project activity isn't baseline scenario, which is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to methodology ACM0002, baseline emissions are equal to the power delivered to the grid, multiplied by the baseline emission factor EF_y. The baseline emission factor is defined as the Combined Margin (CM): the equally weighted average of the Operating Margin (OM) emission factor ($EF_{OM,y}$) and the Build Margin (BM) emission factor ($EF_{BM,y}$).

The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as Chinese DNA.

Baseline

According to methodology ACM0002 (version 06), baseline emissions are equal to the power generated by the project activity and delivered to the grid, multiplied by the baseline emission factor EF_y. The baseline emission factor is computed as a combined margin: an equally weighted average of the Operating Margin Emission Factor ($EF_{OM,y}$) and the Build Margin Emission Factor ($EF_{BM,y}$).

According to methodology ACM0002, baseline emissions are equal to the power generated by the project activity and delivered to the grid, multiplied by the baseline emission factor EF_y. The baseline emission factor is equal to the combined margin: an equally weighted average of the Operating Margin Emission Factor ($EF_{OM,y}$) and the Build Margin Emission Factor ($EF_{BM,y}$).

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA on 09 August 2007, but deviate at some points by using data published in the China Energy Statistical Yearbook, China Electric Power Yearbook and 2006 IPCC. We will refer to these emission factors as the "published emission factors".

For more information on the published OM and BM emission factors, please refer to:

- Calculation result of the baseline emission factor of China grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
- Calculation process of the baseline OM emission factor of China grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
- Calculation process of the baseline BM emission factor of China grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

We calculate the OM Emission Factor on the basis of the *Bulletin on Baseline Emission Factors of China Grid* renewed by the Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on August 9, 2007[61] but deviate at some points by using the original data published in the China Energy Statistical Yearbook, China Electric Power Yearbook and IPCC 2006, which results in an OM Emission Factor of 1.011882tCO_2e/MWh, and the BM Emission Factor of 0.69157tCO_2e/MWh. Therefore, the Combined Baseline Emission Factor of the South China Power Grid **c**orresponds to **0.851726**tCO_2e/MWh.

According to the *Bulletin on Baseline Emission Factors of China Grid* renewed by the Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on August 9, 2007, the OM Emission Factor is 1.0119tCO_2e/MWh, and the BM Emission Factor of 0.6748tCO_2e/MWh. Therefore, the Combined Baseline Emission Factor of the South China Power Grid **c**orresponds to **0.84335**tCO_2e/MWh.

We will use the lower combined margin emission factor of **0.84335**tCO_2e/MWh for conservative purpose that can be calculated based on the published OM (1.0119) and BM (0.6748) by the Chinese DNA. The full process of the calculation of the emission factors and all underlying data are presented in Annex 3 to this PDD.

STEP 1 Calculate the Operating Margin emission factor ($EF_{OM,y}$)

ACM0002 (Version 06) outlines four options for the calculation of the Operating Margin emission factor(s) ($EF_{OM,y}$):

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

As per ACM0002, "Dispatch Data Analysis" should be the first methodological choice. However, the method is not selected herein, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

The Simple OM method has been chosen instead. This is possible because low cost/ must run resources account for less than 50% of the power generation in the grid in most recent years. From 2001 to 2005, according to gross annual power generation statistics for the Southern Grid, the ratio of power generated by hydro-power and other low cost/compulsory resources was: 36.86% in 2001, 35.99% in 2002, 33.53% in 2003, 29.95% in 2004, 30.42% in 2005 respectively, significantly lower than 50%.

The simple Operating Margin (OM) emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2e/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used ("ex-ante" approach).

The calculation equation of the Simple OM is as follows:

[61] Bulletin on Baseline Emission Factors of China Grid was renewed by the Director's Office of the National Climate Change Coordination of NDRC (Chinese DNA) on August 9, 2007.

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$ Equation (B.1)

Where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in years y;

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid,

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel(coal, oil and gas) in year(s) y; and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by relevant power sources *j*.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i$$ Equation (B.2)

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i, using country specific values;

$OXID_i$ is the oxidation factor of the fuel *i*, according to default values from 2006 IPCC Guidelines for default values;

$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i, as per 2006 IPCC Guidelines for default values.

In addition, there is net imported power to the Southern Grid from the Central China Grid. Since it is not possible to identify the specific power plants exporting electricity from the Central China Grid to the Southern Grid, the average emission factor of the Central China Grid will be taken into account.

The Operating Margin emission factors for 2003, 2004 and 2005 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we can find in the bulletin mentioned above. The published Operation Margin Emission Factor as 1.0119tCO_2e/MWh.

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 2 Calculate the Build Margin emission factor ($EF_{BM,y}$)

According to ACM0002, the Build Margin Emission Factor is calculated as the generation weighted average emission factor (measured in tCO_2e/MWh) of a sample of *m* power plants. The calculation equation is as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$ Equation (B.3)

Where
$F_{i,m,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power plants m in years y,
$COEF_{i,m}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels (coal, oil and gas) used by relevant power plants m and the percent oxidation of the fuel in year(s) y; and
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by power plants m.

The methodology provides the following two options:

Option 1: Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission.

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

Project participants have chosen Option 1.

The sample group *m* consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. From these two options, project participants should use the sample group that comprises the larger annual generation.

However, 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[62] 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 capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Proportional weights that correlate to the distribution of installed capacity in place during the selected period above are applied, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency levels 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 based on coal, oil or gas fuel etc from the generic term "thermal power" in the present energy statistics, the following calculation measures will be taken:
First, according to the energy statistics of the selected period in which approximately 20% capacity has been added to the grid, determine the ratio of CO_2 emissions produced by solid, liquid, and gas fuel consumption for power generation; than multiply this ratio by the respective emission factors based on

[62] 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.

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).

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

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

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

Where,

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

$COEF_{i,j,m}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants m and the oxidation percentage of the fuel in year(s) y,

Coal, Oil and *Gas* stands for solid, liquid and gas fuels respectively.

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

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

Where,

$EF_{Thermal}$ is the weighted emissions factor of thermal power generation with the efficiency level of the best commercially available technology in China in the previous three years.

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors of coal, oil and gas-fired power generation with efficiency levels of the best commercially available technology in China in the previous three years.

A coal-fired power plant with a total installed capacity of 600MW 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 343.33gce/kWh, which corresponds to an efficiency of 35.82% for electricity generation.

For gas and oil power plants a 200MW power plant with a specific fuel consumption of 258gce/kWh, which corresponds to an efficiency of 47.67% for electricity generation, is selected as commercially available best practice technology in terms of efficiency.

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 Annex3.

Sub-step 3: Calculate the Build Margin emission factor

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

Where,

CAP_{Total} is the total capacity addition of the selected period in which approximately 20% capacity has been added to the grid,

$CAP_{Thermal}$ is the total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

For details we can find in the bulletin mentioned above. The published Build Margin emission factor is 0.6748tCO_2e/MWh.

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.

The data sources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants for the years 2001 to 2005

Source: *China Electric Power Yearbook* (2002-2006)

2. Fuel consumption and the net caloric value of thermal power plants the years 2003 to 2005

Source: *China Energy Statistics Yearbook* (2004-2006)

3. Carbon emission factor and carbon oxidation factor of each fuel

Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy*, Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one.

STEP 3 Calculate the Electricity Baseline Emission Factor (EF_y)

The Baseline Emission Factor is calculated as a Combined Margin, using the weighted average of the Operating Margin and Build Margin.

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \quad \text{Equation (B.9)}$$

According to the *Bulletin on Baseline Emission Factor of China Region Grid* which was published by the Office of National Coordination Committee on Climate Change on Aug. 9, 2007, the **Operating Margin** emission factor (EF_{OM}) of the Southern Grid is **1.0119tCO_2e/MWh** and the **Build Margin** emission factor (EF_{BM}) is **0.6748tCO_2e/MWh**. The defaults weights for hydroelectric power projects are used as specified in ACM0002 (Version 06).

$$w_{OM} = 0.5\,;\ w_{BM} = 0.5$$

We calculate a Baseline Emission Factor of 0.84335tCO_2e/MWh.

Emission Reductions (ER_y)

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y$$

Equation (B.10)

where the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2e/MWh) calculated in Step 3, times the electricity supplied by the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_y$$

Equation (B.11)

There is no modified or retrofit facilities for the proposed project, therefore $EG_{baseline} = 0$ 。
The project activity is a run-of-river hydropower project, According to the ACM0002, greenhouse gas emissions from the project activity are zero. Hence $PE_y = 0$.

According to the ACM0002, there is no leakage calculation is required. Hence $L_y = 0$;
Therefore, the emission reductions are equal to the baseline emissions, namely,

$$ER_y = BE_y = EG_y \times EF_y$$

Equation (B.12)

.

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

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Generation of Power Sources j in (years) y (2001-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2002-2006*
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 power delivered to the grid

Data / Parameter:	$GEN_{import,y}$
Data unit:	MWh
Description:	The Power Transmitted from the Central China Grid to the Southern Grid in (years) y (2003-2005)
Source of data used:	http://www.sp.com.cn/agdl/dltj/default.htm
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 year (s) y (2003-2005 including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2004-2006*
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 power delivered to the grid

Data / Parameter:	$F_{i,,j,y}$
Data unit:	10^4t/10^8m^3
Description:	The Fuel Consumption of Power Sources j in (years) y (2003-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
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 OM and BM

Data / Parameter:	NCV_i
Data unit:	TJ/ fuel in a mass or volume unit
Description:	The NCV_i *of* Fuel i in a mass or volume unit
Source of data used:	*China Energy Statistical Yearbook 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 OM and BM

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ
Description:	The *Emission Factor of* Fuel i in a mass or volume unit
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy*
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:	$OXID_i$
Data unit:	%

Description:	The Oxidation Rate of Fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy*
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:	$GENE_{best,coal}$
Data unit:	%
Description:	The optimum commercial, coal-fired power supply efficiency
Source of data used:	*Chinese DNA: Bulletin on Baseline Emission Factor of China Region Grid-the calculation of baseline Build Margin emission factor for China Grid*
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate OM

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	%
Description:	The optimum commercial, oil and gas power supply efficiency
Source of data used:	*Chinese DNA: Bulletin on Baseline Emission Factor of China Region Grid-the calculation of baseline Build Margin emission factor for China Grid*
Value applied:	47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate OM

Data / Parameter:	$CAP_{y,i}$
Data unit:	MW
Description:	The Install Capacity of Power Sources j in (years) y (2003-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2004-2006*
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 BM

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

According to B.6.1, the baseline emission factor of the Southern Grid is 0.84335tCO_2e/MWh in the first crediting period, and the net electricity supplied to the grid（EG_y） by the project is 99,560MWh.

Therefore, BE_y in the first crediting period is to be calculated as follows:

$$BE_y = EG_y \times EF_y = 83{,}964 tCO_2e$$

Hence the emission reductions due to the project are equal to the baseline emissions, and annual emission reductions are 83,964tCO$_2$e 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 587,748tCO$_2$e during the first 7 years crediting period.

Table B.5 Estimate of Emission Reductions Due to the Project

Years	Estimation of project activity emissions (tCO$_2$e)	Estimation of baseline Emissions (tCO$_2$e)	Estimation of leakage (tCO$_2$e)	Estimation of overall emission reductions (tCO$_2$e)
01/11/2008-31/10/2009	0	83,964	0	83,964
01/11/2009-31/10/2010	0	83,964	0	83,964
01/11/2010-31/10/2011	0	83,964	0	83,964
01/11/2011-31/10/2012	0	83,964	0	83,964
01/11/2012-31/10/2013	0	83,964	0	83,964
01/11/2013-31/10/2014	0	83,964	0	83,964
01/11/2014-31/10/2015	0	83,964	0	83,964
Total(tCO$_2$e)	0	587,748	0	587,748

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

B.7.1. Data and parameters monitored:

In order to calculate emission of baseline, we need to monitor the power supplied to the grid ($EG_{s,y}$) and the electricity use of power plant supplied by the grid ($PG_{g,y}$), and according to the two data, the net power supplied to the grid (EG_y) will be calculated ($EG_y = EG_{s,y} - PG_{g,y}$).

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Power supplied to the grid in year y
Source of data to be used:	Measured by meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	The electricity supplied to the grid by the project is estimated to be 99,660MWh
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 periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity sales receipt.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PG_{g,y}$
Data unit:	MWh
Description:	The electricity use of power plant supplied by the grid in year y
Source of data to be used:	Measured by meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5:	The electricity use of power plant supplied by the grid is estimated to be 100MWh
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 periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity sales receipt.
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 insure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner will be responsible for the implementation of the monitoring plan, and the Grid Company will cooperate with the project owner.

1. Monitoring Objective

The main monitoring data are electricity supplied to the grid and the electricity use of power plant supplied by the grid because the baseline emission factor is fixed by ex-ante calculation.

2. Monitoring Organization

A chief monitoring officer will be appointed by the project owner who supervises and verifies metering and recording, collects data (meter's data reading, sales/billing receipts), calculates emission reductions and prepares a monitoring report.
The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting Co., Ltd.

3. Monitoring Equipment and program

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448－2000),* the electric energy metering equipment will be properly configured and the metering equipment will be checked by both the project owner and the grid company before the project is in operation.
Five meters (see figure B.2) are required, of which,

- M1 is the main meter (0.5S, bi-direction) before the construction of Latudi switching station completed(Latudi switching station is estimated to be finished in May 2008), which measures the total electricity supplied to the grid by the Guquan River Power Station and Zema River Power Station;
- M2 is the backup meter (0.5S, bi-direction), which measures the power supply of the Guquan River Power Station;
- M3 is the backup meter (0.5S, bi-direction), which measures the power supply of the Zema River Power Station;
- M4 is the auxiliary power consumption meter (0.5S). In case of emergencies, the hydropower station could also receive power for auxiliary power consumption from the Shangpa transformer substation.

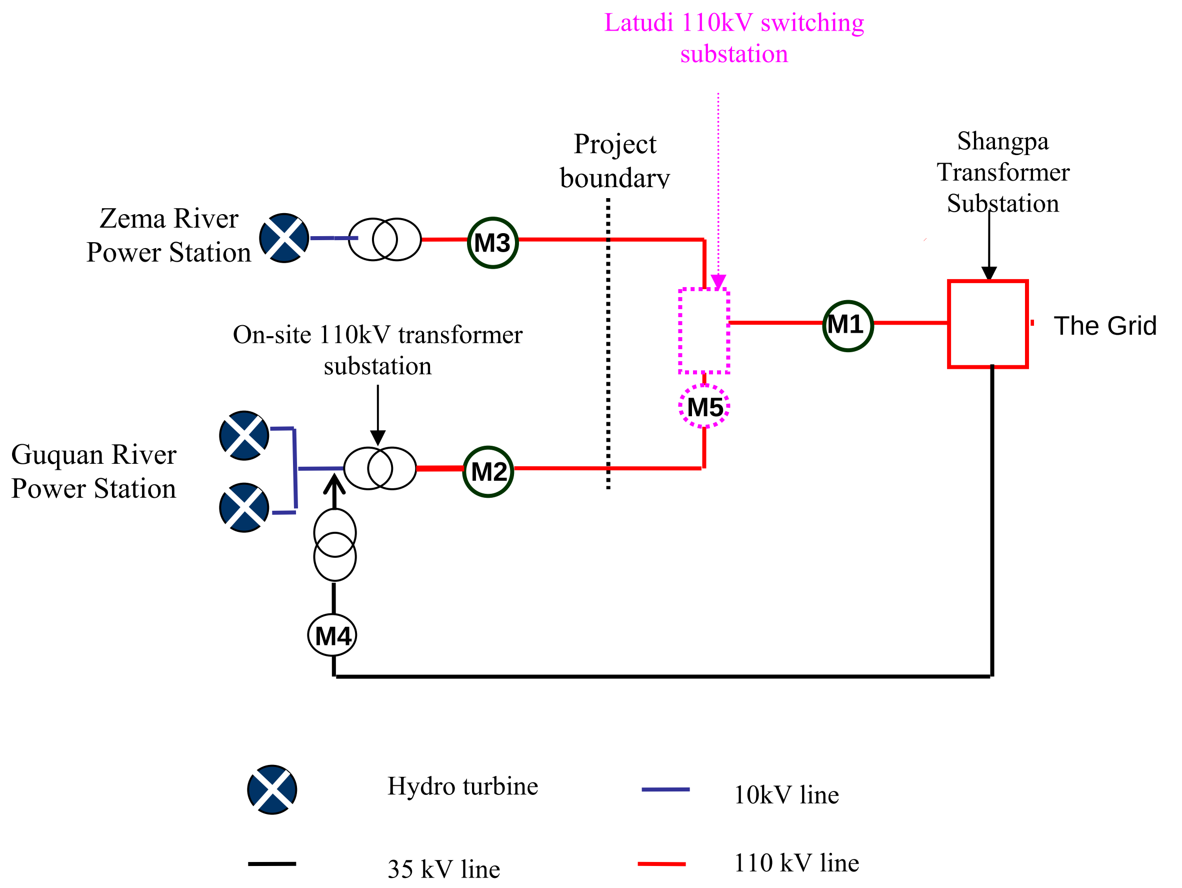
- M5 is the main meter (0.5S, bio-direction) after the construction of Latudi switching station completed, which measures the electricity supplied to the grid by the Guquan River Power Station.

Therefore, before the construction of Latudi switching station completed, the net electricity produced is equal to {M2a - (M2a +M3a –M1a)*[M2a /(M2a +M3a)]}- {M2b + (M1b-M2b -M3b)*[M2b /(M2b +M3b)]}-M4[♣].After the construction of Latudi switching station completed, the net electricity produced is equal to M5a-M5b-M4.[63]

[♣]The M2a is the power supplied by the Guquan River project, and there are some line losses from M2 (and M3) to M1, the line loss should be shared by the project owner of Guquan River project (M2) and Zema River power station (M3) respectively. The total line loss for the two project is (M2a+M3a-M1a), and the shared coefficient is [M2a/(M2a+M3a)]. Therefore, the line loss shared by the Guquan River project is: (M2a+M3a-M1a)*[M2a/ (M2a+M3a)]. Therefore the power supplied to the grid by the Guquan River project is: power supply-line loss of the project, namely: M2a- (M2a+M3a-M1a)*[M2a/ (M2a+M3a)].
Based on the same reason, the M2b is the power imported to the project from the grid (line loss excluded), The total line loss for the two project is (M1b-(M2b+M3b)), and the shared coefficient is [M2b/(M2b+M3b)]. Therefore, the line loss shared by the Guquan River is: [M1b-(M2b+M3b)]*[M2b/(M2b+M3b)]. Therefore the power imported to the project from the grid is: M2b+ (M1b-M2b-M3b)*[M2b/ (M2b+M3b)] (line loss included).
M4 is the auxiliary power consumption meter, which monitor the power imported to the project through the auxiliary line.

Therefore, the net power supplied to the grid is: {M2a- (M2a+M3a-M1a)*[M2a/(M2a+M3a)]}-{M2b+ (M1b-M2b-M3b)*[M2b/(M2b+M3b)]}-M4

[63] In the equation, “a” and “b” represent the two directions readings of the same meter respectively, “a” represent power supplied to the grid, “b” represent the electricity use of the project supplied by the grid.



M1 main meter, the total electricity supplied to the grid by Guquan and Zema power stations
M2 backup meter, the power supplied by Guquan River Power Station
M3 the power supplied by Zema River Power Station
M4 the power supplied by the grid company to the Guquan power station, which will be measured by Special HV Measuring Tank
M5 the electricity supplied to the grid after the Latudi Transformer substation construction finished

Figure B.2. Simplified electrical grid connection diagram

4. Data Collection:

The project owner and the Grid Company are responsible for operation monitoring of the backup meters and the main meters and guarantee the measuring equipments are in good operation and completely sealed. The main monitoring process is as follows:

- i The project owner and Grid Company read and check the backup meters and the main meters and record the data on the 25th of every month;
- ii The grid company uses the equation, i.e. M2a -M2a(M2a +M3a –M1a)/(M2a +M3a), to calculate the electricity supplied by the project based on the readings;
- iii The grid company provides the electricity quantity to the project owner;
- iv The project owner provides an electricity sales invoice 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 Grid Company provides an electricity sales invoice to the project owner and the invoice is stored by the project owner.

vi The project owner records the net electricity supplied to the grid;

vii The project owner keeps and safe keeps the records of the main meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the meter exceeds the allowable tolerance or the meter operate abnormally during a month, or any other unexpected problems, the grid-connected electricity generated by the proposed project shall be followed by:

i Check the history record and estimate the electricity supplied to the grid, unless a test by either party reveals it is inaccurate;

ii If the history record is not within acceptable, the proposed project owner and the Grid Company shall jointly prepare an new agreement of the correct readings; and

iii If the proposed 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 reading will be readily accessible for the DOE. Calibration test records will be maintained for verification.

5. Calibration

The verification of electric energy meter should be periodically carried out according to relevant National electric industry standards or regulations, the meters M1, M2, M3 and M5 will be calibrated every year, and the meter M4 will be calibrated every four years. After verification, 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 the Grid Company within 10 days after:

i The detection of a difference larger than the allowable tolerance in the readings of the main meter and the backup meters;

ii Repair to the faulty meter caused by improper operation.

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 and CD-ROM. In addition, a hard copy printout will be archived. In addition, the project owner will collect sales receipts 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 receipts).
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 records will be kept for a period of 2 years following the end of the crediting period.

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

Date of completion: 24/07/2008
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: aiminyang820@yahoo.com.cn
(Not Project Participant)

Tracy Yuan, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-62199416, 62199417
Fax: +86-10-62166196, 62164780
Email: abeautytracy@yahoo.com.cn
(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:

20/05/2005 (the date of equipment purchasing contract) [64]

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:

01/11/2008 or the date after registration whichever is later.

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

C.2.2.2. Length:

[64] The date is the earliest starting date of the project activity.

SECTION D. Environmental impacts

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

According to the relevant environmental law and regulations, an environmental impact assessment had been carried out, and the environmental impact assessment report has been approved by the Environment Protection Bureau of Nujiang Lisu Autonomous Prefecture, Yunnan Province on May 19, 2005. The main assessment conclusions are provided below:

1. Impact on Aquatic Air

The construction wastewater includes production waste and sanitary waste. The production waste is produced from washing sandstone, mixing concrete and etc. The main pollution, suspended solid, can be treated by sedimentation, and will be discharged after reaching the standards. Sanitary waste is discharged discontinuous and the quantity is small, so the project owner will construct a sewage collecting pool, and the treated sanitary waste will be use for virescence.

2. Impact on Acoustic Environment

The main noises of the power station construction are primarily from blowing, boring, digging, concrete mixing and transporting. The project will take measures such as select low noise equipments and techniques, use porous absorption materials, and equip protective appliance for the builder to minimize the harm of noises. Meanwhile, the owner will plant on both sides of the main road and arrange the construction schedule properly to diminish the impact on living area and settlements.

3. Impact on Ambient Environment

During the operation period, it doesn't produce pollution to the air. The influence to the ambient focus on construction period and after construction the impact will disappear automatically. According to the dust pollution produced from digging, chiseling, concrete mixing and transport during construction, the project owner will take those measures such as wet construction, equipping tank car, virescence, preparing dustproof respirators, and etc to minimize the harm of dust for the environment and the builders.

4. Impact on the Solid Waste

The waste slag will be pilled up in slag disposal pit arranged. According to the character of each pit, the owner will adopt the method of combination project measure with plant measure to prevent collapse for each pit. In addition, collect the domestic garbage as recoverable or non-recoverable garbage. Ship the recoverable to reclamation depot, and the non-recoverable garbage will be transported to disposal pit nearby to be piled up.

5. Impact on Soil and Water Conservation and Plant Destroy

Excavation, land occupation and waste slag piling will make the ground bare and loss of water and soil. Take integrated protective measures as engineering measure, earth measure, plant measures combined to prevent soil and water loss. Make virescence in time.

6. Impact of land requisition on land utilization

The permanent requisitioned land is 5.55hectares, and the temporary requisitioned land is 2.45hectares. The requisitioned farmland is scattered around the river bank and the area is very small. All the requisitioned land will be compensated according to relevant laws and regulations.

7. Impact on immigration

There is no immigration caused by the project activity.

8. Impact of Ecosystem

The construction area is not in the protection area of "three river co-current flow" world heritage nature reserve, and far from the Gaoli Gong Mountain national nature reserve, so the construction will not impact the reserves. Moreover, there is no sensitive protecting target such as precious or in danger propagation and no migratory fish in the construction area. Therefore the impact of the construction is limited. Furthermore, the designed ecological water flow is $0.128m^3/s$ in the EIA, and the project owner will take method to satisfy the ecological water demand at the downriver.

From the above description, it can be concluded that the project has no negative impact on the local environment after some effective method employed. In addition, the Guquan River, which the project located, is a small county river and located in the Fugong County, furthermore, the project is a run-of-river hydropower station without any regulating capacity, and ecological water flow of $0.128m^3/s$ is guaranteed for satisfying the ecological water demand at the downriver, therefore, according to the environmental impact assessment there is no any transboundary impact foreseen for the project.

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:

All of project participants and host party involved think there is little negative environmental impact of this specific project.

SECTION E. Stakeholders' comments

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

Questionnaires had distributed to local residents who may be impacted by the project, in order to collecting advices on the influence imposed on the local society, economy, daily life etc for the project broadly.

Furthermore, a special stakeholder consultation meeting for the parties interested in the project was organized at 10:00 on Jan. 28, 2007 at the meeting room of the revenue of Fugong County to collect opinions from all the potential stakeholders. In order to make the potential stakeholders to receive information of the meeting, Fugong Hongyuan Hydropower Development Co., Ltd had published a bulletin for the meeting of stakeholders on the newspaper "*Nujiang Paper*" on Jan. 26, 2007 and also publicized the meeting bulletin via the website of www.tqcdmchina.com. In the bulletin, the companies advised that all the potential stakeholders could learn the detailed information on the project. At the meeting, the project owner and the consultant invited the participants to express their comments and concerns about the project and CDM. The representatives asked some following questions focusing on CDM and the project.

1. Whether the noise during construction will affects people's life?
2. Is there the submergence in this project? Is there any impact on the local people because of the submergence?
3. Is there any immigration? If yes, are they voluntary? Whether the immigration satisfied with the life after the migration?
4. How about the local people's life? What do the local people live on? How about the economic condition?
5. What is the impact of the project on the local environment?
6. What is the impact of construction on the local industry?
7. Whether the project has the impact on people's income?
8. Whether the cost will increase due to the implementation of the CDM project?
9. Have you known CDM before? What is the attitude for local people and government for CDM project? Whether people support this CDM project?
10. Whether all the stakeholders agree with the construction of the hydropower stations?

E.2. Summary of the comments received:

We have reclaimed 31questionnaires, the investigated people are all local villagers, of which 12.9% are women and 100% are junior high school graduates or under and the investigation results are following:

About 90% of the investigated residents use firewood to cook and warm;
100% of the investigated residents think the construction of the hydropower station will bring benefits to their lives and think their income increases after construction;
100% of the investigated residents think the traffic condition will be better after construction;
About 74% of the investigated residents think the communication condition will be better after construction;
100% of the investigated residents think there will be no negative impact on their lives and all of them agree with the construction of the project.

From the questionnaires and stakeholders' meeting, we find that all the local government and residents agree with the construction of the project. All stakeholders think that although it will occupy some infield, the owner will supply corresponding compensation. Furthermore, there will be no serious influence on the ecosystem after implementing the measures mentioned above.

On the contrary, the project will bring lots of benefits to local government and residents:
The project will improve the living condition of local residents, for example, the owner will maintain and rebuild the water resource facilities in Guquan village and Mugujia village, and it will ensure the water of flooding and living for the villagers; the owner will maintain and rebuild the country road about 5km which can improve the local traffic condition, especially bring convenient to the villagers who leave at Qianmiguluo village about 2km above the sea level; the project will provide more jobs, thus will increase the revenue of local residents.
In addition, the implement of the project conforms to the national and local development targets, and meets the development strategy and trend proposed by the Nujiang Prefecture government. Moreover, the project will increase the public revenue, and promote the development of local economy.

The impact of this project is generally positive, therefore, everyone supports the construction of this project and application of CDM project.

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

Given the generally positive (or neutral) nature of the comments received, no action has been taken to address the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project owner:

Organization:	Fugong Hongyuan Hydropower Development Co., Ltd.
Street/P.O.Box:	NO18, South Road of Shangpa Street, Shangpa Town
Building:	/
City:	Fugong County, Nujiang Lisu Autonomous Prefecture
State/Region:	Yunnan Province
Postfix/ZIP:	/
Country:	People's Republic of China
Telephone:	+86-886-3413889, 13988683938
FAX:	+86-886-3413889
E-Mail:	wzp061@163.com
URL:	/
Represented by:	Zhiping Wang
Title:	Vice board chairman
Salutation:	Mr.
Last Name:	Wang
Middle Name:	/
First Name:	Zhiping
Department:	Office
Mobile:	+86-13305789061
Direct FAX:	+86-578-2578733/2689133
Direct tel:	+86-578-2578733
Personal E-Mail:	wzp061@163.com

The Buyer

Organization:	RWE Power AG.
Street/P.O.Box:	Rellinghauser Straβe 37
Building:	/
City:	/
State/Region:	Essen
Postfix/ZIP:	45128
Country:	Germany
Telephone:	+49-201-12-20226
FAX:	+49-201-12-24132
E-Mail:	michael.fuebi@rwe.com
URL:	www.rwe.com
Represented by:	Michael Fübi
Title:	Principal of Climate Protection
Salutation:	Dr.
Last Name:	Fübi
Middle Name:	/
First Name:	Michael
Department:	/
Mobile:	/
Direct FAX:	+49-201-12-24132
Direct tel:	+49-201-12-20226
Personal E-Mail:	michael.fuebi@rwe.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I countries available to the project.

Annex 3

BASELINE INFORMATION

Table 1–Power Supply data for the Southern Grid, 2001-2005

	2001	2002	2003	2004	2005
Electricity Generation of Thermal power plant (MWh)	162,910,000	185,168,000	222,780,000	263,574,000	287,187,000
Electricity Generation of Hydro power plant (MWh)	79,971,000	83,093,000	83,271,000	84,072,000	94,919,000
Other Power (MWh)	15,135,000	21,012,000	29,089,000	28,530,000	30,632,000
Total Electricity Generation of the Southern Grid. (MWh)	258,016,000	289,273,000	335,140,000	376,277,000	412,738,000
the ratio of power generated by hydro-power and other low cost/compulsory resources（%）	36.86%	35.99%	33.53%	29.95%	30.42%

Data Source: China Electric Power Yearbook 2002-2006.

Table 2 –Power Supply data for the Southern Grid, 2003 (not including low operating cost and must-run power plants)

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	143,351,000	17,079,000	43,295,000	19,055,000
Rate of Electricity Consumption of the Power Plant (%)	5.50	8.43	7.40	8.01
Power Supplied to the Grid(MWh)	208	15,639,240	40,091,170	17,528,695
Total Supplied to Grid of the Thermal Power (MWh)		208,725,800.00		
Net import Power from the Central China Power (MWh)		11,100.00		
The total Power for the Southern Grid (MWh)		208,736,900.00		

Data Source: China Electric Power Yearbook 2004; State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04_12_dljh.htm

Table 3 –Power Supply data for the Southern Grid, 2004 (not including low operating cost and must-run power plants)

	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)	160,208,116.20	18,465,088.10	46,209,768.00	22,483,256.80
Total Supplied to Grid of the Thermal Power (MWh)		247,366,229.10		
Net import Power from the Central China Power (MWh)		10,951,240.00		
The total Power for the Southern Grid (MWh)		258,317,469.10		

Data Source: China Electric Power Yearbook 2005; State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04_12_dljh.htm.

Table 4–Power Supply data for the Southern Grid, 2005 (not including low operating cost and must-run power plants)

	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	7.34	6.94
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)		269,169,531.00		
Net import Power from the Central China Grid (MWh)		96,363,000.00		
The total Power for the Southern Grid. (MWh)		365,532,531.00		

Data Source: China Electric Power Yearbook 2006; State Power Information Network: http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm *etc.*

Table 5. Calculation of average emission factor for the Central China Grid in 2003 and 2004

	2003	2004	2005
Total CO_2 emission of the Central China Grid (tCO_2e)	276,404,544	345,671,697	359,887,488
The total power supplied to the Central China Grid (MWh)	346,613,868	418,261,666	466,644,030
Average emission factor (tCO_2e/ MWh)	0.7974423	0.8264484	0.7712249

Table 6–2003 data for primary fuel input for thermal power supply to the Southern Grid

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Subtotal =A+B+C+D
Raw coal	Ten thousand Tons	4,491.79	831.84	2,169.11	1,405.27	8,898.01
Clean coal	Ten thousand Tons	0.05	0.00	0.00	0.00	0.05
Other washed coal	Ten thousand Tons	0.00	0.00	36.38	20.37	56.75
Coke	Ten thousand Tons	0.00	0.00	0.00	0.50	0.50
Coke oven gas	Ten thousand Tons	0.00	0.00	0.00	0.04	0.04
Other gas	10^8 Cubic meter	3.21	0.00	0.00	11.27	14.48
Crude oil	10^8 Cubic meter	6.85	0.00	0.00	0.00	6.85
Gasoline	Ten thousand Tons	0.02	0.00	0.00	0.00	0.02
Diesel oil	Ten thousand Tons	31.90	0.00	0.00	0.76	32.66
Fuel oil	Ten thousand Tons	627.22	0.30	0.00	0.00	627.52
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^8Cubic meter	2.85	0.00	0.00	0.00	2.85
Natural gas	10^8Cubic meter	0.00	0.00	0.00	0.00	0.00
Other petroleum products	10^8Cubic meter	11.35	0.00	0.00	0.00	11.35
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00
Other E (standard coal)	Ten thousand Tons	93.21	0.00	0.00	22.35	115.56

Data Source: China Energy Statistical Yearbook 2004.

Table 7- Calculation of the OM Emission Factor for the Southern Grid in 2003

Fuel	Unit	Fuel Consumption in the Southern Grid (E)	Emission Factor （tC/TJ） (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume)
Raw coal	Ten thousand Tons	8,898.01	25.80	100	20,908	175,993,455.05
Clean coal	Ten thousand Tons	0.05	25.80	100	26,344	1,246.07
Other washed coal	Ten thousand Tons	56.75	25.80	100	8,363	448,971.84
Coke	Ten thousand Tons	0.50	25.80	100	28,435	13,449.76
Coke oven gas	10^8 Cubic meter	0.04	12.10	100	16,726	2,968.31
Other gas	10^8 Cubic meter	14.48	12.10	100	5,227	335,797.81
Crude oil	Ten thousand Tons	6.85	20.00	100	41,816	210,055.71
Gasoline	Ten thousand Tons	0.02	18.90	100	43,070	596.95
Diesel oil	Ten thousand Tons	32.66	20.20	100	42,652	1,031,759.27
Fuel oil	Ten thousand Tons	627.52	21.10	100	41,816	20,301,304.48
LPG	10^8Cubic meter	0.00	17.20	100	50,179	0.00
Refinery gas	10^8Cubic meter	2.85	18.20	100	46,055	87,592.00
Natural gas	10^8Cubic meter	0.00	15.30	100	38,931	0.00
Other petroleum products	Ten thousand Tons	11.35	20.00	100	38,369	319,357.98
Other coking products	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Other E (standard coal)	Ten thousand Tce	115.56	0.00	100	0.00	0.00
CO_2 emission of power import from Central China Grid		0.7974423×11,100= 8,851.61tCO_2e				
Total emission (Q)		198,755,406.84tCO_2e				
Supply to the Southern Grid (P)		208,736,900MWh				
OM Emission Factor (=Q/P)		0.952181tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 8–2004 data for primary fuel input for thermal power supply to the Southern Grid

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

Data Source: China Energy Statistical Yearbook 2005.

Table 9- Calculation of the OM Emission Factor for the Southern Grid in 2004

Fuel	Unit	Fuel Consumption in the Southern Grid (E)	Emission Factor （tC/TJ） (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume)
Raw coal	Ten thousand Tons	11,717.88	25.80	100	20,908	231,767,573.55
Clean coal	Ten thousand Tons	0.21	25.80	100	26,344	5,233.50
Other washed coal	Ten thousand Tons	0.00	25.80	100	8,363	0.00
Coke	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Coke oven gas	10^8 Cubic meter	0.00	12.10	100	16,726	0.00
Other gas	10^8 Cubic meter	2.58	12.10	100	5,227	59,831.38
Crude oil	Ten thousand Tons	16.89	20.00	100	41,816	517,932.98
Gasoline	Ten thousand Tons	0.00	18.90	100	43,070	0.00
Diesel oil	Ten thousand Tons	50.71	20.20	100	42,652	1,601,975.28
Fuel oil	Ten thousand Tons	957.71	21.10	100	41,816	30,983,494.25
LPG	10^8Cubic meter	0.00	17.20	100	50,179	0.00
Refinery gas	10^8Cubic meter	2.86	18.20	100	46,055	87,899.34
Natural gas	10^8Cubic meter	0.48	15.30	100	38,931	104,833.40
Other petroleum products	Ten thousand Tons	1.66	20.00	100	38,369	46,707.86
Other coking products	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Other E (standard coal)	Ten thousand Tce	79.42	0.00	100	0.00	0.00
CO_2 emission of power import from Central China Grid		0.8264484×10,951,240=9,050,630.40tCO_2e				
Total emission (Q)		274,226,116.64tCO_2e				
Supply to Southern Grid (P)		258,317,469MWh				
OM Emission Factor (=Q/P)		1.061586tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 10– Energy Consumption Statistics of Power Generation of the Southern Grid in 2005

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total E=A+B+C+D
Raw coal	Ten thousand Tons	6,696.47	1,435	3,212.31	1,975.55	13,319.33
Clean coal	Ten thousand Tons	0.00	0.00	0.00	0.15	0.15
Other washed coal	Ten thousand Tons	0.00	0.00	10.39	33.88	44.27
Coke	Ten thousand Tons	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	Ten thousand Tons	10.91	0.00	0.00	0.00	10.91
Gasline	Ten thousand Tons	0.68	0.00	0.00	0.00	0.68
Diesel oil	Ten thousand Tons	31.96	2.02	0.00	1.81	35.79
Fuel oil	Ten thousand Tons	887.21	0.00	0.00	0.00	887.21
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	4.92	0.00	0.00	0.00	4.92
Natural gas	10^8 Cubic meter	0.93	0.00	0.00	0.00	0.93
Other petroleum products	Ten thousand Tons	1.70	0.00	0.00	0.00	1.7
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tce	104.66	133.15	0.00	59.72	297.53

Data Source: China Energy Statistical Yearbook 2006

Table 11– The Operation Margin Emission Factor Calculation of the Southern Grid in 2005

Fuel	Unit	Fuel Consumption in the Southern Grid (E)	Emission Factor （tC/TJ） (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume)
Raw coal	Ten thousand Tons	13,319.33	25.80	100	20,908	263,442,601.85
Clean coal	Ten thousand Tons	0.15	25.80	100	26,344	3,738.21
Other washed coal	Ten thousand Tons	44.27	25.80	100	8,363	350,237.59
Coke	Ten thousand Tons	12.84	25.80	100	28,435	345,389.71
Coke oven gas	10^8 Cubic meter	0.79	12.10	100	16,726	58,624.07
Other gas	10^8 Cubic meter	17.83	12.10	100	5,227	413,485.84
Crude oil	Ten thousand Tons	10.91	20.00	100	41,816	334,555.88
Gasline	Ten thousand Tons	0.68	18.90	100	43,070	20,296.31
Diesel oil	Ten thousand Tons	35.79	20.20	100	42,652	1,130,638.84
Fuel oil	Ten thousand Tons	887.21	21.10	100	41,816	28,702,703.26
LPG	Ten thousand Tons	0.00	17.20	100	50,179	0.00
Refinery gas	Ten thousand Tons	4.92	18.20	100	46,055	151,211.46
Natural gas	10^8 Cubic meter	0.93	15.30	100	38,931	203,114.71
Other petroleum products	Ten thousand Tons	1.70	20.00	100	38,369	47,833.35
Other coking products	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Other Energy	Ten thousand Tce	297.53	0.00	100	0	0.00
Emission of electricity from the Central China Grid		0.7712249×96,363,000=74,317,554.67tCO_2e				
Total Emission (Q)		369,521,974.54tCO_2e				
Thermal Power supplied to the Southern Grid (P)		365,532,531MWh				
OM Emission Factor [＝Q/P]		1.010914tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 12-Full-wighted Ave. OM 3 years of the Southern Grid

years	2003	2004	2005
Total CO_2 Emission (tCO_2e)	198,755,407	274,226,117	369,521,975
Total supply （MWh）	208,736,900	258,317,469	365,532,531
Full-weighted average OM	= (198,755,407+274,226,117+369,521,975) / (208,736,900 +258,317,469 +365,532,531) = 1.011911tCO_2e/MWh		

Table13. Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission in 2005

Fuel		Unit	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal	Average NCV (MJ/t,km^3)	Emission Factor （tC/TJ）	Oxidation Rate (%)	CO_2 Emission (tCO_2e)	Ratio
Coal	Raw coal	10^4tons	6,696.47	1,435.00	3,212.31	1,975.55	13,319.33	20,908	25.80	100	263,442,602	-
	Clean coal	10^4tons	0.00	0.00	0.00	0.15	0.15	26,344	25.80	100	3,738	-
	Other washed coal	10^4tons	0.00	0.00	10.39	33.88	44.27	8,363	25.80	100	350,238	-
	Coke	10^4tons	4.79	0.00	0.00	8.05	12.84	28,435	25.80	100	345,390	-
	Total	-	-	-	-	-	-	-	-	-	264,141,967	89.48%
Oil	Crude oil	10^4tons	10.91	0.00	0.00	0.00	10.91	41,816	20.00	100	334,556	-
	Gasoline	10^4tons	0.68	0.00	0.00	0.00	0.68	43,070	18.90	100	20,296	-
	Diesel oil	10^4tons	0.00	0.00	0.00	0.00	0.00	43,070	19.60	100	0.00	-
	Fuel oil	10^4tons	31.96	2.02	0.00	1.81	35.79	42,652	20.20	100	1,130,639	-
	LPG	10^4tons	887.21	0.00	0.00	0.00	887.21	41,816	21.10	100	28,702,703	-
	Other petroleum products	10^4tons	1.70	0.00	0.00	0.00	1.70	38,369	20.00	100	47,833	-
	Total	-	-	-	-	-	-	-	-	-	30,236,028	10.24%
Gas	Natural gas	10^7m^3	9.30	0.00	0.00	0.00	9.30	38,931	15.30	100	203,115	-
	Coke oven gas	10^7m^3	0.00	0.00	0.00	7.90	7.90	16,726	12.10	100	58,624	-
	Other gas	10^7m^3	18.70	0.00	0.00	159.60	178.30	5,227	12.10	100	413,486	-
	LPG	10^4tons	0.00	0.00	0.00	0.00	0.00	50,179	17.20	100	0	-
	Refinery gas	10^4tons	4.92	0.00	0.00	0.00	4.92	46,055	18.20	100	151,211	-
	Total	-	-	-	-	-	-	-	-	-	826,436	0.28%
Total		-	-	-	-	-	-	-	-	-	295,204,431	100%

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

	Variable	Supply Efficiency J	Emission Factor of fuel F (tc/TJ)	Oxidation Rate G (%)	Emission Factor (tCO_2e/MWh) =3.6/J/1000*F*G*44/12
Coal-fired	$EF_{Coal,Adv}$	35.82%	25.80	100	0.9508
Gas-fired	$EF_{Gas,Adv}$	47.67%	15.30	100	0.4237
Oil-fired	$EF_{Oil,Adv}$	47.67%	21.10	100	0.5843

The emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9117 tCO_2e/MWh.$$

Table15. The Installed Capacity of the Southern Grid 2003

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Tianshengqiao	Subtotal
Thermal power(MW)	27,231.4	3,190.1	3,556.8	6,465.8	0.0	40,444.1
Hydro power(MW)	8,107.2	4,525.2	6,543.2	3,713.7	2,520.0	25,409.3
Nuclear power(MW)	3,780.0	0.0	0.0	0.0	0.0	3,780.0
Wind power and other(MW)	83.4	0.0	0.0	0.0	0.0	83.4
Total (MW)	39,202.0	7,715.3	10,100.0	10,179.5	2,520.0	69,716.8

Data Source: China Energy Statistical Yearbook 2004.

Table16. The Installed Capacity of the Southern Grid 2004

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	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	0.0	0.0	3,780.0
Wind power and other(MW)	83.4	0.0	0.0	0.0	83.4
Total (MW)	42,620.9	9,418.5	11,365.5	14,698.3	78,103.3

Data Source: China Energy Statistical Yearbook 2005, Tianshenqiao power station is included in Guizhou

Table17–The Installed Capacity of the Southern Grid 2005

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	35,182.60	4,931.20	4,758.40	9,634.80	54,507.00
Hydro power(MW)	9,035.70	6,085.30	7,993.10	7,233.00	30,347.10
Nuclear power(MW)	3,780.00	0.00	0.00	0.00	3,780.00
Wind power and other(MW)	83.40	0.00	0.00	0.00	83.40
Total (MW)	48,081.70	11,016.50	12,751.50	16,867.80	88,717.50

Data Source: China Energy Statistical Yearbook 2006, Tianshenqiao power station is included in Guizhou.

Table18. The Calculation of BM Emission Factor for the Southern Grid

	2003	2004	2005	New addition 2003-2005	The Ratio in new addition
Thermal power(MW)	40,444.10	46,659.70	54,507.00	14,062.90	74.01%
Hydro power(MW)	25,409.30	27,580.10	30,347.10	4,937.80	25.99%
Nuclear power(MW)	3,780.00	3,780.00	3,780.00	0.00	0.00%
Wind power (MW)	83.40	83.40	83.40	0.00	0.00%
Total(MW)	69,716.80	78,103.30	88,717.50	19,000.70	100.00%
Ratio of installed capacity in 2005	78.58%	88.04%	100.00%	-	-

$EF_{BM,y}$ = 0.9117×74.01% = 0.6748tCO_2e/MWh.

The OM is calculated as 1.0119tCO_2e/MWh, the BM is calculated as 0.6748tCO_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 ACM0002 (version 6), the default weight of hydropower is:

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

So the Baseline Emissions Factor (EF_y in tCO_2e/MWh) is 0.84335tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

In this monitoring plan, we only monitor the power supplied to the grid and electricity use of power plant supplied by the grid, please find in section B.7.2.