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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

Nansha Hydro Power Project in Yunnan Province China

The version 02 PDD was completed on 25/07/2008

Revision history:

- Version 01(completed on 21/06/2007): submitted to DOE for validation (Initial adoption);
- Version 02(completed on 25/07/2008) revised according to the DOE's revision request;

A.2. Description of the project activity:

Nansha Hydro Power Project in Yunnan Province China (hereafter referred to as the proposed project) is a hydro power plant with a new reservoir in Yuanyang County of Honghe Hani & Yi Autonomous State Yunnan Province China. Three water turbines and related generators with each capacity of 50MW are adopted, and the annual generated electricity is 702,280MWh with annual operation hours of 4,682h, (the annual grid-connected electricity is 616,314MWh)[1]. The electricity will be connected to Yunnan Province Power Grid, finally to South China Power Grid through 110KV transmission lines. The surface area at full reservoir level of the proposed project is 8,938,000 m^2 and the installed capacity is 150MW (3×50MW), so the power density of the proposed project is 16.8W/ m^2.

Electricity generated by the proposed project will displace part of the electricity generated by South China Power Grid which is dominated by fossil fuel-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. It is expected that the proposed project activities will generate annual emission reductions 519, 768 tCO_2e in the first seven years.

As a renewable hydro power project, the proposed project will contribute to the local sustainable development through following aspects:

- The proposed project will supply enough clean electricity for developing the mines and metal smelting industry in Honghe Hani & Yi Autonomous State.
- To displace part of the electricity from coal-fired power plants, and thus will avoid environmental pollution caused by coal burning.
- To make good use of the local water resource to solve the difficulties of lack of power and unstable voltages.
- To create new job opportunities for the local people: temporary job opportunities will be available during the construction period and 98 permanent jobs during the operation time.
- After the operation of the proposed project, the local people can make good use of electricity instead of biomass, especially firewood, which can reduce the breakage to local vegetation and protect the environment.

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 Part involved wishes to be considered as project participant (Yes/No)*
P.R. China(host)	*Honghe Guangyuan Hydro*	*No*

[1] From Chapter 15 in the Feasibility Study Report (FSR).

	Power Development Co.Ltd	
Netherlands	*Carbon Asset Management Sweden AB*	*No*

The detailed information of participants is included in 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):

The People's Republic of China (the "Host County")

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

Honghe Hani & Yi Autonomous State Yunnan Province

A.4.1.3. City/Town/Community etc:

Yuanyang County

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

The layout of the dam and the power station of the proposed project is on the same line on Hong River. So the dam and the power station have the same east longitude and north latitude. The geographical coordinates of the proposed project are east longitude 102°51′21″and north latitude23°13′46″, 2.5km away from Yuanyang County. Figure 1 shows the location of the proposed project.

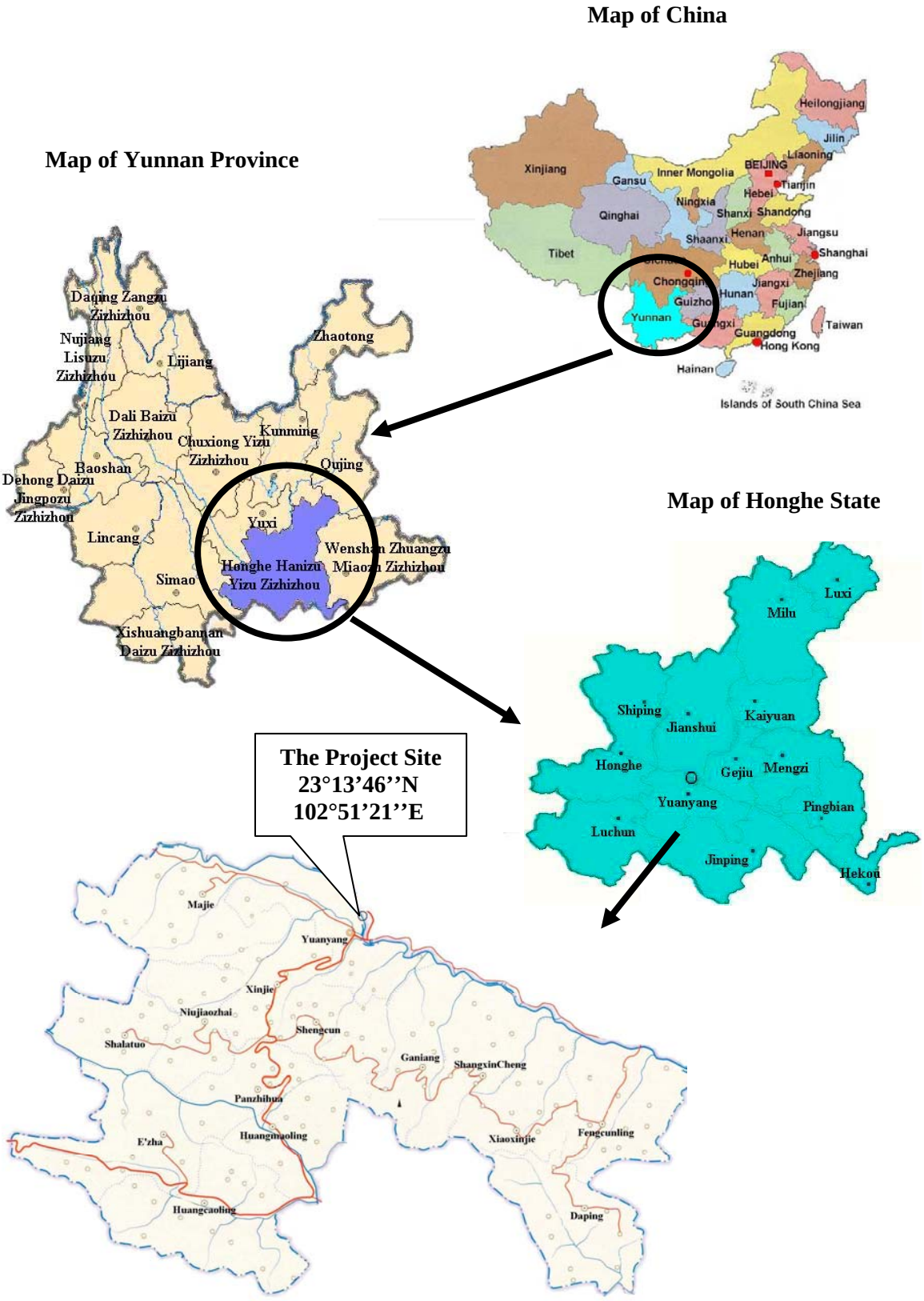

Figure 1. Geographical Location of the proposed project

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

Sectoral scope 1, energy industries (renewable sources)

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

The proposed project is a hydro power plant with a new reservoir. The normal water level of the reservoir is 267m and at the normal water level the volume of the reservoir is 208 million m^3 as daily accommodation reservoir. The power plant can be accommodated according to the load and need of the power system. The total capacity of the proposed project is 150MW, and 3 water turbines of mixed flow will be adopted.

The construction include the non flooding dam segment, flooding dam segment, flooding discharge bottom hole, the water diversion dam and the power plant etc. The dam is the grinding concrete gravity dam with the maximum height of the dam 85m, the length at the top of the dam 232.92m, the width at the top of the dam is 15.4m. Hong River has a lot of sand, 2 holes (5m×7m) at the bottom which is used to discharge sand are set up.3 holes (17m×17m) are set up at the surface of the flooding dam.5 holes will be combined to discharge flood. The power plant will collocate at the left bank of the river as the dam back power plant. The water diversion and electricity generation system is made up of intake, pressure pipelines, power plant, and trail water aqueduct.

The main technical index of the proposed project is as follows:

Table 1 The main technical index of the proposed project

Item	Unit	Value	Note
The water surface area of the reservoir	Million m^2	8.938	At the normal water level
Regulating performance		Daily	
Installed capacity	MW	150	3×50MW
Annual electricity generation	MWh	702,280	
Electricity connected to SCPG annually	MWh	616,314	
Annual operation hours	h	4,682	
The maximum height of the dam	M	85	Grinding Concreting Gravity Dam
The collocation type of the power plant		Type of back dam	

Data source: From P61-P66 of Feasibility Study Report (FSR).

According to the purchase contract for the turbines and generators and main transformer for the proposed project, the main parameter of the water turbines and generators and the main transformer are tabled as follows:

Table 2 The main parameters and models of the equipment of the proposed project

Turbines	**Manufacturer**	**Type**	**Parameters**
3 turbines	Tianjin City Tianfa Heavy Hydro Equipments Production Co.Ltd.	HL-LJ-420	Rating water head: 44.5m Rating flow: 129.92m^3/s Rating capacity 51.546MW
Generators	**Manufacturer**	**Type**	**Parameters**
3 generators	Tianjin City Tianfa Heavy Hydro Equipments	SF50-52/9200	Rating Voltage: 10.5KV Rating capacity:50MW Capacity factor: 0.85

	Production Co.Ltd.		Rotating speed: 115.4r/min
Main transformer	**Manufacturer**	**Type**	
3 transformers	Tianwei Baobian (Hefei City) Transformer Co.Ltd.	SF10-6300kVA/110kV	

The proposed project adopts domestic technologies and equipment, not referring to international technical transfer.

As for the time schedule, the Scheme of Water and Soil Conservation (SWSC) of the proposed project was approved on 11th April 2005 by Water Conservation Department of Yunnan Province. The EIA report of the proposed project was completed in June 2005, and the EIA report was approved by National Environmental Protection Bureau on 10th August 2005. The FSR of the proposed project was completed in July 2005, and the FSR was reviewed by China International Engineering Consult Co.Ltd who was commissioned to do this review by National Development and Reform Commission (NDRC) in January 2006 and finally approved by NDRC in June 2006. It started its main body construction in July 2006. Since 28th December 2007, the first generator (50MW) of the proposed project had started to generated electricity, and it is estimated all the three generators of the proposed project will generate electricity in the end of year 2008. The milestones especially related to CDM consideration including the evidence is shown in the end of section B.5.

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

The renewable crediting period (7×3 years) is chosen. In the first crediting period (from 01/01/2009 to 31/12/2015), the total emission reductions generated by the proposed project in the first seven years is 3,638,376 tCO_2e. It is expected that the proposed project activities will generate annual emission reductions of 519, 768 tCO_2e.

Years	**Annual estimation of emission reductions In tonnes of CO_2 e**
01/01/2009-31/12/2009	519, 768
01/01/2010-31/12/2010	519, 768
01/01/2011-31/12/2011	519, 768
01/01/2012-31/12/2012	519, 768
01/01/2013-31/12/2013	519, 768
01/01/2014-31/12/2014	519, 768
01/01/2015-31/12/2015	519, 768
Total estimated reductions(tonnes of CO_2e)	3,638,376
Total number of crediting years	7
Annual average over the crediting period of estimated reductions（tonnes of CO_2e）	519, 768

A.4.5. Public funding of the project activity:

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No existing official development assistance (ODA) from Annex I countries is involved in the proposed 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:

1. The baseline methodology: ACM0002: "Consolidated baseline methodology for grid connected electricity generation from renewable sources" version 06, in effect as of 19 May 2006;

2. The monitoring methodology: ACM0002: "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", in effect as of 19 May 2006;

3. The tool for demonstration and assessment of additionality: the approved methodology of "the tool for demonstration and assessment of additionality", Version 04.

More information about the methodology can be obtained at:

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

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

The proposed project activity is within the scope of the methodology ACM0002 based on the following reasons:

- The proposed project is a middle scale hydro power project with a new reservoir[2], and the electricity generated by the proposed project will be connected to South China Power Grid, so it is a grid-connected electricity generation project from renewable sources.
- The surface area at full reservoir level of the proposed project is 8,938,000 m^2 and the installed capacity is 150MW, so the power density of the proposed project is 16.8W/ m^2, greater than 4W/ m^2, which accords with the applicability of ACM0002 (version 06) for new hydro electric power project with a reservoir.
- The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity.
- The geographic and system boundaries for the South China Power Grid can be clearly identified and information and data on the characteristics of the grid is available.

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

Based on the methodology of ACM0002 (version 06), the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to. Furthermore, as a new hydroelectric project with a reservoir, the project boundary includes the physical site of the plant including the dam and the power plant as well as the reservoir area.

The electricity generated by the proposed project will be transmitted to Yunnan Power Grid which is part of South China Power Grid. According to the latest guidelines issued on 9th August 2007 by China's DNA, the geographical boundary of South China Power Grid covers Guangdong Power Grid, Guangxi Power Grid, Guizhou Power Grid and Yunnan Power Grid. The spatial scope of the project boundary also covers all power plants physically connected to South China Power Grid.

The GHG emission sources included in or excluded from the project boundary are as follows:

[2] *Classification & design safety standard of hydropower projects (DL5180-2003)* issued by State Economic and Trade Commission of People's Republic of China in 2003

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation of South China Power Grid	CO_2	Yes	According to ACM0002, major emission sources
		CH_4	No	According to ACM0002, excluded for simplification. This is conservative.
		N_2O	No	According to ACM0002, excluded for simplification. This is conservative.
Project Activity	Emissions of CH4 from the Reservoir.	CO_2	No	As renewable hydro power plant, excluded for simplification.
		CH_4	No	The power density of the proposed project is 16.8W/ m^2, greater than 10W/ m^2, CH_4 emission is excluded.
		N_2O	No	As renewable hydro power plant, excluded for simplification.

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

In the absence of the proposed project, the possible alternatives to the proposed project would be as the following:

1) the proposed project activity, but not undertaken as CDM project activity;
2) Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity output;
3) Construction of a power plant using other sources of renewable energy with equivalent amount of electricity output; and
4) Provision of equivalent amount of annual power output by the grid (South China Power Grid) where the proposed project is connected into.

The scenario most likely to occur among the four alternative scenarios is analyzed as follows:

As for alternative 1), without CDM, the total investment FIRR of the proposed project is only 6.69% less than benchmark level 8% for electric power industry in China. Furthermore, the project site is at the under developed minority areas in Yunnan Province. The proposed project faced the big initial investment pressure and poor economic benefits with lower tariff. Without CDM, the above barriers can't be overcome. Therefore, alternative 1) the proposed project activity, but not undertaken as CDM project activity can not be the realistic and credible alternatives to the proposed project activity. The concrete analysis about this alternative is shown in section B.5.

As for alternative 2), the annual electricity output of the proposed project is 702,280MWh. If a coal-fired power plant with the same electricity 702, 280MWh is constructed, according to "China Electric Power Yearbook 2006", the annual operation hours of coal-fired power plant in Yunnan Province in year 2005 is 6,396h[3], so the related installed capacity is 110MW (702,280MWh divided by 6,396h), which goes against the *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators* (issued in August 1997). For this reason, the possible alternative baseline scenario of building an 110MW fuel-fired power plant conflicts with Chinese regulations. At the same time, the development direction of the capacity of the coal-fired projects is efficient and big, and all the capacity of each turbine is bigger than 200MW. From the above analyse, scenario 2) is not feasible as a realistic and credible alternative scenario.

As for alternative 3), the main business of the project owner is hydro power generation, and the project owner won't invest other renewable resources such as wind power and solar power. Furthermore, due to

[3] P596 of China Electric Power Yearbook 2006.

the constraints of geographical conditions and other objective conditions, the wind power resource in Yunnan Province is focused on high mountains, and the site of proposed project is far away from these areas, so the wind power near the proposed site is spare.[4] Furthermore, the local area is short of biomass resources and solar power, so the same amount of annual power generation cannot be achieved from biomass energy or solar power. Therefore, scenario 3) is not feasible and cannot be the baseline scenario.

As for alternative 4), under the current relevant laws and regulations in China's power market, the existing capacity and newly added capacity building of South China Power Grid meet the requirements of the national laws and regulations, and economically viable.

Hence, in the absence of the proposed project, the most realistic and credible alternative is alternative 4) Provision of equivalent amount of annual power output by the grid (South China Power Grid) where the proposed project is connected into.

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

The following steps are used to demonstrate the additionality of the proposed project according to the "Tool for the demonstration and assessment of additionality" (version 04) agreed by EB

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

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

The alternatives to the project activity are as follows:

- 1)the proposed project activity, but not undertaken as CDM project activity;
- 2)Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity output;
- 3)Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity output; and
- 4) Provision of equivalent amount of annual power output by the grid (South China Power Grid) where the proposed project is connected into.

Based on the analysis in section B.4, the main business of the project owner is hydro power generation, and the project owner won't invest other renewable resources such as wind power and solar power. Moreover, the wind power resource, solar power resource and biomass resource near the proposed project site is spare which show these projects themselves are not feasible. Therefore alternative 3) is excluded.

Substep 1b. Enforcement of applicable laws and regulations

According to the analysis in section B.4., alternative 2) the construction of the coal fired power projects with equivalent amount of annual electricity output would be contrary to the state's laws and regulations, so alternative 2) is excluded. The remaining alternatives meet all the related regulations and laws.

Based on the analysis in the two sub-steps, the alternative 1) and 4) is remaining. The following analysis will show that the additionality of the proposed project is mainly embodied in investment analysis.

Step 2. Investment analysis.

Sub-step 2a. Determine appropriate analysis method.

[4]http://www.ydxw.com/showinfo.asp?id=43486

In the "Tool for the demonstration and assessment of additionality", three options are available for investment analysis: the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III).

The simple cost analysis (Option I) is not applicable because the project activity will produce economic benefits (from electricity sale) other than CERs income.

The investment comparison analysis (Option II) can be applied to the condition that the alternatives are also the investment projects. However, the most credible alternative of the proposed project is Provision of equivalent amount of annual power output by South China Power Grid. This alternative is not an invested project, so the investment comparison analysis (Option II) can't be applied.

The benchmark IRR of total investment for electric power industry in China is available, so the benchmark analysis (Option III) is chosen and the Financial Internal Return Rate (FIRR) is used to assess the financial viability of the project activity.

Sub-step 2b. Apply benchmark analysis.

In accordance with the Term 1.11 on page 2 of *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects, Beijing: China Electric Power Press, 2003*, the FIRR benchmark of power industry is very important parameter for financial evaluation. The benchmark of power industry is issued to be 8% of the total investment FIRR and 10% of the capital FIRR. The projects are considered to be financially feasible when the FIRRs of the projects are higher than or equal to the relevant financial benchmark.

According to the guidelines about "Benchmark" on page 34 of *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*, so far, there are no unified and clear guidelines or laws for the benchmark for China electric power industry. But 8% as the benchmark for total investment FIRR and 10% as the benchmark for capital FIRR have been the common practice and become the consensus in the filed of electric power. Therefore, the newly built electric power projects indirectly adopt 8% as the benchmark for total investment FIRR from this interim rule. The proposed project is a newly built hydropower project, so it also adopts 8% as the benchmark for total investment FIRR. Furthermore, the benchmark in the page 15-9 in FSR for the proposed project is also 8% of the total investment.

The FIRR of the proposed project is calculated and compared as follows.

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

Table 3 Main parameters for the calculation of financial indicators

Item	Unit	Value	Date source
Installed capacity	MW	150	Page15-1of the FSR
The total static investment	Million Yuan	977.33[5]	The Approval document for the FSR by NDRC
Annual O&M cost	Million Yuan	23.464	Page 15-15 of the FSR
Annual grid-connected electricity	MWh/year	616,314	Page 15-9 of the FSR
Electricity Tariff	Yuan/kWh	0.215	The approved document of

[5] In the page 15-8 of FSR completed in July 2005, the total static investment is 988.767million yuan. Then the FSR completed in July 2005 was reviewed and assessed by China International Engineering Consult Co.Ltd who was commissioned to do this review by National Development and Reform Commission (NDRC). According to the final Assessment Report issued on 18/01/2006 by China International Engineering Consult Co.Ltd, the total static investment was changed into 977.33million yuan. Finally, the total static investment of 977.33million yuan was approved by NDRC on 15/06/2006.

(including VAT)			"Yunfagaijiage [2006]28" by Yunnan Province Development and Reform Commission on 06/01/2006
Value Added Tax (VAT)	%	17	Page 15-10 of the FSR
Town building and maintenance tax	%	5	Page 15-10 of the FSR
Surcharge for education	%	3	Page 15-10 of the FSR
Income tax	%	33	Page 15-10 of the FSR
Project time	Year	34years(4years of construction and 30 years of operation)	Page 15-9 of the FSR

All the data except the electricity tariff (including VAT) of 0.215yuan/kWh in the above table are from the Feasibility Study Report which was completed in July 2005and the Assessment Report for the FSR by China International Engineering Consult Co.Ltd on 18/01/2006, and both the FSR and Assessment Report were approved by National Development and Reform Commission (NDRC) on 15/06/2006.

The tariff which can be available for the proposed project owner when they made the CDM consideration is based on the document of "*the Notice of the Related Problems about the Trial Implementation of the Different Tariff During Different Seasons (the Abundant Rainfall Season or Dry Season) for Newly Operated Hydropower Projects*" issued by Yunnan Province Development and Reform Commission on 06/01/2006(the document number: "Yunfagaijiage [2006]28"). The tariff of 0.215yuan/kWh (including VAT) was set in this approved document which can be applicable for the hydropower projects in Yunnan Province. So this tariff was adopted by the proposed project.

The FIRRs without and with the income from CERs sale are listed in table 4 below.

Table 4 Comparison of financial indicators without and with income from CERs

Financial indicator	Unit	Without the income from CERs	Benchmark	With the income from CERs
FIRR of total investment (after tax)	%	6.69	8	10.61

Without the income from CERs, the FIRR of the proposed project is 6.69%, lower than the benchmark FIRR, so the proposed project is financially unacceptable. With the income from CERs (the price of CERs is assumed to be 10 USD/tCO_2e[6], 7×3 years of the crediting period), the FIRR is increased to be 10.61%.

Sub-step 2d. Sensitivity analysis.

Three factors are considered in the following sensitivity analysis:

- Total static investment;
- Annual Operation and Maintenance cost;
- Annual grid-in electricity.
- The grid-in tariff

[6] Expected and also can be shown in the ERPA of the proposed project

Assuming the above three factors vary in the range of -10% ~+10%, the FIRR of the project (without the income from CERs sales) varies to different extents, as shown in Figure 2.

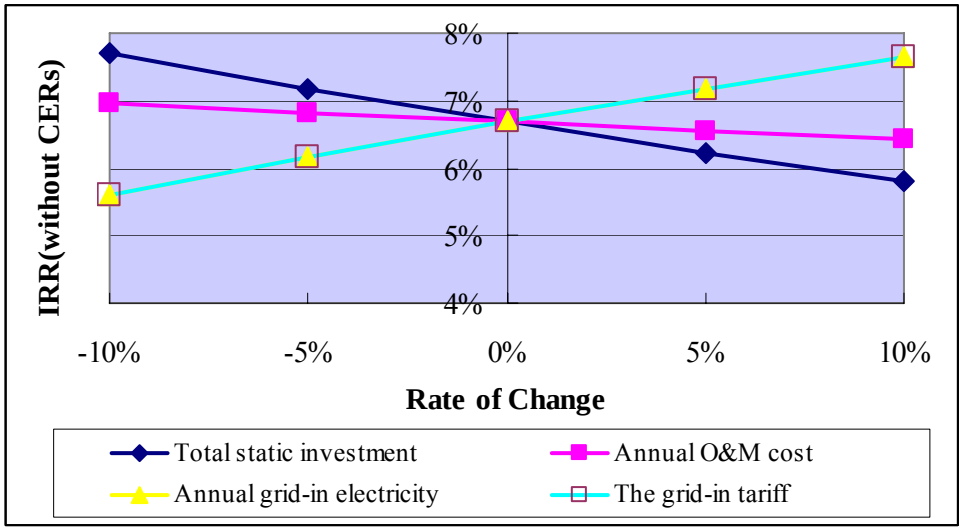

Figure 2 Sensitivity analysis of the proposed project

1) As for the total static investment

In the case that the total static investment changes from -10% to 10%, the FIRR of the proposed project can't exceed the benchmark of 8%. In order to reach the benchmark of 8%, the total static investment must be decreased by 12.7%.

According to the ***Note of Investment Increase of Nansha Hydropower Project*** provided by Guangdong Province Keyuan Engineering Supervision Consulting Company, there are three reasons that the investment of the proposed project will be increased:

- The increase of price level of the construction materials, resulting in the increase of the investment of the construction parts and equipments installation parts;
- The flood in October 2006 resulted in loss and increased the engineering treatment input;
- The compensation standard for the immigrants increased in year 2007 which resulted in the increase of the compensation fee.

Therefore, the total static investment can't be decreased by 12.7%. The proposed project is always lack of financial attractiveness within the reasonable range of total static investment.

2) As for the annual O&M cost

The impact of the annual O&M cost is relatively not sensitive. When the annual O&M cost changes -10%~+10%, the FIRR of the proposed project doesn't exceed 8%. In order to reach the benchmark of 8%, the annual O&M cost must be decreased by 51.3%.

Furthermore, according to the FSR of the proposed project, annual O&M Cost which is consistent of and sum of the maintenance repairs cost, workers wage and benefit cost, the fee for water resource use, insurance cost and other cost, each of the above cost is decided and calculated by some fixed parameters such as the number of the workers, the installed capacity, the normal standard for utilization of water resource use etc. So annual O&M Cost is relatively fixed and it can't be decreased by more than 51.3%..

Therefore, the proposed project is always lack of financial attractiveness within the reasonable range of annual O&M cost.

3) As for annual grid-in electricity

In the case that the annual grid-in electricity changes from -10% to 10%, the FIRR of the proposed project can't exceed the benchmark. In order to reach the benchmark of 8%, the annual grid-connected electricity must be increased by 13.1%.

Furthermore, according to the **Hydrological Analysis of the proposed project from page 2-1 to page 2-21 in the *FSR***, the hydrological condition for the proposed project is based on the Yuanjiang Hydrometric Station and Manhao Hydrometric Station as long as 50 years from year 1953 to year 2003. Based on the basic hydrological information, the flux regulation and flood regulation were calculated, and the best scheme of the normal water level, the best scheme of dead water level, and the best scheme of the installed capacity were decided and chosen from alternative schemes. From the result of the balance of the electric power, the effective utilization rate of the installed capacity of the proposed project is 90%, and there is 10% of the installed capacity which was blocked. Therefore, the grid-in electricity will not be changed so much and it can't be increased by more than 13.1%.

Therefore the proposed project is always lack of financial attractiveness within the reasonable range of annual grid-in electricity.

4) As for the grid-in tariff

In the case that the grid-in tariff changes from -10% to 10%, the FIRR of the proposed project can't exceed the benchmark. In order to reach the benchmark of 8%, the grid-in tariff must be increased by 13.1%.

According to the Term 5.1 *The Grid-in Tariff* in the PPA which was signed between the project owner and Yunnan Power Grid Company on 08/04/2008, the grid-in tariff of 0.215yuan/kWh (including VAT) for the proposed project was approved and actually implemented. So the final and actual tariff is the same as the tariff in the investment analysis in the PDD, and there were none of changes. So the tariff can't be increased by 13.1%.

Therefore the proposed project is always lack of financial attractiveness within the reasonable range of tariff.

To conclude, under the reasonable variations in the critical assumptions, the conclusion regarding the financial additionality is robust and supported by sensitivity analysis.

Step 4. Common practice analysis

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

Choose the similar scale

According to *Classification & design safety standard of hydropower projects (DL5180-2003)* issued by State Economic and Trade Commission of People's Republic of China in 2003, hydropower plant, with capacity less than 50MW, is defined as small scale hydropower projects; hydropower plant, with capacity less than 300MW and more than 50MW, is defined as middle scale hydropower project; hydropower plant, with capacity more than 300MW, is defined as large scale hydropower projects.

The proposed project is a middle scale hydropower station with a total installed capacity of 150MW (with capacity less than 300MW and more than 50MW). Those selected power plants similar to the proposed project have been built in Yunnan Province with capacity less than 300MW and more than 50MW (the projects with the installed capacity larger than 300MW and lower than 50MW were excluded).

According to 2006 China Water Resource Yearbook, there are 28 hydro power projects operated in Yunnan Province with the total installed capacity of 1350.1MW. There are 10 hydro power projects with the installed capacity less than 300MW and more than 50MW in Yunnan Province (18 hydro power projects with capacity lower than 50MW are excluded.)

Choose the similar area

As for the area selection when doing common practice, China is so large and the development policy and investment environment for each province for hydropower projects is so different, for example, the tariff in each province has some difference, so Each Province in China was set as the area for common practice. So, Yunnan Province was chosen as the similar area.

Those selected power plants similar to the proposed project have been built with installed capacity less than 300MW and more than 50MW in Yunnan Province.

Choose the similar construction year

According to the Notice on Issuing ***Electric Power Sector Reform Programme*** by State Council on 10th February 2002[7], China began undertaking significant electric power sector reform including dividing the former single national power company into regional companies and separating generation and distribution responsibilities. This electric power sector reform has the following features:

- Firstly, the State Power Grid Corporation and the South China Power Grid Corporation were established. The State Grid Corporation was responsible for establishing limited liability companies or corporations in five districts including North China, Northeast China, Northwest China, East China and Central China. The South China Power Grid Corporation was consisted of the grid assets of the former State Electric Power Corporation in Yunnan, Guizhou and Guangxi. According to the held grid assets ratio, ultimate controlling party was responsible for establishing the South China Power Grid Corporation. The electric power enterprises in Tibet were managed by the State Power Grid Corporation.
- Secondly, the five main electricity generation groups were restructured. In the aspect of electricity generation, five electricity generation corporations were established including China Huaneng Corporation, China Datang Corporation, China Huadian Corporation, China Guodian Corporation, and China Electric Power Investment Corporation. In addition, four assisting corporations were established: China Electric Power Engineering & Consulting Corporation, China Hydropower Engineering & Consulting Corporation, China Hydropower Construction Corporation and China Gezhouba Corporation.
- Thirdly, tariff competition policy has been shaped. The core content of this electric power sector reform was price competition, cost reduction and forming new electricity pricing system. The new pricing system designed by this electric power sector reform is, differentiating grid-in tariff, transmission/distribution tariff, and terminal sale tariff. The grid-in tariff was consisted of capacity price fixed by the state and electricity price from market competition price. For grid corporations still in operation/management monopoly status, their transmission/distribution pricing mechanism should be fixed by the government under strict efficiency principle, cost restriction and incentive policy, and their terminal sale price should be based on the above mentioned prices and the established grid-in electricity tariff linkage mechanism. If possible, electricity generation enterprises can supply electricity to big clients directly through negotiation, implement transmission/distribution price fixed by the state, and finally form relatively reasonable electricity sale price.
- Fourthly, the State Electricity Regulatory Committee was established. According to the setting of vertical management system, it was necessary to dispatch delegate institution to regional grid corporation and electricity trade dispatching centre and encourage inner industry competition.

Therefore, the projects which started its construction before 10th February 2002 had the essential difference and were excluded from the similar projects.

Based on the above analysis, it was defined that the similar projects as middle scale hydropower projects in Yunnan Province which started its construction after 10th February 2002.

[7] http://www.lawon.cn/law/detail.dox?id=2211075

The basic information, especially the year of construction start for the ten projects with the installed capacity less than 300MW and more than 50MW in Yunnan Province is as follows:

Table 5 the basic information of the ten projects in Yunnan Province

Number	Project name	Installed capacity(MW)	Annual power generation(MWh)	Year of construction Start
1	Husonghe Hydropower Station	63MW(3×21MW)	195,510	Before 1997
2	Luosiwan Hydropower Station	60(2×30MW)	300,730	12th April,1996
3	Lazhuang Hydropower Station	60(3×20MW)	252,080	Before 1992
4	Chaishitan Hydropower Station	60(3×20MW)	155,980	November 1997
5	Gaoqiao Hydropower Station	90(2×45MW)	450,000	Year 2000
6	Malutang Hydropower Station(1st phase)	100(2×50MW)	689,110	January 2002
7	Xucun Hydropower Station	78(3×26MW)	327,000	December 1996
8	Supahe A'jiutian Hydropower Station	105MW(3×35MW)	477,000	28th July 2002[8]
9	Xiangshui Hydropower Station	100MW(2×50MW)	284,070	Year 1993
10	Zhangwo Hydropower Station	54MW(2×27MW)	2,700	25th October 2003[9]

As for Husonghe Hydropower Station[10], Luosiwan Hydropower Station[11], Lazhuang Hydropower Station[12], Chaishitan Hydropower Station[13], Gaoqiao Hydropower Station[14], Malutang Hydropower

[8] http://www.iac.org.cn/default.asp?pg=36&channel_id=21&item_id=129&info_id=1572

[9] http://www.cnr.cn/tbtj/200312050110.html

[10] http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=43794

Station (1st phase)[15], Xucun Hydropower Station[16] and Xiangshui Hydropower Station[17], all these eight projects started their construction before 10th February 2002 when *the Notice of Electric Power Sector Reform Programme* was issued by State Council.

Based on the above analysis and exclusion, Husonghe Hydropower Station, Luosiwan Hydropower Station, Lazhuang Hydropower Station, Chaishitan Hydropower Station, Gaoqiao Hydropower Station, Malutang Hydropower Station (1st phase), Xucun Hydropower Station and Xiangshui Hydropower Station were excluded. Supahe A'jiutian Hydropower Station and Zhangwo Hydropower Station are remaining.

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

The detailed information and the advantages for Supahe A'jiutian Hydropower Station are as follows:

- Supahe A'jiutian Hydropower Station was sited on the Supehe River in Baoshan City, and it got the support from Baoshan City Committee and the People's Government of Baoshan City, and it was invested by Yunnan Domestic Electric Power Investment Co.Ltd (which was consistent of Yunnan Province Development and Investment Co.Ltd, Kunming Design Institute of National Power Company, Yunnan Hongta Group Co.Ltd, Yuntianhua Group Co.Ltd and Yunnan Dianneng (Group) Co.Ltd), Baoshan Electric Power Co.Ltd, Baoshan State-owned Assets Operation Co.Ltd. All the above investors have strong capital capacity and have relation to the state capital.[18]
- It is said that it is the biggest hydropower plant on Supahe River and it has the best economical index.[19]
- As for the number of immigrates, it has only 10 people who needed to immigrate, which shows it has excellent development condition and it needs a little investment for immigration treatment. [20]
- As for the geological condition, the proposed site is the granite area and the engineering geological condition is good and the hydrological geological condition is simple.[21]
- It was estimated that the FIRR of total investment of this project was 17.95%, and the payback period is estimated to be 7.72years, which shows this project is economically feasible.[22]

Based on the above aspects, compared with the proposed project, Supahe A'jiutian Hydropower Station has comparative advantage in the project's technological, geological and economic characteristics, and Supahe A'jiutian Hydropower Station was feasible.

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[11] http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=61972

[12] http://www.topcj.com/html/2/KPGG/20070214/45241.shtml

[13] http://www.sinoepages.com/sl/companys.asp?id=8807

[14] http://www.ztec.gov.cn/Article_Show.asp?ArticleID=352

[15] http://paper.wenweipo.com/2002/10/19/FI0210190019.htm

[16] http://scholar.ilib.cn/abstract.aspx?A=slsdjs200201006

[17] http://www.gz.csg.cn/show.aspx?id=5042&cid=180

[18] http://www.100.com.cn/html/yingyong/zongjie/500.html and http://www.chinapower.com.cn/newsarticle/1020/new1020835.asp

[19] http://www.chinapower.com.cn/newsarticle/1020/new1020835.asp

[20] http://www.dh.gov.cn/dhzrmzfgzxxw/397302369431742054 4/20070829/157858.html

[21] http://www.xb.yn.gov.cn/tzjh-b.htm#

[22] http://www.xb.yn.gov.cn/tzjh-b.htm#

The detailed information and the advantages for Zhangwo Hydropower Station are as follows:

- Zhangwo Hydropower Station is on Heng River which is the branch of Jinsha River; the water resource on the Heng River is very good, with the length of 307km and the river area of 14,980m^2 and the annual average flux of 285m^3/s;[23]
- The economical index of Zhangwo Hydropower Station is very good, and its annual generated electricity is 283,100MWh, and its FIRR is up to 17.5%, and the NPV is 108.33 million yuan and the total investment recovery period is 8.5years;[24]
- The project owner is Sichuan Yibin Yili Group, and this Group invested 2 billion yuan to invest the six hydropower stations on Heng River. These projects acquired the emphasis from the local government. The government of Yibin County, Shuifu County, Yanjin County set up the special leadership group to help these projects to solve the problems of irrigation, land occupation and construction. Furthermore, these projects got the policy concessions, all the administrative fees which need these projects to afford is based on the minimum amount of the standard, and all these fees needn't be afforded and paid until three years after the operation of these project, and the tax is based on the tax policy for the new enterprises in the western region.[25]
- The project owner acquired the loan of 330million yuan from Yibin Country Credit Cooperative for the proposed project, which is the biggest loan acquired by the private investors in Yibin City.[26]

Based on the above aspects, compared with the proposed project, Zhangwo Hydropower Station has comparative advantage in the project's technological and economic characteristics and the big support from the local government of Yibin County, Shuifu County, Yanjin County, so it was feasible.

So, the proposed project is not the common practice in Yunnan Province.

Considering CDM before the implementation of the proposed project

In the FSR of the proposed project completed in July 2005, the FIRR in this FSR under the input parameters of the tariff of 0.212yuan/kWh (excluding VAT) or 0.248yuan/kWh (including VAT) and also with the total static investment of 988.767million yuan is 8.02 %(the total investment, after tax). The tariff of 0.212yuan/kWh (excluding VAT) in this FSR was not from the approved tariff document by the government, and it was the calculated and expected tariff in order to meet the demand of loan and reach the benchmark.

On 6th January 2006, *"the Notice of the Related Problems about the Trial Implementation of the Different Tariff During Different Seasons (the Abundant Rainfall Season or Dry Season) for Newly Operated Hydropower Projects"* was issued by Yunnan Province Development and Reform Commission (the document number: "Yunfagaijiage [2006]28"). Based on this document, the project owner found the proposed project can't acquire the tariff of 0.212yuan/kWh (excluding VAT) in the FSR, but it can only acquire the tariff of 0.215yuan/kWh (including VAT) set in Yunfagaijiage [2006]28.

The FSR completed in July 2005 was reviewed and assessed by China International Engineering Consult Co.Ltd who was commissioned to do this review by National Development and Reform Commission (NDRC) in January 2006. According to the final Assessment Report issued on 18/01/2006 by China International Engineering Consult Co.Ltd, the total static investment was changed into 977.33million yuan.

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[23] http://www.ynnw.gov.cn/Modules/Document/InfoShow.aspx?kid=6967

[24] http://www.ynnw.gov.cn/Modules/Document/InfoShow.aspx?kid=6967

[25] http://www.fswater.gov.cn/News/slnews/200306/200306160004.htm

[26] http://www.sichuandaily.com.cn/2003/09/05/2003090524146480.6373.htm

Based on the above three documents: FSR completed in July 2005, the approved document for tariff of "Yunfagaijiage [2006]28" on 06/01/2006 and the final Assessment Report by China International Engineering Consult Co.Ltd on 18/01/2006, the IRR of the proposed project is lower than 8% and the proposed project was estimated unfeasible.

The project owner tried their best to seek for the solutions, including contacting and learning about CDM in the early of year 2006 and especially knowing that Gansu Xiaogushan Hydropower Project and Hunan Yuzaikou Hydropower Project applied for CDM and had got the approval from National Development and Reform Commission (NDRC) from the website[27].

Based on the primary contact with CDM, on 18th February 2006, the entities related to the proposed project such as Zhongshui Pearl River Planning Survey and Design Co.Ltd, the local government such as Yunnan Province Development and Reform Commission and Yunnan Province Price Bureau, Yunnan Power Grid Company, the investors of the proposed project such as Dongguan City Changyuan Industrial Co.Ltd, Shantou City Yingyuan Construction Engineering Co.Ltd, the 2nd Engineering Bureau of Guangdong Province Water Resource, the villager's representative and CDM Consulting Company etc held the meeting to discuss the issues including the low tariff barriers faced by the project owner and the methods to solve the problems. All participates suggested the project owner should apply for CDM. After this meeting, the project owner started to prepare for the CDM project application. And in March 2006, the CDM Consulting Agreement was signed between the proposed project owner and the CDM Consulting Company.

Based on the above serious consideration of CDM by the proposed project, the investors of the proposed project such as Dongguan City Changyuan Industrial Co.Ltd, Shantou City Yingyuan Construction Engineering Co.Ltd and the 2nd Engineering Bureau of Guangdong Province Water Resource strengthened the belief for the proposed project,, and then they issued the Letter of Capital Payment and paid the capital to the account of the company.

Because of CDM consideration and the help of the three investors on capital payment, the project owner started to choose the suitable equipments and signed the turbines and generators purchase agreement on 6th, June 2006. And the FSR of the proposed project was approved by NDRC on 15th June 2006 and the construction of the proposed project was started on 18th July 2006.

The milestones especially related to CDM consideration is as follows:

Year	Date	Milestones	Evidence/Remarks
2005	June	EIA Report completed	EIA Report completed by Zhujiang Water Resource Protection Science Institute
	July	FS Report completed	FS Report designed by Zhongshui Pearl River Planning Survey and Design Co.Ltd. The tariff in the FSR is 0.212yuan/kWh (excluding VAT), and the total static investment in the FSR is 988.767million yuan and the FIRR in the FSR is 8.02%.
	10th August	EIA Report approved	Approval Letter for EIA issued by National Environmental Protection Bureau
2006	6th January	the document of "Yunfagaijiage [2006]28" issued by Yunnan Province	0.215yuan/kWh (including VAT) was set in this approval document applicable for hydropower projects in Yunnan

[27] http://cdm.ccchina.gov.cn/web/Main.asp?ColumnId=18&ScrollAction=2

		Development and Reform Commission	Province.
	18th January	Based on the review for the FSR completed in July 2005 by China International Engineering Consult Co.Ltd, the final Assessment Report was issued by China International Engineering Consult Co.Ltd	The confirmed total static investment through review is 977.33 million yuan
	January-February	Based on the FSR and "Yunfagaijiage [2006]28" and the final Assessment Report, the proposed project is not feasible, and the project owner tried to seek for the solutions, including contacting and learning about CDM	
	18th February	The meeting on serious consideration of CDM application by each party of the proposed project in the People's Government of Honghe State Yunnan Provice	The Minutes of Meeting
	7th March	After negotiation, the Agreement between the project owner and the CDM consult company was signed	CDM Consulting Agreement
	5th April	Based on the proposed project considering CDM, the three investors strengthened the belief for the proposed project, and they issued the Letter of Capital Payment and then paid the capital.	The Letter of Capital Payment by the three investors of Dongguan City Changyuan Industrial Co.Ltd, Shantou City Yingyuan Construction Engineering Co.Ltd, the 2nd Engineering Bureau of Guangdong Province Water Resource
	6th, June	Purchase Agreement of Water Turbines and Generators signed between Honghe Guangyuan Hydro Power Development Co.Ltd and Tianjin City Tianfa Heavy Hydro Equipments Production Co.Ltd.	Purchase Agreement of Water Turbines and Generators
	15th June	FS Report approved by NDRC	FSR Approval Letter of NDRC. The approved total static investment in this document is 977.33 million yuan
	18th July	Commencement of the main body construction	The Letter of Commence
	28th July	Purchase Agreement of the Main Transformer signed	Purchase Agreement of the Main Transformer

		between Honghe Guangyuan Hydro Power Development Co.Ltd and Tianwei Baobian (Hefei City) Transformer Co.Ltd.	
2007	12th July-10th August	The PDD of the proposed project was uploaded on the UNFCCC website for GSP [28]	http://cdm.unfccc.int/Projects/Validation/DB/7SAJD2YX4Y6Y0137P4JZLNXAPA2VHK/view.html
	28th December 2007	the first generator of the proposed project had started to generated electricity	
2008	8th April	The Power Purchase Agreement was signed between the project owner and the Yunnan Power Grid	The tariff in the PPA is approved as 0.215yuan/kWh(including VAT)
	the end of year 2008	It is estimated all the three generators will generate electricity.	

In conclusion, the proposed project is additional and the project owner considered applying for CDM project to overcome the difficulties before the implementation of the proposed project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

1. Baseline emissions

The baseline emission factor will be calculated according to the steps specified by the baseline methodology ACM0002 (version 06). The power system to which the proposed project belongs is South China Power Grid. According to the approved methodology ACM0002, baseline emission factors of operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) were determined ex-ante based on the data of South China Power Grid, which include installed capacity, electricity output and consumption of different types of fuels of all plants. The baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$.

[28] After the sign of the CDM Consult Agreement on 7th March 2006, the project owner and the CDM consult company together seeked for the CERs buyers for the proposed project. After comparison among several CERs buyers and negotiation with each of them on the CERs price and other transfer conditions of CERs, the project owner and the present CERs buyer primarily agreed on the key point such as CERs price and other important conditions in the end of year 2006. After primary and intention confirm of the CERs buyer, the CDM consult company started to prepare all the documents of CDM application such as the PDD (Chinese version and English version) and other application materials which China DNA required from January 2007 to March 2007, and then the PDD and other application materials were submitted to China DNA for approval in April 2007. The final ERPA was signed between the project owner and the present CERs buyer on 31st May 2007. After the sign of the final ERPA and the approval by China DNA, the proposed project prepared to do the validation. After signing the validation contract and preparation of other materials, the PDD was uploaded on the website of UNFCCC for GSP from 12th July 2007-10th August 2007.

Step 1. Calculate the Operating Margin Emission Factor(s) ($EF_{OM,y}$)

According to ACM0002, four methods could be used to calculate the OM: (a) Simple OM, (b) Simple adjusted OM, or (c) Dispatch Data Analysis OM, or (d) Average OM.

For the proposed project, the simple Operating Margin emission factor was chosen based on the following two reasons:

1) In China, the State Grid Corporation runs the interregional dispatch system and each regional grid corporation runs the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.

2) From 2001 to 2005, the proportion of the hydro power plus nuclear power plus the power produced by other low-cost/must run resources in the total electricity output of South China Power Grid was 33.76% in 2001, 32.98% in 2002, 31.06% in 2003, 29.95% in 2004 and 28.6% in 2005[29], far lower than 50%. Therefore, method (d) is excluded and method (a) Simple OM can be used to calculate $EF_{OM,y}$.

The Simple OM emission factor 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:

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

Where $F_{i,j,y}$ is the amount of fuel i consumed (ton for solid and liquid fuel, m^3 for gas fuel) 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.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in years y, and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j. In the China Electric Power Year Book and other data resources, only generation data is available. The generation from source j can be translated into electricity delivered to the grid by source j by the following formulation:

$$GEN_{j,y} = G_{j,y} \times (1 - e_{j,y}) \quad (2)$$

Where $G_{j,y}$ is the amount of generation (in MWh) by source j in year y;

$e_{j,y}$ is the rate of plant self consumption of source j in year y.

The CO_2 emission coefficient of fuel type i $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \quad (3)$$

Where:

NCV_i is the net calorific value per ton or m^3 of a fuel i (MJ/t, or MJ/km3).

$OXID_i$ is the oxidation factor of the fuel i.

[29] China Electric Power Yearbooks (2002, 2003, 2004, 2005, and 2006)

$EF_{CO2,i}$ is the CO_2 emission factor per TJ of fuel type *i* (tCO_2/TJ).

According to the methodology ACM0002, the Simple OM emission factor is ex-ante calculated as electricity-to-the-grid weighted average in the South China Power Grid during the most recent 3 years (2003-2005), and will be fixed in the first crediting period.

Based on the formula (1), formula (2) and formula (3), the calculation process for OM is shown in annex 3.

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

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \quad (4)$$

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m in year y*.

The methodology provides two options for the BM calculation :1) Ex-ante calculation based on the available data in the recent three years when the PDD submission; 2) Ex-post update BM according to the actual generated electricity and emission reductions in the first crediting period, and in other crediting period the ex-ante calculation like the first choice can be adopted.

The result of BM emission factor in this project is based on the first choice: ex-ante calculation and the update for the emission factor are not needed.

Because some data can't be available, the BM calculation in this PDD adopts the modifications methods agreed by the CDM EB[30]. First, calculate the newly added installed capacity and the various component technologies, then calculation of the weight of newly added installed capacity of each power generation technology. Finally the commercial and efficient level of each power generation technology is adopted to calculate BM emission factor.

Because the generating capacity of the coal-fired, oil-fired and gas-fired technology can not be separated from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO2 emissions; Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in each grid. Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the additional 20% capacity. The result is BM emission factor.

Concrete steps and the formula for BM are as follows:

Sub-step1: Calculation of the proportion of CO2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO2 emissions.

[30] the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.

$$\lambda_{Coal} = \frac{\sum_{i=Coal,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (5)$$

$$\lambda_{Oil} = \frac{\sum_{i=Oil,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (6)$$

$$\lambda_{Gas} = \frac{\sum_{i=Gas,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (7)$$

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step2: Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \quad (8)$$

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ represent the emission factors of the optimal efficient and commercial coal-fired, oil-fueled and gas-fueled technologies.

Sub-step 3: Calculation of BM in the grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} * EF_{Thermal} \quad (9)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$is the total added installed capacity for thermal power.

Based on the above calculation principle for BM, basic data and parameter, the calculation process for BM is shown in annex 3.

Step 3 Calculate the baseline emission factor EF_y

The baseline emission factor is the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (10)$$

Where the weight w_{OM} and w_{BM} by default, are 50%. The proposed project adopts the default weight.

Step 4 baseline emissions

The baseline emissions (BE_y in tCO_2e) are the product of the baseline emissions factor (EF_y in tCO_2e/MWh) calculated in Step 3, times the result of the electricity supplied by the project activity to the

grid (EG_y in MWh).

In case of equipment shutdown or overhaul, the project is likely to import the electricity from the grid during this period. Thus, the amount of imported electricity ($EG_{SCPG\ to\ PJ,\ y}$) will be deducted from the amount supplied to the grid ($EG_{PJ\ to\ SCPG,\ y}$) and the net quantity of electricity supplied ($EG_y = EG_{PJ\ to\ SCPG,\ y} - EG_{SCPG\ to\ PJ,\ y}$) will be as the base for emission reductions calculation.

$EG_{SCPG\ to\ PJ,\ y}$ is considered to be zero ex-ante and will be monitored in the project operation period by the project operator and verified by DOE periodically.

So the baseline emissions are calculated as:

$$BE_y = EG_y \times EF_y = (EG_{PJ\ to\ SCPG,y} - EG_{SCPG\ to\ PJ,y}) \times EF_y \qquad (11)$$

2. Project emissions

The power density of the proposed project is 16.8W/ m^2, greater than 10W/ m^2, CH_4 emission is excluded. So the project emission (PE_y) is zero.

$$PE_y = 0. \qquad (12)$$

3. Leakage emissions

According to ACM0002, *Ly* is zero.

$$L_y = 0 \qquad (13)$$

4. Emission reductions

Therefore, the annual emission reduction of the proposed project is calculated as follows:

$$ER_y = BE_y - PE_y - L_y = BE_y = EG_y \times EF_y = (EG_{PJ\ to\ SCPG,y} - EG_{SCPG\ to\ PJ,y}) \times EF_y \qquad (14)$$

Where,

EG_y: the net grid-connected power generation of the proposed project（MWh）in year(s) *y;*

$EG_{PJ\ to\ SCPG,\ y}$: the grid-connected power generation of the proposed project to South China Power Grid（MWh）in year(s) *y*;

$EG_{SCPG\ to\ PJ,\ y}$: the power supplied by South China Power Grid Corporation to the proposed project in year(s) *y*（MWh）.

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

Data / Parameter:	NCV_i
Data unit:	MJ/t, or MJ/km3
Description:	the net calorific value per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook（2006）
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the requirements of the latest ACM0002, specific national values should be used if available.
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ (can be transformed to tCO_2e/TJ)
Description:	Emission factor per unit energy of fuel i
Source of data used:	Defaults on page 1.23～page 1.24 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	2006 IPCC defaults
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	the oxidation rate of the fuel *i*
Source of data used:	Defaults on page 1.23～page 1.24 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	Please refer to Annex3
Justification of the choice of data or description of measurement methods and procedures actually applied :	2006 IPCC defaults
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mass or volume unit of fuel i
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data used:	China Energy Statistical Yearbooks(2004,2005,2006)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	In accordance with the requirements of the latest version of ACM0002.
Any comment:	

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	Power generation of sources *j* in year(s) *y*
Source of data used:	China Electric Power Yearbook(2004,2005,2006)
Value applied:	See Annex 3 for details on the power generation of South China Power Grid in 2003, 2004 and 2005.

Justification of the choice of data or description of measurement methods and procedures actually applied :	In accordance with the requirements of the latest version of ACM0002.
Any comment:	

Data / Parameter:	$e_{j,y}$
Data unit:	%
Description:	Self-consumption rate of electricity of sources *j* in year(s) *y*
Source of data used:	China Electric Power Yearbook(2004,2005,2006)
Value applied:	See Annex 3 for details on the self-consumption rate of electricity of South China Power Grid in 2003, 2004 and 2005.
Justification of the choice of data or description of measurement methods and procedures actually applied :	In accordance with the requirements of the latest version of ACM0002.
Any comment:	

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The installed capacity of every kind of electricity generation (such as thermal power, hydro power, nuclear power, wind power and other energy sources etc.) of South China Power Grid in the recent years. And to find the change of capacity additions in the South China Power Grid in the past few years.
Source of data used:	China Electric Power Yearbook
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002 and the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.
Any comment:	Reasonable

Data / Parameter:	$GENE_{best,coal}$
Data unit:	%
Description:	The maximized efficiency of coal-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	36.53
Justification of the choice of data or description of measurement methods and procedures actually	Specific national value

applied :	
Any comment:	

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	%
Description:	The maximized efficiency of oil and gas-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	45.87
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2e/MWh
Description:	OM emission factor of South China Power Grid
Source of data used:	China's DNA : *Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007 and the annex 3 of the PDD*
Value applied:	1.0119
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	/

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2e/MWh
Description:	BM emission factor of South China Power Grid
Source of data used:	China's DNA : *Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007 and the annex 3 of the PDD*
Value applied:	0.6748
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	/

Data / Parameter:	$EF_{CM,y}$
Data unit:	tCO_2e/MWh
Description:	CM emission factor of South China Power Grid
Source of data used:	China's DNA : *Report on Determination of Baseline Grid Emission Factor issued on 9th August 2007*

Value applied:	0.84335
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	/

B.6.3 Ex-ante calculation of emission reductions:

1. the result of EF_y of South China Power Grid

Based on the formula in section B.6.1 and data from section B.6.2, the figures of emission factors of South China Power Grid are as follows:

- $EF_{OM,y}$: 1.0119tCO_2e/MWh;
- $EF_{BM,y}$: 0.6748 tCO_2e/MWh;
- EF_y: 0.84335tCO_2e/MWh.

2. The result of baseline emissions

The amount of the electricity delivered to South China Power Grid from the proposed project ($EG_{PJ\ to\ SCPG,\ y}$) is expected to be 616,314MWh per year. The electricity maybe imported ($EG_{SCPG\ to\ PJ,\ y}$) from South China Power Grid, in case of equipment shutdown or overhaul, taken the value of zero at the stage of validation, will be monitored during the project operation and be deducted from the $EG_{PJ\ to\ SCPG,\ y}$ as the base for emission reduction calculation ex post. So the annual average baseline emission of the proposed project is estimated to be:

$BE_y = EG_y \times EF_y = (EG_{PJ\ to\ SCPG,\ y} - EG_{SCPG\ to\ PJ,\ y}) * EF_y = (616{,}314-0) * 0.84335 = 519{,}768tCO_2$e.

3. The results of project emissions

The proposed project is a hydro power project with a new reservoir and the power density of the proposed project is 16.8W/ m^2, greater than 10W/ m^2, and according to ACM0002 the project emissions are zero, PE_y=0.

4. The results of leakage

According to ACM0002, the leakage emissions are zero, L_y=0.

5. The results of emission reductions

The emission reduction ER_y of the project activity is the baseline emission (BE_y) minus the emission of the proposed activity (PE_y) and the emission due to leakage (L_y)

So, $ER_y = BE_y - PE_y - L_y$ =519,768 tCO_2e.

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

>>

Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of Leakage emission (tCO_2e)	Estimation of emission reductions (tCO_2e)
01/01/2009-31/12/2009	0	519, 768	0	519, 768
01/01/2010-31/12/2010	0	519, 768	0	519, 768

01/01/2011-31/12/2011	0	519, 768	0	519, 768
01/01/2012-31/12/2012	0	519, 768	0	519, 768
01/01/2013-31/12/2013	0	519, 768	0	519, 768
01/01/2014-31/12/2014	0	519, 768	0	519, 768
01/01/2015-31/12/2015	0	519, 768	0	519, 768
Total (tCO_2e)	0	3,638,376	0	3,638,376

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

The proposed project adopts the ex-ante calculation of emission factor of South China Power Grid, so only the grid-connected power generation of the proposed project in year(s) *y* to South China Power Grid （$EG_{PJ\ to\ SCPG,\ y}$） and the power supplied by the South China Power Grid Corporation to the proposed project （$EG_{SCPG\ to\ PJ,\ y}$） in year(s) *y* need to be monitored in the renewable crediting period.

Data / Parameter:	$EG_{PJ\ to\ SCPG,\ y}$
Data unit:	MWh
Description:	Annual Grid-connected power generation of the proposed project to South China Power Grid
Source of data to be used:	Measured by meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	616,314
Description of measurement methods and procedures to be applied:	Directly measured by metering systems installed. The recording frequency will be continuous measurement and monthly recording.The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of sales. The metering systems are calibrated as stated in B.7.2
QA/QC procedures to be applied:	Sales records to the grid. Furthermore, the receipt of electricity sales by the project from the grid company will be available to double check this parameter.
Any comment:	

Data / Parameter:	$EG_{SCPG\ to\ PJ,\ y}$
Data unit:	MWh
Description:	The annual amount of power supplied by the South China Power Grid Corporation to the proposed project
Source of data to be used:	Measured by meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to	Directly measured by metering systems installed. The recording frequency will be continuous measurement and monthly recording. The

be applied:	proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of electricity purchase. The metering systems are calibrated as stated in B.7.2
QA/QC procedures to be applied:	Purchase records from the grid. Furthermore, the receipt of electricity purchase by the project from the grid company will be available to double check this parameter.
Any comment:	

Data / Parameter:	A_{PJ}
Data unit:	M^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8,938,000
Description of measurement methods and procedures to be applied:	Measured once at the start of the proposed project by the proposed project owner, from topographical surveys, maps supplied by the proposed project, the detailed is as follows: According to the topographic map of the reservoir area of the proposed project, the curve of the relation between the water level and the related reserve area can be set up. Once the water level is known, the related reserve area can be read based on the curve, and finally the power density can be calculated. So first of all, the topographic map must have been prepared, and the water level should be measured by the water level meters or instruments, then the related reservoir area can be read. The operators from the technical department of CDM related group will be responsible for measuring of the water level and reading the related reservoir area and calculating the power density and archiving all the data electronically and also in paper. And all data will be kept until 2 years after the end of the total credit period of the proposed project.
QA/QC procedures to be applied:	The uncertainty level of this data is low.
Any comment:	Accurate, for calculation of power density then for PE_y

B.7.2 Description of the monitoring plan:

The purpose of monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed project within the crediting period is complete, consistent, clear and accurate. The plan will be implemented by the project owner with the support of the grid corporation.

1. Monitoring organization

The project owner will designate a CDM manager to be in charge of monitoring the data and information relating to the calculation of emission reductions with the cooperation of the Technical and Financial Departments. The operation and management structure is shown in Figure 3.

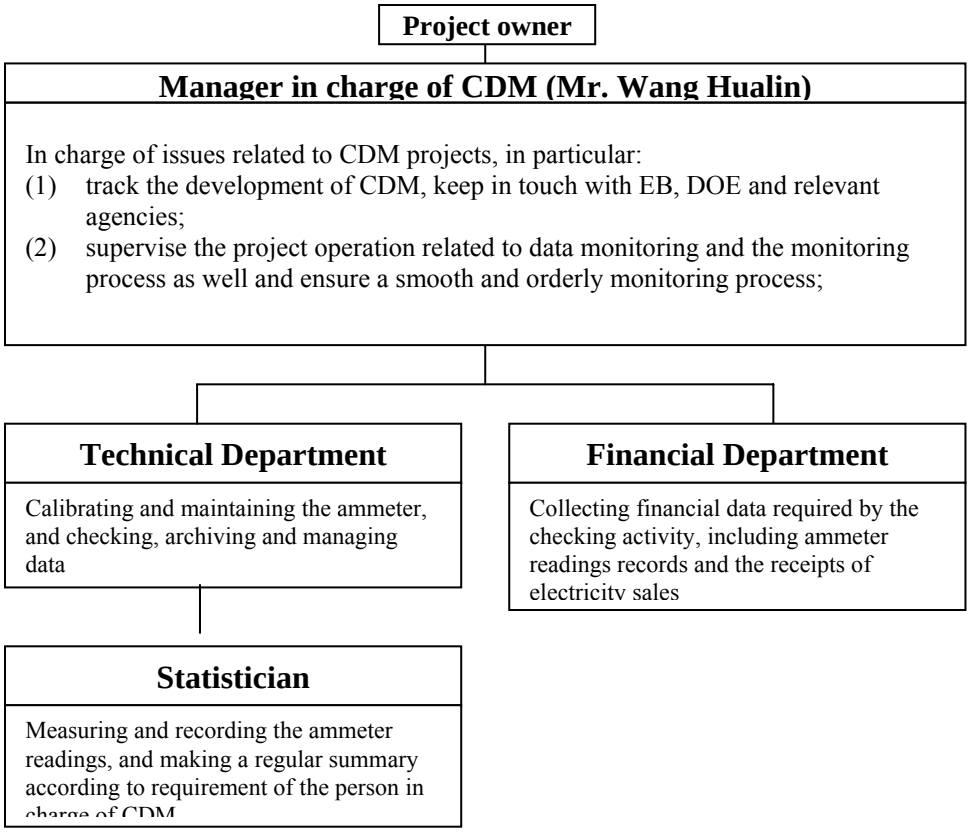


Figure 3 Monitoring and management Structure

2. Data to be monitored

Since the baseline emission factor is calculated ex-ante, the main data to be monitored is:

- grid-connected power of the proposed project activity （$EG_{PJ\ to\ SCPG,\ y}$） and
- the power supplied by the South China Power Grid Corporation grid corporation to the proposed project （$EG_{SCPG\ to\ PJ,\ y}$）.

The net grid-connected power generation of the proposed project in year(s) *y* (EG_y) is equal to $EG_y = EG_{PJ\ to\ SCPG,y} - EG_{SCPG\ to\ PJ,y}$.

Calculation of the emission reduction by the proposed project, only the net electricity produced by the proposed project (EG_y) will be used. If in case of emergency, the electricity supplied from other power stations for the proposed project should also be deducted too.

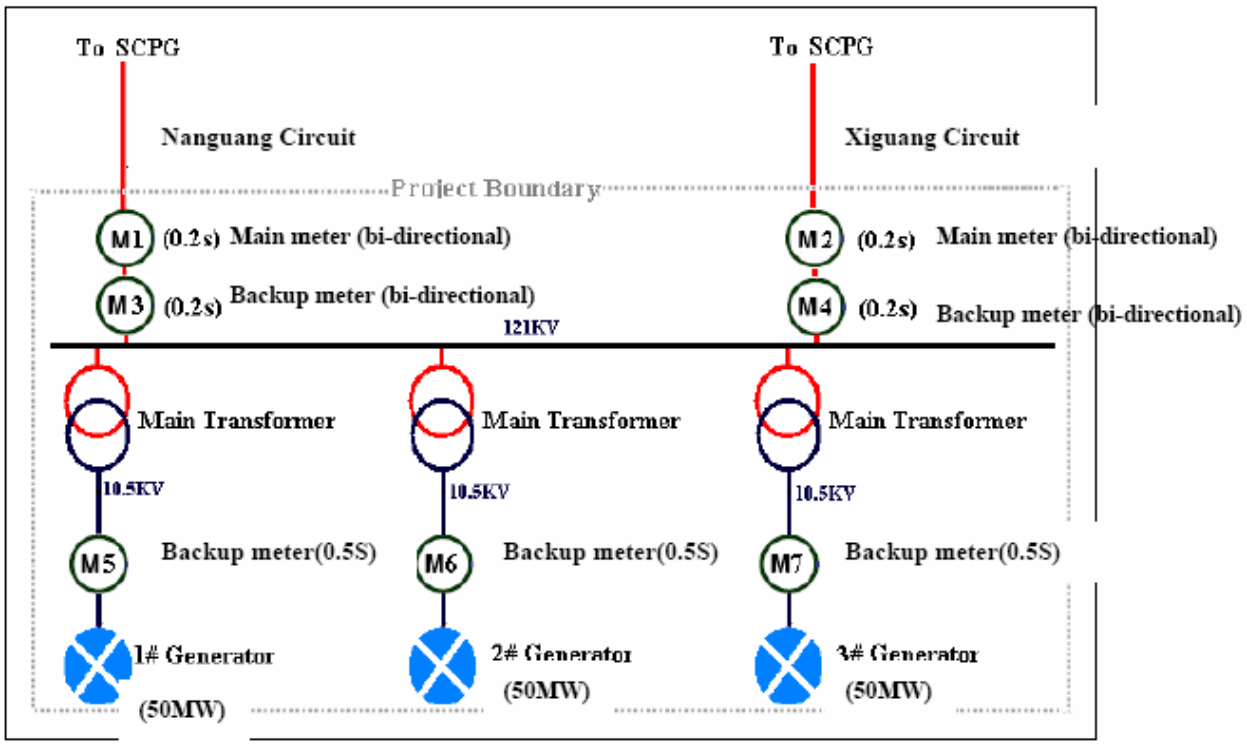
Furthermore, surface area at full reservoir level (A_{PJ}) should be monitored based on the topographical surveys and maps supplied by the proposed project.

3. Monitoring equipment and its installation

The electric energy metering should be equipped according the requirements of the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). Before the operation of the proposed bundled project, the project owner and the power grid corporation should examine the electric energy

metering according to the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). The DL/T448-2000 has been submitted to DOE.

According to the Power Purchase Agreement (PPA) signed between the project owner and Yunnan Power Grid on 08/04/2008, the allocation of the electric energy metering is shown as follows:



Main meter

M1 (the Main meter of 0.2S and bi-directional), installed at the 151 Switch on the Nanguang Circuit.

The Meter of **M1** to measure the grid-connected electricity to SCPG through Nanguang Circuit in the positive direction ($EG_{PJ\ to\ SCPG,Nanguang,\ y}$) and the power supplied by South China Power Grid to the proposed project through Nanguang Circuit in the reverse direction ($EG_{SCPG\ to\ PJ,Nanguang\ y}$). The net grid-connected electricity of the proposed project through Nanguang Circuit in year(s) *y* ($EG_{y,M1}$) is equal to

$$EG_{y,Nanguang} = EG_{PJ\ to\ SCPG,Nanguang,\ y} - EG_{SCPG\ to\ PJ,\ Nanguang\ y}$$

M2(the Main meter of 0.2S and bi-directional), installed at the 152 Switch on the Xiguang Circuit.

The Meter of **M2** to measure the grid-connected electricity to SCPG through Xiguang Circuit in the positive direction ($EG_{PJ\ to\ SCPG,Xiguang,\ y}$) and the power supplied by South China Power Grid to the proposed project through Xiguang Circuit in the reverse direction ($EG_{SCPG\ to\ PJ,Xiguang\ y}$). The net grid-connected electricity of the proposed project through Xiguang Circuit in year(s) *y* ($EG_{y,Xiguang}$) is equal to

$$EG_{y,Xiguang} = EG_{PJ\ to\ SCPG,Xiguang,\ y} - EG_{SCPG\ to\ PJ,Xiguang,\ y}$$

The total net grid-connected electricity of the proposed project through Nanguang and Xiguang Circuit in year(s) *y is the sum of* $EG_{y,Nanguang}$ *and* $EG_{y,Xiguang}$:

$EG_y = EG_{y,Nanguang} + EG_{y,Xiguang}$

Or:

$EG_{PJ\ to\ SCPG,y} = EG_{PJ\ to\ SCPG,Nanguang,\ y} + EG_{PJ\ to\ SCPG,Xiguang,\ y}$

$EG_{SCPG\ to\ PJ,,y} = EG_{SCPG\ to\ PJ,\ Nanguang\ y} + EG_{SCPG\ to\ PJ,Xiguang,\ y}$

So: $EG_y = EG_{PJ\ to\ SCPG,y} - EG_{SCPG\ to\ PJ,,y}$

Backup meter

M3 (0.2S and bi-directional): the Backup meter for M1, installed at the 151 Switch on the Nanguang Circuit.

When in emergency or when the **M1** is in trouble, the data from **M3** can be used for measurement the net grid-connected electricity through Nanguang Circuit in year(s) *y*;

M4 (0.2S and bi-directional): the Backup meter for M2, installed at the 152 Switch on the Xiguang Circuit.

When in emergency or when the **M2** is in trouble, the data from **M4** can be used for measurement the net grid-connected electricity through Xiguang Circuit in year(s) *y*;

M5, M6 and M7 (0.5S): the backup meters, installed at the outlets of the three generators inside the proposed project.

The project owner is responsible for the installation of the meters, and the local grid company is responsible for check of the meters and the supervision record should be provided for the project owner. When there is something wrong with the meters, the project owner should notice the local grid company as soon as possible, and the electricity during the accident should be decided and solved through negotiation by the both parties.

4. Data collection

The steps to monitor the grid-connected power of the proposed project are as follows:

a) The project owner and the grid corporation will get and record the readings of the pass point meter and power check meter within the 24 hours of the last day of every month and check the two reading;

b) The grid corporation provides the project owner the real grid-connected power generation;

c) The project owner offers the grid corporation electricity sales invoices and keep a copy of the invoices;

d) The project owner records the net grid-connected power of the proposed project (the grid-connected power minus the power supplied by the grid corporation to the proposed project);

e) The project owner provides the readings of the pass point meter and copies of invoices to DOE checking personnel.

If the reading of the pass point meter in a certain month is so inaccurate as to be out of the error range or the meter doesn't work normally, the grid-connected power generation shall be worked out by using the following measures:

a) Read the data of the check power meter and work out the grid-connected power of the proposed project according to the line loss rate in the past;

b) If the check power meter's data is not so accurate as to be accepted, or the practice is not standardized, the project owner and the grid corporation should joint make a reasonable and conservative estimation method which can be supported by sufficient evidence and proved to be reasonable and conservative when verified by DOE;

c) If the project owner and the grid corporation don't agree on a estimation method, arbitration will be conducted according the procedures set by the agreement to work out an estimation method.

5. Calibration

The project owner and the grid corporation will sign an agreement to develop a set of quality control procedures regarding measurement and calibration so as to maintain the accuracy of the measurement. The electric meters should be examined and undergo regular field calibration according the relevant standards and regulations of the power industry so as to ensure the sophistication of the meters. After the examination, the meters should be sealed. The lift of the seals requires the presence of both the project owner and the grid corporation. One party must not lift the seals or fiddle with the meters without the presence of the other party.

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

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

(b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

6. Data management

At the end of each month, the monitoring data of that month should be archived electronically. E-documents should have disc backups be printed out. The project owner should also keep the copy of electricity sales/purchase receipts. Written documents such as paper-based maps, diagrams and environmental assessments will be used in addition to the monitoring plan to check the information. In order to facilitate auditors' reference of relevant literature relating to verification of the emission reductions of the proposed project, the index of the project materials and monitoring results should be provided. All paper-based information and data shall be stored by the technology department of the project owner and all the materials shall have copies for backup. And all data will be kept until 2 years after the end of the total credit period of the proposed project.

7. Training

Before the formal operation of the proposed project, the personal in charge of CDM will organize the relevant personals to participate the CDM training. The period of the training will at least last 5 working days.

8. Monitoring Report

After the proposed project is registered and begins its operation, the monitoring report should be submitted at the end of every year for the verification of DOE. The report should cover the monitoring of grid-connected power generation, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

B.8 Date of completion of the application of the baseline study and monitoring methodology and

the name of the responsible person(s)/entity(ies)

The applied study on the baseline and monitoring methodology of the proposed project was completed on 25/07/2008. The individuals/entities involved in the study are as follows:

- Li Chunmin, Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd. E-mail: lcm918@hhcdm.com, Tel: 8610- 83587681, Website: www.hhcdm.com;
- Liu Junhui, Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd. E-mail:ljh400619@sohu.com, Tel: 8610- 83587681, Website: www.hhcdm.com;
- Su Lanren, Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd. E-mail: sulanren@sohu.com, Tel: 8610- 83587681, Website: www.hhcdm.com;
- Liuqiang, Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd. E-mail: lqydcg@yahoo.com.cn, Tel: 8610- 83587681, Website: www.hhcdm.com;

Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd. is not a 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:

>>

06/06/2006[31]

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

>>

30 years

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

C.2.1. Renewable crediting period

7*3

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

>>

01/01/2009[32]

C.2.1.2. Length of the first crediting period:

>>

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

[31] For the project start date, see Purchase agreement for the turbines and generators

[32] Or the date after registration whichever is later.

SECTION D. Environmental impacts

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

The Environmental Impact Assessment (EIA) for the proposed project was carried out by Zhujiang Water Resource Protection Science Institute, which is a grade A environment impact assessment entity certified by the State Environmental Protection Administration. The EIA report was approved by National Environmental Protection Bureau on 10th August 2005. Combined with the EIA report, the influences of the proposed project on the environment are summarized as follows in the construction period and the operation period.

1. Construction Phase

Water Influence

The waste water is mainly from the life of the constructors and the waste water because of washing, the soil machining system and machine repair system. The waste water from life will be treated by septic tank and purification pool. The waste water from production will be treated by natural deposition, three levels of flocculating deposition pool. After the treatment, the waste water can reach 2nd level standard of GB8978-1996.

Air Influence

The air pollutants and the dust are from fuel firing, blasting, concrete mixing, rock crashing and vehicle transportation. Although the atmospheric diffusion condition is poor, the project covers a small range and this kind impact is temporary which will disappear with the end of construction activities. The daily sprinkling of the roads and the construction sites will be done to keep the humidity of the project sites. After the treatment, the gas emissions can reach the standard in GB16297-1996.

Noise Influence

The noise is mainly from traffic vehicle and construction machinery. Because the construction time and peak construction period is relatively short, labour protection and other appropriate measures can be taken to reduce the negative impact of noise on the environment. The construction units should make full use of the advanced equipments with low-noise standards in line with the national standards. Maintenance should be made to strengthen the construction machinery to avoid adding mechanical noise because of poor performance. The strong labor protection will be strengthened to prevent excessive noise impact on the health of construction workers. The anti-noise helmets, earplugs or earmuff should be wearied. The signs will be set up at the higher flow of traffic crossing to prevent traffic chaos causing human pollution. The noise control standards at the construction sites can reach "Construction Sites Noise Limits" (GB12523-90).

Solid Wastes Influence

The solid wastes during construction period are from production wastes and living wastes. The production wastes are soil and residues during excavation. The Living wastes are mainly generated by the life of the constructors.

The solid waste plant will be treated in strict accordance with the requirements of the Soil and Water Conservation to avoid water and soil erosion problems. The living wastes should be concentrated to be treated, and garbage bin will be set up in the construction living quarters to prohibit throwing garbage. Liquid medicine should be sprayed to prevent the breeding of mosquitoes and avoid mosquito gathered

and reduce the probability of spreading diseases. The wastes will be regularly transported to a nearby garbage dump or buried treatment.

2. Operation Phase

Zoology

The releasing flux is bigger than 26.1m^3/s, which can make the water utilization in the backward position of Hong River plentiful.

Immigration allocation and land occupation

It is estimated that 853 inhabitants need to resettle and 3.52 km^2 previously used land is submerged due to the proposed project[33]. Two allocation sites (Immigration New Village and Guanting Town) are arranged and constructed. It was planned that 248 migrants would be resettled in Guanting Town, and 605 migrants would be resettled in Immigration New Village. They are compensated with subsidies, house and farmland etc. The project owner has signed the Agreement of Immigrates Allocation and Compensation with the People's Government of Honghe Hani & Yi Autonomous State and has invested RMB 98.0472 million yuan as immigration compensation. This agreement has been submitted to DOE. At the same time, the project owner signed the Compensation Agreement for Occupied Land and Demolition with each affected villagers such as the three families of Mr. Tan Zhongfa, Mr. Luo Wenming and Mr. Bai Qiaoyou. The three agreements have been submitted to DOE.

Furthermore, according to Resettlement Plan of the project, through compensations in forms of subsidies, house, farmland etc., the living and product activity of all resettled people have been well arranged. Transportation (five roads and two bridges built), electricity supply facilities (four electricity transmission lines built), communication facilities (three communication lines built), water supply (two water pipelines built), education and medical care have been well arranged[34]. Thus life quality improved compared with that before resettlement.

On transboundary impacts[35]

Hong River is one of the international rivers in the southwest of China, and it is originated from Weishan County Yunnan Province and flow to Vietnamese at the Hekou County Yunnan Province. Although the proposed project is on Hong River and is 110km away from the exit to Vietnamese, there are the following reasons to show that it will have little impacts on Hong River:

- It is the run-of-river hydropower project resulting little impact on the Hong River and environment;
- During the distance of 110km from the proposed project and the exit to Vietnamese , there are four big branch river will import to Hong River which can add the water flux of Hong River.
- 26.1 m^3/s of ecological flux will be ensured according to the approved document for the EIA.

So, the proposed project will result in little impact on Hong River and there is none of transboundary impacts.

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:

[33] Page 49 and Page 55 of the EIA Report of the project.

[34] P49-P51 of EIA.

[35] Page 4 in the Assessment Report for the FSR and the Approval Letter for the EIA.

The EIA report of the proposed project has been approved by National Environmental Protection Bureau. The project owner will carry out all the protection measures according to the approved EIA report and the approved Water and Soil Conservation Report. Furthermore, in terms of resettlement and compensation for the immigrants and the submerged land, the project owner signed agreements with the local government and the affected villagers, and the project owner will implement all the signed agreements. Therefore, the construction and operation of the proposed project have no significant environmental impacts.

SECTION E. Stakeholders' comments

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

There are three phases for inviting the comments of the stakeholders.

- The first phase of inviting the comments was done in June 2005 by Zhujiang Water Resource Protection Science Institute during designing EIA report, which emphasized on the comments for environmental impact.
- The second phase of inviting the comments was carried out from 1st March 2006 to 17th March 2006 by the project owner and the local Town Committee in yuanyang County and Jianshui County, which emphasized on the comments whether the proposed project was supported for applying for CDM.
- The third phase of inviting the comments was carried out during validation of the proposed project in year 2007, which emphasized on the comments from the 183 families of the immigrates whose houses and farmlands were submerged and occupied.

In the first phase, in order to know the attitudes and views of the public on the project's construction influence on the surrounding environment, the proposed project has taken the form of public participation in two ways of visiting experts and holding meetings in Nansha Town, Zhaidao Village, Zhala Village and Yuni Village around the project area. As for the special persons, both visiting experts and holding meetings are adopted, and as for the normal people handing out questionnaires is adopted. The investigation content includes the knowledge of the proposed project, the effect on the environment, social economy development and the immigrants.

In the process of investigation, the experts on hydro power technology, environmental protection and social study were invited to participate two small meetings. The suggestions and opinions on hydrophily environmental protection and land entiroment were consulted.

As for the normal people, the total of 125 copies of this questionnaire had been handed out and 105 were recovered, so the recovery rate is 84%.The amount of effective questionnaire is 100. The information for the public in the survey statistics are as follows:

Table E1 The age distribution of the public

Age	Year 19~29	Year 30~40	Year 41~45	Year 46~66
Persons	28	34	21	17
Share(%)	28	34	21	17

Table E2 the career distribution of the public

Careers	Cadres	Workers	Teachers	Technicians	Farmers	Students	Others
Persons	20	15	5	28	15	5	12
Share (%)	20	15	5	28	15	5	12

Table E3 the civilization distribution of the public

Civilization degree	Higher than junior college	Technical Secondary school	Senior high school	Below junior high school
Persons	30	25	20	25
Share (%)	30	25	20	25

In the second phase, the proposed project owner and the local Town Committee together handed out "the letter to solicit the opinions about the proposed project applying for CDM"on1st March 2006. The opinions and suggestions of the public were welcome in this letter. If there are some suggestions and opinions, these opinions can be submitted to the Town Committee within 15 workdays. The local Town Committee and the proposed project owner collected the opinions and formed the "Feedback Opinions about the proposed project applying for CDM" which was signed by the 18 villagers from Yuni Village Jianshui County and 9 villagers from Wuwan Village Majie Town in Yuanyang County.

In the third phase, 76 questionnaires were handed out to 76 families from Geshi in Potou Town, 16 questionnaires were handed out to 16 families from Jianghezhai in Potou Town, 44 questionnaires were handed out to 44 families from Yuni in Potou Village, and 47 questionnaires were handed out to 47 families from Zhala in GuantingVillage. The houses and farmlands of the above 183 families were submerged or occupied. The questionnaire emphasized the following aspects:

- The type of immigrate allocation;
- Whether to be satisfied with the immigrate allocation scheme;
- Whether to be satisfied with the compensation standard;
- Whether to have got the compensation fee;
- Which to live on after immigrations;
- Whether the life has security after immigrations;
- Whether the life has been improved after immigrations;
- How about the condition of medical care, transportation, communication and education for children compared to the past;

E.2. Summary of the comments received:

>>

The result of comments from the first phase is as follows which is shown in EIA report:

125questionnaires were distributed to the local people, and 105 questionnaires had been returned. The response rate is 84%.

1. Comments from these questionnaires for normal local people are summarized:

1) the opinions about the project engineering

85% of the public have known the proposed project.75% of the public agreed on the construction of the proposed project and 12% had no opinions about the proposed project and 13% of the public had negative attitudes about the project because they thought the compensation can't meet the requirement of immigration and settle down.65% thought the construction of the proposed project will play an important part in general development of the local area, and 70% of the public thought the proposed project will boost the economy development, and 63% thought the proposed project can improve the water supply of the backward position of the river and the country, and 65% thought it can improve the water quality, and 56% thought it can increase the life level and 30% thought it can improve the transportation condition.

2) The effect on the entiroment after the reservoir construction

45% thought the proposed project will improve the environment quality, 45% thought it will have small impacts on environment but can be controlled and reduced by adopting related measures, and 10% thought it will have impacts on environment.60% thought the reservoir will not generate water body pollution, 72% thought the immigrants are the biggest problem. 65% thought the proposed project will flood the soil and forest.20% thought flooding would impact the animals and plants. 72% thought the

solid waste is the main environment during construction. 45% thought construction will destroy the vegetation.

3) the opinions about the natural scene

48% thought construction of the proposed project will have no direct impact on the scene of the both banks and 31% thought the proposed project will have positive impact on local area, 21% with negative impact. Most of the people thought the proposed project would be constructed on reasonable argumentation.

2. Comments from these questionnaires for experts are summarized:

The triphibian and hydrophily zoology and the minority heritage are emphasized by experts, and most of the experts thought this issue must be emphasized from natural environment, culture and science. Through analysis of the impact on natural scene, all of them thought the proposed project has no big impact on scene.

From the above analysis, most of the public hold the positive attitude for the proposed project. Therefore, the local people supported the construction of the proposed project, and they figured out that the power plant had positive meaning for local economy development. They had a positive and optimistic attitude for the environmental impacts because of the construction of the proposed project. The public generally hope that the project will start as soon as possible in order to spur local economic development, increase incomes and social benefits.

The result of comments from the second phase is as follows which is shown in the Feedback Opinions Paper:

In the Feedback Opinions Paper on 17th March 2006, all the public thought that the proposed project makes good use of the water resource to generate electricity and supply the electricity to the local areas, and the proposed project supplies several jobs for local people. The operation of the proposed project will reduce the GHG emissions from fossil fuels. The proposed project will not emit the waste water and waste gas. The local people supported the proposed project applying for CDM and supported the construction and operation of the proposed project.

The result of comments from the third phase is as follows which is shown in the 183 questionnaires from Geshi, Jianghezhai, Yuni in Potou Town and Zhala in Guanting Eown:

Items	Questions	Choices	Geshi	Jiangbi anzhai	Yuni	Zhala	Total	Share (%)
1	The type of allocation	*"Houkao"*				47	**47**	25.68
		Allocated in the local areas	76	16	44		**136**	74.32
		Immigrated to other places					**0**	0
2	Whether to be satisfied with the immigrate allocation scheme	Satisfied	22		27	3	**52**	28.42
		Basically satisfied	53	16	16	44	**129**	70.48
		Not Satisfied	1		1		**2**	1.10
3	Whether to be satisfied with	Satisfied	6			1	**7**	3.83
		Basically	65	16	44	46	**171**	93.44

	the compensation standard	satisfied						
		Not Satisfied	5				**5**	2.73
4	Whether to have got the compensation fee	Got all						0
		Got a part	76	16	44	47	**183**	100
		Got none						0
5	Which to live on after immigrations	Agricultural production	72	15	39	47	**173**	94.54
		Employment	2				**2**	1.09
		Others	2	1	5		**8**	4.37
6	Whether the life has security after immigrations	had security	50	8	12	31	**101**	55.19
		had basic security	26	8	32	16	**82**	44.81
		had none security					**0**	0
7	Whether the life has been improved after immigrations	Improved	52	16	36	47	**151**	82.51
		None of improvement	24		5		**29**	15.85
		Worsen			3		**3**	1.64
8	How about the condition of medical care compared to the past	Improved	65	16	40	47	**168**	91.80
		None of improvement	11		4		**15**	8.20
		Worsen					**0**	0
9	How about the condition of transportation and communication	Better	76	16	43	47	**182**	99.45
		The same					**0**	0
		Worsen			1		**1**	0.55
10	Whether to be satisfied with the education condition for the children	Satisfied	67	12	37	47	**163**	89.07
		Basically satisfied	8	4	6		**18**	9.84
		Not Satisfied	1		1		**2**	1.09

From the above table, it can be shown that:

- All the 47 families(25.68%) from Zhala have been immigrated to Guanting Town as “Houkao”; 136 families(74.32%) from Geshi, Jiangbianzhai and Yuni have been allocated in the local area “Immigration New Village”;
- 98.9% thought they were satisfied with the immigrate allocation scheme;
- 97.27% thought they were satisfied with the compensation standard;
- 100% thought they had got part of the compensation fee; the remaining compensation fee
- 94.54% lived on agricultural production after immigrations; 1.09% lived on through employment after immigrations; 4.37% lived on other life sources after immigrations;
- 100% thought their life had security after immigrations;

- 98.36% thought their life had been improved after immigrations;1.64% thought the life had been worsen after immigrations;
- 100% thought the condition of medical care had been improved or not been worsen compared to the past;
- 99.45% thought the condition of transportation and communication had been better or the same; 0.55% thought the condition of transportation and communication had been worsen;
- 98.91% thought they were satisfied with the education condition for the children; 1.09% thought they were not satisfied with the education condition for the children.

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

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The project owner took the public comments and feedback seriously and took prompt and proper action in response to the stakeholders' comments and suggestions, especially on the immigration problem.

The survey during the first phase shows that the main problem is that some people were worried that the compensation can't meet the requirement of immigration and settle down. For this worry, the project owner has signed the Agreement of Immigrates Allocation and Compensation with the People's Government of Honghe Hani & Yi Autonomous State and has invested RMB 98.0472 million yuan as immigration compensation. The project owner and the government worked together and they had the pressure and responsibility to carry out all items set in the Agreement of Immigrates Allocation and Compensation.

And there are none of negative comments during the second phase.

As for the third phase, the project owner has been doing the coordination work and arrangement for a few families who had the negative attitude for immigrate allocation scheme, the compensation standard and the life condition with the People's Government of Honghe Hani & Yi Autonomous State.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No existing official development assistance (ODA) from Annex I countries is involved in the proposed project.

Annex 3

BASELINE INFORMATION

The proportion of the hydro power plus nuclear power plus the power produced by other low-cost/must run resources in the total electricity output of South China Power Grid in the last five years:

Table 3-1 the power generation of South China Power Grid in 2001

Power generation(MWh)	Guangdong	Guangxi	Guizhou	Yunnan	Total
Fossil fuelled	109,119,000	12,110,000	27,376,000	14,305,000	162,910,000
Hydro power	19,073,000	17,609,000	9,565,000	21,648,000	67,895,000
Others	15,000,000	0	0	0	15,000,000
Total	143,327,000	29,719,000	36,941,000	35,953,000	245,940,000

The proportion of low operating cost/must-run power plants of South China Power Grid in 2001: (245,940,000-162,910,000)/245,940,000=33.76%.
Data Source: China Electric Power Yearbook 2002.

Table 3-2 the power generation of South China Power Grid in 2002

Power generation(MWh)	Guangdong	Guangxi	Guizhou	Yunnan	Total
Fossil fuelled	123,081,000	13,069,000	33,231,000	15,787,000	185,168,000
Hydro power	16,913,000	18,634,000	9,512,000	25,062,000	70,121,000
Others	21,012,000	0	0	0	21,012,000
Total	161,008,000	31,703,000	42,743,000	40,849,000	276,303,000

The proportion of low operating cost/must-run power plants of South China Power Grid in 2002: (276,303,000-185,168,000)/276,303,000=32.98%.
Data Source: China Electric Power Yearbook 2003.

Table 3-3 the power generation of South China Power Grid in 2003

Power generation(MWh)	Guangdong	Guangxi	Guizhou	Yunnan	Total
Fossil fuelled	143,351,000	17,079,000	43,295,000	19,055,000	222,780,000
Hydro power	17,136,000	19,288,000	8,019,000	26,837,000	71,280,000
Others	20,089,000	0	0	0	20,089,000
Total	189,577,000	36,367,000	51,314,000	45,891,000	323,149,000

The proportion of low operating cost/must-run power plants of South China Power Grid in 2003: (323,149,000-222,780,000)/323,149,000=31.06%.
Data Source: China Electric Power Yearbook 2004.

Table 3-4 the power generation of South China Power Grid in 2004

Power generation(MWh)	Guangdong	Guangxi	Guizhou	Yunnan	Total
Fossil fuelled	169,389,000	20,143,000	49,720,000	24,322,000	263,574,000
Hydro power	14,114,000	17,229,000	23,379,000	29,350,000	84,072,000
Others	28,630,000	0	0	0	28,630,000
Total	212,133,000	37,372,000	73,100,000	53,672,000	376,277,000

The proportion of low operating cost/must-run power plants of South China Power Grid in 2004: (376,277,000-263,574,000)/376,277,000=29.95%.
Data Source: China Electric Power Yearbook 2005.

Table 3-5 the power generation of South China Power Grid in 2005

Power generation(MWh)	Guangdong	Guangxi	Guizhou	Yunnan	Total
Fossil fuelled	176,453,000	25,023,000	58,430,000	27,281,000	287,187,000
Hydro power	17,482,000	19,582,000	10,848,000	33,228,000	81,140,000
Others	33,924,000	0	0	0	33,923,000
Total	227,859,000	44,604,000	69,278,000	60,509,000	402,250,000

The proportion of low operating cost/must-run power plants of South China Power Grid in 2005: (402,250,000-287,187,000)/402,250,000=28.6%.
Data Source: China Electric Power Yearbook 2006.

The concrete processes for calculating the emission factors of South China Power Grid are shown in the following tables:

Table 3-6 Thermal power generation of South China Power Grid in 2003

Province	The fuel fired electricity generation (MWh)	The rate of electricity self-consumption (%)	The fuel fired electricity connected to the grid (MWh)
Guangdong	143,351,000	5.5	135,466,695
Guangxi	17,079,000	8.43	15,639,240
Guizhou	43,295,000	7.4	40,091,170
Yunnan	19,055,000	8.01	17,528,695
The total	--	--	208,725,800

Note: When calculating simple OM emission factor of South China Power Grid in 2003, the electricity imports from Central China Power Grid is 11,100 MWh, so the total thermal power generation of South China Power Grid in 2003 is 11,100+208,725,800=208,736,900 MWh.
Data source: China Electric Power Yearbook 2004

Table 3-7 Calculation of simple OM emission factor of South China Power Grid in 2003

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor（tC/TJ）	OXID（%）	NCV（MJ/t, or MJ/km3）	Emission（tCO_2e）
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000（quality unit） or I=E*F*G*H*44/12/1000（volume unit）
Raw coal	10^4 ton	4,491.79	831.84	2,169.11	1,405.27	**8,898.01**	25.8	100	20,908	175,993,455.05
Washed coal	10^4 ton	0.05				**0.05**	25.8	100	26,344	1,246.07
Other washed coal	10^4 ton			36.38	20.37	**56.75**	25.8	100	8,363	448,971.84
Coke	10^4 ton				0.5	**0.5**	29.2	100	28,435	15,222.20
Coke oven gas	10^8M^3				0.04	**0.04**	12.1	100	16,726	2,968.31
Other gas	10^8M^3	3.21			11.27	**14.48**	12.1	100	5,227	335,797.81
Crude oil	10^4 ton	6.85				**6.85**	20	100	41,816	210,055.71
Gasoline	10^4 ton	0.02				**0.02**	18.9	100	43,070	596.95
Diesel	10^4 ton	31.9			0.76	**32.66**	20.2	100	42,652	1,031,759.27
Fuel oil	10^4 ton	627.22	0.3			**627.52**	21.1	100	41,816	20,301,304.48
LPG	10^4 ton					**0**	17.2	100	50,179	0.00
Refinery gas	10^4 ton	2.85				**2.85**	15.7	100	46,055	75,560.14
Natural gas	10^8M^3					**0**	15.3	100	38,931	0.00
Other petroleum products	10^4 ton	11.35				**11.35**	20	100	38,369	319,357.98
Other coking products	10^4 ton					**0**	29.2	100	28,435	0.00
Other energy	10^4 tce	93.21			22.35	**115.56**	0	100	0	0.00
Total		-	-	-	-	-	-	-	-	198,736,295.81
Total CO_2	198,736,295.81+0.797346*11,100=**198,745,146**									

emission （tCO_2e）	
Total thermal power generation connected to the grid（MWh）	11,100+208,275,800=**208,736,900**
$EF_{simple,OM,2003}$ （tCO_2e /MWh）	**0.952132**

Note: The electricity imports from Central China Power Grid in 2003 is 11,100 MWh, and the simple OM emission factor of Central China Power Grid in 2003 is 0.797346 tCO_2e /MWh, so the total CO_2 emission of South China Power Grid in 2003 is 198,736,295+0.797346*11100=**198,745,146** tCO_2e.
Data source: China Energy Statistical Yearbook 2004;

Table 3-8 Thermal power generation of South China Power Grid in 2004

Province	The fuel fired electricity generation（MWh）	The rate of electricity self-consumption（%）	The fuel fired electricity connected to the grid（MWh）
Guangdong	169,389,000	5.42	160,208,116
Guangxi	20,143,000	8.33	18,465,088
Guizhou	49,720,000	7.06	46,209,768
Yunnan	24,322,000	7.56	22,483,257
The total	--	--	247,366,229

Note: When calculating simple OM emission factor of South China Power Grid in 2004, the electricity imports from Central China Power Grid in 2004 is 10,951,240 MWh, so the total thermal power generation of South China Power Grid in 2004 is 10,951,240+247,366,229 = 258,317,469 MWh.
Data source: China Electric Power Yearbook 2005.

Table 3-9 Calculation of simple OM emission factor of South China Power Grid in 2004

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor（tC/TJ）	OXID（%）	NCV（MJ/t, or MJ/km3）	CO_2emissions（tCO_2e）
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000（quality

										unit）or I=E*F*G*H*44/12/1000（volume unit）
Raw coal	10^4 ton	6017.7	1305	2643.9	1751.28	**11,717.88**	25.8	100	20,908	231,767,573.6
Washed coal	10^4 ton	0.21				**0.21**	25.8	100	26,344	5,233.50
Other washed coal	10^4 ton					**0**	25.8	100	8,363	0.00
Coke	10^4 ton					**0**	29.2	100	28,435	0.00
Coke oven gas	10^8M^3					**0**	12.1	100	16,726	0.00
Other gas	10^8M^3	2.58				**2.58**	12.1	100	5,227	59,831.38
Crude oil	10^4 ton	16.89				**16.89**	20	100	41,816	517,932.98
Gasoline	10^4 ton					**0**	18.9	100	43,070	0.00
Diesel	10^4 ton	48.88			1.83	**50.71**	20.2	100	42,652	1,601,975.28
Fuel oil	10^4 ton	957.71				**957.71**	21.1	100	41,816	30,983,494.25
LPG	10^4 ton					**0**	17.2	100	50,179	0.00
Refinery gas	10^4 ton	2.86				**2.86**	15.7	100	46,055	75,825.26
Natural gas	10^8M^3	0.48				**0.48**	15.3	100	38,931	104,833.40
Other petroleum products	10^4 ton	1.66				**1.66**	20	100	38,369	46707.86
Other coking products	10^4 ton					**0**	29.2	100	28,435	0.00
Other energy	10^4 tce	79.42				**79.42**	0	100	0	0.00
Total		-	-	-	-	-	-	-	-	265,163,407
Total CO_2 emission（tCO_2e）	265,163,407+0.827319*10,951,240=**274,223,576**									
Total thermal power generation	10,951,240+247,366,229=**258,317,469**									

connected to the grid （MWh）	
$EF_{simple,OM,2004}$ （tCO_2e /MWh）	**1.061576**

Note: The electricity imports from Central China Power Grid in 2004 is 10,951,240 MWh, and the simple OM emission factor of Central China Power Grid in 2004 is 0.827319 tCO_2e/MWh, so the total CO_2 emission of South China Power Grid in 2004 is 265,163,407+0.827319*10951240=**274,223,576** tCO_2e.
Data source: China Energy Statistical Yearbook 2005

Table 3-10 Thermal power generation of South China Power Grid in 2005

Province	The fuel fired electricity generation（MWh）	The rate of electricity self-consumption（%）	The fuel fired electricity connected to the grid（MWh）
Guangdong	176,453,000	5.58	166,606,923
Guangxi	25,023,000	7.95	23,033,672
Guizhou	58,430,000	6.94	54,374,958
Yunnan	27,281,000	7.34	25,278,575
The total	--	--	269,294,127

Note: When calculating simple OM emission factor of South China Power Grid in 2005, the electricity imports from Central China Power Grid in 2005 is 96,363,000 MWh, so the total thermal power generation of South China Power Grid in 2005 is 96,363,000+269,294,127=365,657,127MWh.
Data source: China Electric Power Yearbook 2006.

Table 3-11 Calculation of simple OM emission factor of South China Power Grid in 2005

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor（tC/TJ）	OXID（%）	NCV（MJ/t, or MJ/km3）	CO_2emissions（tCO_2e）
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000（quality unit）or I=E*F*G*H*44/12/1000（volume

										unit）
Raw coal	10^4 ton	6,696.47	1,435	3,212.31	1,975.55	**13,319.33**	25.8	100	20,908	263,442,601.9
Washed coal	10^4 ton				0.15	**0.15**	25.8	100	26,344	3,738.21
Other washed coal	10^4 ton			10.39	33.88	**44.27**	25.8	100	8,363	350,237.59
Coke	10^4 ton	4.79			8.05	**12.84**	29.2	100	28,435	390,906.18
Coke oven gas	10^8 M^3				0.79	**0.79**	12.1	100	16,726	58,624.07
Other gas	10^8 M^3	1.87			15.96	**17.83**	12.1	100	5,227	413,485.84
Crude oil	10^4 ton	10.91				**10.91**	20	100	41,816	334,555.88
Gasoline	10^4 ton	0.68				**0.68**	18.9	100	43,070	20,296.31
Diesel	10^4 ton	31.96	2.02		1.81	**35.79**	20.2	100	42,652	1,130,638.84
Fuel oil	10^4 ton	887.21				**887.21**	21.1	100	41,816	28,702,703.26
LPG	10^4 ton					**0**	17.2	100	50,179	0.00
Refinery gas	10^4 ton	4.92				**4.92**	15.7	100	46,055	130,440.66
Natural gas	10^8 M^3	0.93				**0.93**	15.3	100	38,931	203,114.71
Other petroleum products	10^4 ton	1.7				**1.7**	20	100	38,369	47,833.35
Other coking products	10^4 ton					**0**	29.2	100	28,435	0.00
Other energy	10^4 tce	104.66	133.15		59.72	**297.53**	0	100	0	0.00
Total		-	-	-	-	-	-	-	-	295,229,176
Total CO_2 emission（tCO_2e）	295,229,176+0.772171*96,363,000=**369,637,871**									
Total thermal power generation connected to the grid（MWh）	96,363,000+269,294,127=**365,657,127**									
$EF_{simple,OM,2005}$（tCO_2e /MWh）	**1.010887**									

Note: The electricity imports from Central China Power Grid in 2005 is 96,363,000 MWh, and the simple OM emission factor of Central China Power Grid in 2005 is 0.772171tCO_2e/MWh, so the total CO_2 emission of South China Power Grid in 2005 is 295,229,176+0.772171*96,363,000=**369,637,871** tCO_2e.
Data source: China Energy Statistical Yearbook 2006

Table 3-12 the three years average OM emission factor of South China Power Grid

Years	2003	2004	2005	three years average emission factor （tCO2e/MWh）
Total CO_2 emission（tCO_2e）	198,745,146	274,223,576	369,637,871	1.0119
The total fuel fired electricity connected to the grid（MWh）	208,736,900	258,317,469	365,657,127	

Data Source: from the above table 3-6～table 3-11.

Table 3-13 Calculation of the weight of CO_2 emissions from solid fuels, liquid fuels and gas fuels among total emissions in South China Power Grid

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	NCV （kJ/kg, or kJ/m3）	Emission factor (tc/TJ)	OXID	CO_2 emissions (tCO_2e)
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/100
Raw coal	10^4 ton	6,696.47	1,435	3,212.31	1,975.55	13,319.33	20,908	25.8	1	263,442,602
Washed coal	10^4 ton	0	0	0	0.15	0.15	26,344	25.8	1	3,738
Other washed coal	10^4 ton	0	0	10.39	33.88	44.27	8,363	25.8	1	350,238
Coke	10^4 ton	4.79	0	0	8.05	12.84	28,435	29.2	1	390,906
Total of solid fuels										**264,187,484**
Crude oil	10^4 ton	10.91	0	0	0	10.91	41,816	20	1	334,556
Gasoline	10^4 ton	0.68	0	0	0	0.68	43,070	18.9	1	20,296
Diesel	10^4 ton	31.96	2.02	0	1.81	35.79	42,652	20.2	1	1,130,639
Fuel oil	10^4 ton	887.21	0	0	0	887.21	41,816	21.1	1	28,702,703
Other	10^4 ton	1.7	0	0	0	1.7	38,369	20	1	47,833

petroleum products										
Total of liquid fuels										**30,236,028**
Natural gas	10^7 M^3	9.3	0	0	0	9.3	38,931	15.3	1	203,115
Coke oven gas	10^7 M^3	0	0	0	7.9	7.9	16,726	12.1	1	58,624
Other gas	10^7 M^3	18.7	0	0	159.6	178.3	5,227	12.1	1	413,486
LPG	10^4 ton	0	0	0	0	0	50,179	17.2	1	0
Refinery gas	10^4 ton	4.92	0	0	0	4.92	46,055	15.7	1	130,440.66
Total of gas fuels										**805,665**
Total of solid, liquid and gas fuels										**295,229,176**

Data source: China Energy Statistical Yearbook 2006

From the above table, λ_{Coal} =89.49%, λ_{Oil} =10.24% and λ_{Gas} =0.27% are calculated.

Table 3-14 Emission factor of the most efficient commercial thermal power plants

Thermal power	**Variable**	**Efficiency of electricity supply (%)**	**Emission factor of the fuels (tC/TJ)**	**OXID**	**Emission factor (tCO_2e/MWh)**
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas- fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil- fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.91178 tCO_2e/MWh.

Table 3-15 Calculation of BM emission factor of South China Power Grid

	installed capacity in 2003	**installed capacity in 2004**	**installed capacity in 2005**	**Newly added installed capacity between 2003 and 2005**	**Weight in newly added installed capacity**
	A	B	C	D=C-A	
Thermal power（MW）	40,444.1	46,659.7	54,507	14,062.9	74.01%
Hydropower（MW）	25,409.3	27,580.1	30,347.1	4,937.8	25.99%
Nuclear power（MW）	3,780	3,780	3,780	0	0.00%
Wind power（MW）	83.4	83.4	83.4	0	0.00%
Total（MW）	69,716.8	78,103.3	88,717.5	**19,000.7**	**100.00%**
Share in 2005 installed capacity	78.58%	88.04%	100%		

$EF_{BM,y}$=0.91178×74.01%=0.6748 tCO_2e/MWh.

Data source: China Electric Power Yearbook 2004, China Electric Power Yearbook 2005, China Electric Power Yearbook 2006.

Annex 4

MONITORING INFORMATION

No other information.

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