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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Shangri-La Langdu River 3rd Level Hydropower Station
Version: 2.0
Date: 20/11/2007

Revision History of the PDD

Version	Date	Comments
Version 1.0	23 July 2007	Complete version of the PDD, prepared for the host country approval process
Version 2.0	20 November 2007	Revised draft PDD; prepared for validation, incorporating the latest NDRC emission factors information

A.2. Description of the project activity:

The Shangri-La Langdu River 3rd Level Hydropower Station (hereafter referred as "the project" or "the specific project") involves the construction and operation of a low-dam run-of-river diversion type hydropower station on the middle reaches of Langdu River, Shangri-La County, Diqing Zang Autonomous Prefecture, Yunnan Province, China. It is constructed and operated by Shangri-La County Minhe Hydroelectric Development Co., Ltd. The total installed capacity is 18MW, with the average annual utilization hours will be 4,573 hours thus the average annual generation of 82,312.5MWh, the power supplied to the grid is estimated to be 66,537.2MWh. The generated electricity will be transmitted to Pulang Transformer Substation of Diqing Grid, then to the Yunnan Grid, and finally to the Southern Grid.

The specific project activity will transmit renewable hydropower to the Southern Grid, and substitute relevant generation from fossil fuel fired power plant of the Southern Grid, and then reduce Greenhouse Gas emissions amount to 56,114tCO_2e annually.

Contribution to sustainable development:

The project activity contributes significantly to the region's sustainable development in the following ways:

- The objective of the project is to generate electricity from the hydropower station, and thus to regulate the surplus and deficiency of the grid, substitute relevant generation from thermal power plant of the Southern Grid, and then will reduce Greenhouse Gas emissions.

- In recent years, China has witnessed a huge increase in power consumption. The hydropower project will contribute in a sustainable manner to bridging the gap between supply and demand of power on a regional and national level.

- In China, more than 80% of total electricity production is derived from coal based power plants. Being so heavily dependant on coal for its energy requirements, this project carries environmental benefits for the country's air, soil and water sources.

The project will definitely contribute to the province's economic development by improving the local energy generation infra-structure and generating employment during both the construction and the operation of the power plant.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant（Yes/No）
People's Republic of China(host）	Shangri-La County Minhe Hydroelectric Development Co., Ltd. (as the project owner)	No
The Netherlands	Essent Energy Trading BV (as the CERs buyer)	No

More detailed contact information on project participants are given 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):

People's Republic of China

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

Yunnan Province

A.4.1.3. City/Town/Community etc:

Geza Township, Shangri-La County, Diqing Zang Autonomous Prefecture

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

The project is located on the middle reaches of Langdu River, Geza Township, Shangri-La County, Diqing Zang Autonomous Prefecture, in Yunnan Province, China. The dam is in the Langdu River and is 1.5km downstream from Telangyong estuary, and the exact location of the dam is at the longitude of 100°04′23″E and latitude of 28°16′33″N; the power plant is located on the left bank of the middle reaches of Langdu River, and the exact location of the power plant is at the longitude of 100°07′30″E and latitude of 28°16′11″N.

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

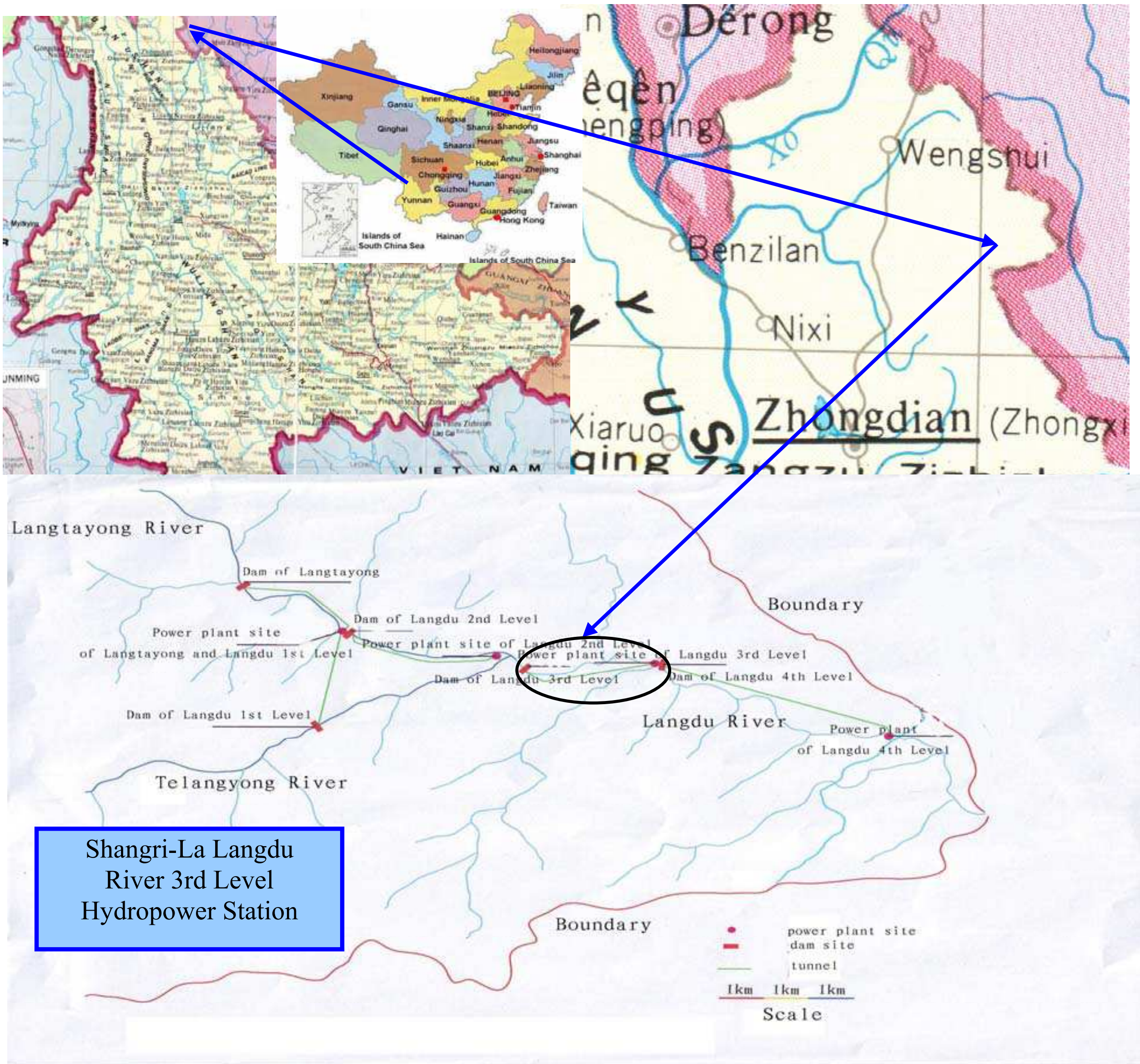


Fig A.1 the Location of Shangri-La Langdu River 3rd Level Hydropower Station

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

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

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

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

The construction mainly consists of a dam, diversion tunnel, pressure forebay, power plant and booster station.

The project is a low-dam run-of-river diversion type hydropower station with 18MW of total installed capacity. It will utilize three units of HLA575C-LJ-112 turbines and three units of SF6000-10/2600 generators matched with the three turbines. The key technical parameters are shown in TableA.1:

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

The Main Technical Data		Value	Source
Turbine	Amount	3	Technical Specifications of Turbine and Generator
	Designation	HLA575C-LJ-112	
	Manufacture	Zhejiang Jinlun Electromechanical Co., Ltd.	
	Rated Water Head	106m	
	Rated Flow Rate	6.9m^3/s	
	Rated Rotational Speed	600r/min	
	Rated Output	6.565MW	
Generator	Amount	3	Technical Specifications of Turbine and Generator
	Designation	SF6000-10/2600	
	Manufacture	Chaozhou Huineng Electrical Co., Ltd.	
	Rated Power	6MW	
	Rated Voltage	6.3kV	
	Power Factor	0.8	
	Rated Current	687.3A	

The power generated from the project will be transmitted to the Pulang Transformer Substation of Diqing Zang Autonomous Prefecture via the Junction Station, then to the Yunnan Grid, finally to the Southern Grid.

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

Training will be given by the following types: First, the employees will study in a hydropower station which has been already operated. Second, the employees will take part in the equipment installation of the hydropower station, and then workshop will be carried out for the convenience of employees to communicate and learn from each other. Third, core content of the station operation will be imparted by teaching intently. Fourth, there are some experienced experts will be invited to teach the employees

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

The project activity utilizes the renewable crediting period (7years×3), and the estimation of the emission reductions during the first crediting period (from Dec. 2008 to Nov. 2015) is presented in Table A.2. Estimated Emission Reductions throughout the first crediting period are 392,798 tonnes of CO_2 e.

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2008(the last 1 month)	4,676
2009	56,114
2010	56,114

2011	56,114
2012	56,114
2013	56,114
2014	56,114
2015(the first 11 months)	51,438
Total estimated reductions (tonnes of CO_2 e)	392,798
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	56,114

Note: Above figures are *ex-ante* expectations of reductions, and should be changed based on *ex-post* monitoring.

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology:

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

Baseline methodology:

Approved consolidated baseline methodology ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 6, dated 19 May 2006.*

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

The methodology draws upon the *"Tool for the demonstration and assessment of additionality" (version 03, approved at EB29).*

Reference website: http://cdm.unfccc.int/EB/029/eb29_repan05.pdf.

Monitoring methodology

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

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

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

This project satisfies all conditions that are applicable to ACM0002:
1. The specific project is a run-of-river hydropower station, and is connected to the Southern Grid.
2. The specific project activity does not involve fuel switching from fossil fuels.
3. The geographic and system boundaries for the Southern Grid can be clearly identified, and the credible information can be obtained.

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

In this specific case, the power generated by the project will be transferred to the Southern Grid. The space boundary of this project consists of the physical and geological boundary of this specific project, and all the other power plants connect to the Southern Grid. The Southern Grid is a large regional grid, which consists of four sub-grids: Guangdong, Guangxi, Yunnan and Guizhou.

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

	Source	Gas	Included?	Justification / Explanation
Baseline	The Southern Grid	CO_2	Yes	As per methodology ACM0002, only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity are accounted.

		CH_4	No	According to methodology ACM0002, only account CO_2 emissions from power generation in fossil fuel fired power that is displaced due to the project activity. This is conservative.
		N_2O	No	According to methodology ACM0002, only account CO_2 emissions from power generation in fossil fuel fired power that is displaced due to the project activity. This is conservative.
Project Activity		CO_2	No	The project consists in grid-connected electricity generation from renewable sources, as per ACM0002 methodology, CO_2 emissions are not to be considered.
		CH_4	No	The project is a run-of-river type hydropower station, and in line with the methodology, CH_4 emissions are not to be considered.
		N_2O	No	The project consists of grid-connected power generation from renewable sources, N_2O emissions are not to be considered.

In line with the methodology, the only greenhouse gas accounted for in the calculation of the emission reductions is CO_2.

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

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

1. The specific hydropower activity, without being registered as a CDM project activity;
2. Thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent annual power is supplied by the Southern Grid.

The scenarios described above are discussed individually considering relevant laws and regulations, as well as investment analysis:

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

The first scenario is in compliance with Chinese relevant laws and regulations. The attractiveness of the project without CDM revenues is measured by conducting the after-tax Project Internal Rate of Return (Project IRR) analysis. According to the section B.5, The after-tax Project IRR of the project is 5.27% without CDM revenue which is lower than the benchmark rate of 10%[1]. Therefore, the project faces obvious finance barriers without CDM revenue. Hence, the first alternative is not feasible, and it is not the baseline scenario.

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

1 The hydropower NO.[1995]186 documents of the Ministry of Water Resources of the People's Republic of China is The Revision of Economic Evaluation Code for Small Hydropower Project(SL16-95). A small hydropower project is: a station with installed capacity is lower than 25MW and the building, revising, expansion, rebuilding of its corresponding Grid. Middle scale stations under 50MW in the country can follow these regulations.

There is a great difference in the utilization hours between a thermal power plant and a hydropower plant with equivalent installed capacity. If we consider the capacity that can be generated by the same annual electricity generation as the alternative scenario for the project, the installed capacity of the thermal plant would be less than 18MW. However, according to Chinese regulations, construction of thermal power plants whose installed capacity is less than 135MW is prohibited in China[2]. Therefore, the second scenario does not comply with Chinese relevant laws and regulations and is not a feasible alternative.

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

There are not enough wind sources, biomass sources, solar sources, tidal sources or geothermal sources to supply the equivalent annual generation. So this scenario is not a feasible alternative.

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

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

Conclusion:

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

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

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

The additionality of the project activity is demonstrated using *the Tool for the Demonstration and Assessment of Additionality (version 3)* as developed by 29th conference of EB as follows:

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

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

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

1. The specific hydropower activity, without being registered as a CDM project activity;
2. Thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent annual power is supplied by the Southern Grid.

As discussed in section B.4 above, the third alternative is not feasible since there are not enough wind sources, biomass sources, solar sources, tidal sources or geothermal sources to supply the equivalent annual generation in local area.

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

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

According to the analysis in B.4, the first and the fourth scenarios are in compliance with Chinese relevant laws and regulations, but the second scenario doesn't comply with Chinese relevant laws and regulations, therefore it isn't a feasible alternative.

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

Step 2 Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The analysis will be analyzed through Option III of the additionality tool, i.e. Benchmark analysis. This method is applicable because:

- Option I: Simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.
- Option II: Investment comparison analysis is not appropriate as, the only realistic alternative to the project not being implemented as a CDM project activity involves the delivery of power by the grid, which is not a project.
- Option III, benchmark analysis is appropriate. It provides the simplest method of analysis which is the least demanding in terms of data availability. This method has also been used in other PDDs of grid connected renewable energy projects in China.

Conclusion: We conclude that only option III is appropriate for the analysis of the additionality of the project activity.

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

Based on the benchmark IRR rate from the Chinese *Economic evaluation code for small hydropower projects*, the IRR of electric power projects in range of 25MW should not be lower than the threshold of 10%.

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

The basic parameters for calculation key financial indexes are provided in TableB.2:

Table B.2 the Basic Financial Parameter of the Project

The basic parameters	Value	Source
Installed capacity	18MW	Feasibility Study Report
Annual grid generation	66,537.2MWh	Feasibility Study Report
Static Total Investment	9,336.45ten thousand Yuan RMB	Feasibility Study Report
Estimated grid price(with VAT)	0.155Yuan/ kWh	No.[2006]8 NDRC's Document of Diqing Zang Autonomous Prefecture
VAT	6%	Feasibility Study Report
Urban Construction and Maintenance Tax	5%	Feasibility Study Report
Education surcharge tax	3%	Feasibility Study Report
Corporate income tax	33%	Feasibility Study Report
Reserves	10%	Feasibility Study Report
Welfare fund	5%	Feasibility Study Report

Operation period	20years	Feasibility Study Report
Annual operation cost	214.16ten thousand Yuan RMB	IRR calculation Table

The After-tax Project IRR of the project is provided in Table B.3

Table B.3 After-tax Project IRR

	After-tax Project IRR of total investment
Without CDM revenue	5.27%
With CDM revenue	10.43%

According to the calculation, the after-tax Project IRR of the project is 5.27% without CDM revenue which is lower than the benchmark rate of 10%. Based on the benchmark revenue rate in financial evaluation of Chinese power system, the Project IRR of small hydropower project total investment should not be lower than the threshold of 10%. So the project faces obvious financial barriers without CDM revenue. But the after-tax IRR will achieve 10.43% with CDM revenue (assumed CERs price is €8.00/tCO_2e), which is higher than 10%. Therefore, the CDM revenue can improve the economical attraction of the project.

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

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

1. Static total investment
2. Annual operation cost
3. Estimated grid price

Variations of ±10% have been considered in the critical assumptions. Table B.4 summarizes the results of the sensitivity analysis, while Figure B.1 provides a graphic depiction.

Table B.4 Impact of Variations in Critical Assumptions on after-tax Project IRR

	-10%	-5%	0%	5%	10%
Estimated Grid Price	4.23%	4.76%	5.27%	5.78%	6.28%
Static Total Investment	6.41%	5.82%	5.27%	4.76%	4.29%
Annual Operation Cost	5.48%	5.38%	5.27%	5.16%	5.06%

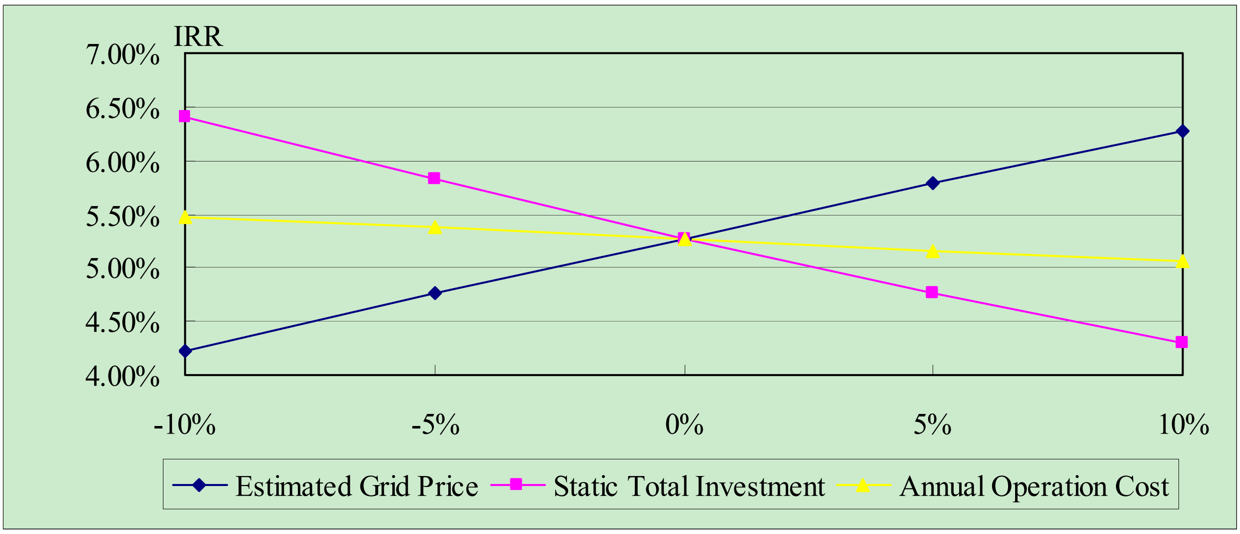


Fig B.1 the after-tax Project IRR Sensitivity Analysis when Static Total Investment, Annual Operation Cost or Grid price changed

Fig.B.1 shows that when the key indexes as annual operation cost, estimated grid price and static total investment has changed within ±10%, the after-tax Project IRR is always lower than 10%, always lacking of commercial attraction.

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

Step 4. Common Practice Analysis

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

For the common practice analysis, we have analyzed all hydropower projects located in Yunnan Province with an installed capacity between 15 and 50MW that have started operations after 2000 or are still under construction. According to the tool for the demonstration and assessment of additionally, projects are considered "similar" in case they are located in the "same county/region", are of "similar scale", and "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc". Projects which started operations in the year 2000 or before are excluded as they were developed under a market environment that is substantially different from the current market environment, which is, for independent power producers at least, considerably less attractive.[3] We have selected projects with an installed capacity between 15MW and 50MW because UNFCCC considers hydropower projects below 15MW as small scale projects, and because the Chinese government considers hydropower stations above 50MW as large scale projects. The selected geographical area, i.e. Yunnan Province, is relatively large. Note that Yunnan Province is considerably larger than several countries, and includes a number of similar projects.

[3] Economist Intelligence Unit (2003), "China Hand", page 37-40.

In our range, a number of hydropower stations exist that have obtained CDM project status or are in the process of applying for CDM project status and are therefore not included in the table.[4] The remaining projects are listed in table B.5.

Table B. 5 Existing hydropower stations similar to the project

Name of hydropower station	Capacity (MW)	Operation year	Location	Project Entity
Jiren River Hydropower Station	30	2000	Diqing Prefecture Shangri-La County	Diqing Power Co., Ltd.
Nanting River Hydropower Station	34	2004	Wenshan Prefecture Maguan County	Wenshan Electric Power Co., Ltd.
Luoshuidong Hydropower Station	20	2004	Wenshan Prefecture Xichou County	Wenshan Electric Power Co., Ltd.

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

Nanting River Hydropower Station, Jiren River Hydropower Station, Luoshuidong Hydropower Station are developed and operated by state owned companies. State owned entities, for several reasons such as financing conditions, face fewer barriers as privately owned project entities and can therefore not be compared to private project activities.

It is clear from the investment analysis that the project, like other similar projects benefiting from or applying for CDM support, does not benefit from the same economic advantages as the projects listed in table B.5. Therefore, the project is additional.

Impact of CDM registration

Registration of the project as a CDM project would result in additional revenues for the project, significantly improving the economic attractiveness of the project. This is the most important contribution of CDM to the project realization, removing the crucial barrier towards its realization. The income through

[4] These "CDM hydropower stations" include: Maguan Daliangzi Hydropower Project, Chaoyang Hydropower Station, Heier 25MW Hydropower project, Nandihe Hydropower Station, Langwai River Hydropower Station, Yingjiang Mangya River 1st Hydropower Station, Yingjiang Songpo Hydropower Station, Yingjiang Binglang River Mengnai Hydropower Station, Shizishan Hydropower Station, Fugong County Guquan River Hydropower Station, Lianghe Hulukou Hydropower Station, Mihu River 3rd Level Hydropower Station, Mengjiahe Kachang Muwen Hydropower Station, Yijiang Hedi Hydropower Station, Yijiang Dahai Hydropower Station, Yijiang Luositan Hydropower Station, Yingjiang Xiangbai River Zhina Hydropower Station, Binglang River Tucang Hydropower station, Longchuan Nanwanhe 2nd Level Hydropower Station, Maguan Huabazi Hydropower Station, Maguan Tongguo Hydropower Station, and the Guangnan Duimen River Hydropower Station, Jinping County Ladeng River Hydropower Station, Fugong Latudi River Hydropower Station, Shangri-La Langdu River 2nd Level Hydropower Station, Shangri-La Langdu River 1st Level Hydropower Station, Shangri-La Langdu River 4th Level Hydropower Station, Shangri-La Langtayong Hydropower Station.

CDM will raise the IRR for the project with from 5.27% to 10.43%, raising the project's IRR above the benchmark of 10% and making the project more attractive.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The electricity generated by the project is connected to the Southern Grid. The Southern Grid includes the Guangdong, Guangxi, Yunnan and Guizhou grids. Therefore, the project selects for the Southern Grid for the calculation of baseline emission factor.

Baseline

According to methodology ACM0002, baseline emissions are equal to the power supplied to the grid multiplied by the baseline emission factor EF_y. The baseline emission factor is equal to the combined margins: the equally weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$).the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$) calculation of the Southern Grid is as follows:

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

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

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

As per the methodology 'Dispatch Data Analysis' (c) should be the first methodological choice. However, the method is not selected for OM emission factor calculation, because dispatch data, especially detailed dispatch data, are not available to the public or to the project participants in China. For the same reason, the simple adjusted OM (b) methodology cannot be used.

According to China Electricity Year Book (2002-2006), from 2001 to 2005, in the composition of gross annual generation power for the Southern Grid, the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation is as following: 36.86% in 2001, 35.99% in 2002, 33.53% in 2003, 29.95% in 2004, 30.42% in 2005 respectively, obviously far lower than 50%. Based on these considerations, the OM has been calculated according to the Simple OM. The "ex-ante vintage" will be employed for OM calculation of the project.

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

Where

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

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

The CO_2 emission coefficient $COEF_i$ is obtained as,

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

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i, National fixed value;
$OXID_i$ is the oxidation factor of the fuel,2006 IPCC Guidelines for default values;
$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i, 2006 IPCC Guidelines for default values.

In addition, there is net imported power to the Southern Grid from the Central China Grid. Since it is not possible to identify the specific power plants exporting electricity from the Central China Grid to the Southern Grid, the average emission factor of the Central China Grid will be taken into account.
The operating margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity. The calculation above is based on the data of DNA China:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls.

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

According to ACM0002, the Build Margin Emission Factor ($EF_{BM,y}$) is calculated as the weighted average emission factor (measured in tCO_2e/MWh) of a sample of m power plants. The calculation equation is as following:

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

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

The methodology provides the following two options for calculation of $EF_{BM,y}$:

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

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

Project participants have chosen Option 1. However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[5] the following deviation in methodology application:
1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

The build margin calculations featured below is derived from the "Bulletin on the baseline emission factor of the Chinese Electricity Grid", which has been renewed by the Chinese DNA (Office of National Coordination Committee on Climate Change) on Aug. 9, 2007.

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:
First, according to the energy statistical data of most recent one year, determine the ratio of CO_2 emissions produced by solid, liquid, and gas fuel consumption for power generation; then multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency. Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

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

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

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

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

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

Where,

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

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i, taking into account the carbon content and the oxidation percentage of the fuel (coal, oil and gas) in year(s) y,

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

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

Where,

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.

A coal-fired power plant with a total installed capacity of 600MW is assumed to be the commercially available best practice technology in terms of efficiency. The estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 343.33gce/kWh, which corresponds to an efficiency of 35.82% for electricity generation.

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

Sub-step 3: Calculate the Building Margin emission factor

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

Where,

CAP_{Total} is the total capacity addition and;

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

As mentioned above, the build margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period. The calculation above is based on the data of DNA China:

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf.

The data resources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
   Source: *China Electric Power Yearbook* (2002-2006)
2. Fuel consumption and the net caloric value of thermal power plants
   Source: *China Energy Statistical Yearbook* (figures are for 2004-2006)
3. Carbon emission factor and carbon oxidation factor of each fuel
   Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 Energy, Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one.

STEP 3 Calculate the Electricity Baseline Emission Factor (EF_y)

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

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

According to the calculation, the **operating margin emission factor (EF_{OM}) of the Southern Grid is 1.0119tCO_2e/MWh** and the **build margin emission factor (EF_{BM}) is 0.6748tCO_2e/MWh**. The default weights for hydroelectric power projects are used as specified in ACM0002 (version 06).

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

Using above mentioned values the Combined Baseline Emission Factor of the Southern Grid corresponds to 0.84335tCO_2e/MWh.

Emission Reduction ER_y

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

$$ER_y = BE_y - PE_y - L_y \qquad \text{(Equation B.10)}$$

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

$$BE_y = (EG_y - EG_{baseline}) \times EF_y \qquad \text{(Equation B.11)}$$

There is no modified or retrofit facilities, so $EG_{baseline}$ =0.

EG_y is the net electricity supplied to the grid in y year, it is calculated by:

$$EG_y = EG_{s,y} - PR_{g,y} \qquad \text{(Equation B.12)}$$

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

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

According to ACM0002, greenhouse gas emissions from the project activity are zero. Hence, $PE_y = 0$.
Based on ACM0002, project participant does not need to consider leakage in applying ACM0002 methodology, i.e. $L_y = 0$.

$$ER_y = BE_y = EG_y \times EF_y = (EG_{s,y} - PR_{g,y}) \times EF_y \qquad \text{(Equation B.13)}$$

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

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Generation of Power Sources *j* in (years) *y* (2001-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2002-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$GEN_{import,y}$
Data unit:	MWh
Description:	The Power Transmitted from the Central China Grid to the Southern Grid in (years) *y* (2003-2005)
Source of data used:	http://www.sp.com.cn/zgdl/dltj/default.htm
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the OM

Data / Parameter:	$EF_{import,y}$
Data unit:	MWh
Description:	Emission factor of the Central China Grid in (years) y (2003-2005)
Source of data used:	China DNA: Bulletin on Baseline Emission Factor of China Region Grid-the calculation of baseline Build Margin emission factor for China Grid
Value applied:	Provided in Annex 3
Justification of the choice of	National Fixed Value

data or description of measurement methods and procedures actually applied :	
Any comment:	To calculate OM

Data / Parameter:	PR_y
Data unit:	%
Description:	The rate of electricity consumption of thermal power plants in year (s) *y* (2003-2005 including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$F_{i,j,y}$
Data unit:	$10^4t/10^8m^3$
Description:	The Fuel *i* Consumption of Power Sources *j* in (years) *y* (2003-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	NCV_i
Data unit:	TJ/ fuel in a mass or volume unit
Description:	The net calorific value of Fuel *i* in a mass or volume unit
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ
Description:	The Emission Factor of Fuel *i* in a mass or volume unit
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and	IPCC Default Value

procedures actually applied :	
Any comment:	To calculate OM and BM

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	The Oxidation Rate of Fuel *i*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

Data / Parameter:	$GENE_{best,coal}$
Data unit:	%
Description:	The optimum commercial, coal-fired power supply efficiency
Source of data used:	*Clean Development Mechanism in China: Bulletin on Baseline Emission Factor of China Region Grid-the calculation of baseline Build Margin emission factor for China Grid*
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate OM

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

Data / Parameter:	$CAP_{y,i}$
Data unit:	MW
Description:	The Install Capacity of Power Sources *j* in (years) *y* (2003-2005, including Guangdong, Guangxi, Yunnan and Guizhou)
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data

Any comment:	To calculate BM

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

According to section B.6.1, the baseline emission factor of the project is 0.84335tCO_2e/MWh in first crediting period. And the net annual power supplied to the grid by the project is 66,537.2MWh.
Therefore, BE_y during the first crediting period is to be calculated as follows:

$$BE_y = EG_y \times EF_y = (EG_{s,y} - PR_{g,y}) \times EF_y = (66{,}603.7-66.5)\times 0.84335 = 56{,}114 tCO_2e$$

Of which, 66,603.7MWh: the electricity supplied to the Grid, is the sum of net electricity supplied to the grid and the electricity use of power plant supplied by the Grid. 66.5MWh: the electricity use of power plant supplied by the Grid, is estimated according to the 1‰ of the net electricity supplied to the grid. The datum of the net electricity supplied to the grid can be found in the project's Feasibility Study Report. More detailed information about the two data is given in B.7.1.

Hence the emission reductions due to the project are equal to the baseline emissions, and annual emission reductions are 56,114tCO_2e during the first crediting period.

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

The total emission reductions of the project are 392,798 tonnes of CO_2 e during 7 years crediting period.

Table B.6 Estimate of Emission Reductions Due to the Project

Year	Estimation of project activity Emissions (tonnes of CO_2 e)	Estimation of baseline Emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
2008(last 1 months)	0	4,676	0	4,676
2009	0	56,114	0	56,114
2010	0	56,114	0	56,114
2011	0	56,114	0	56,114
2012	0	56,114	0	56,114
2013	0	56,114	0	56,114
2014	0	56,114	0	56,114
2015(first 11 months)	0	51,438	0	51,438
Total (tonnes of CO_2 e)	0	392,798	0	392,798

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

B.7.1. Data and parameters monitored:

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

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Power supplied to the grid in *y* year
Source of data to be used:	Measured and verified against sale data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The annual electricity delivered to the grid by the project is 66,603.7MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid will be double checked according to electricity sales receipts.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PR_{g,y}$
Data unit:	MWh
Description:	Power supplied to the specific project from the grid in year *y*
Source of data to be used:	Measured and verified against sale data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The electricity supplied to the project by grid company is 66.5MWh*
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis.
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standard and regulations; Power supplied to the project will be double checked according to purchasing receipts.
Any comment:	Refer to B.7.2. Description of the monitoring plan

B.7.2. Description of the monitoring plan:

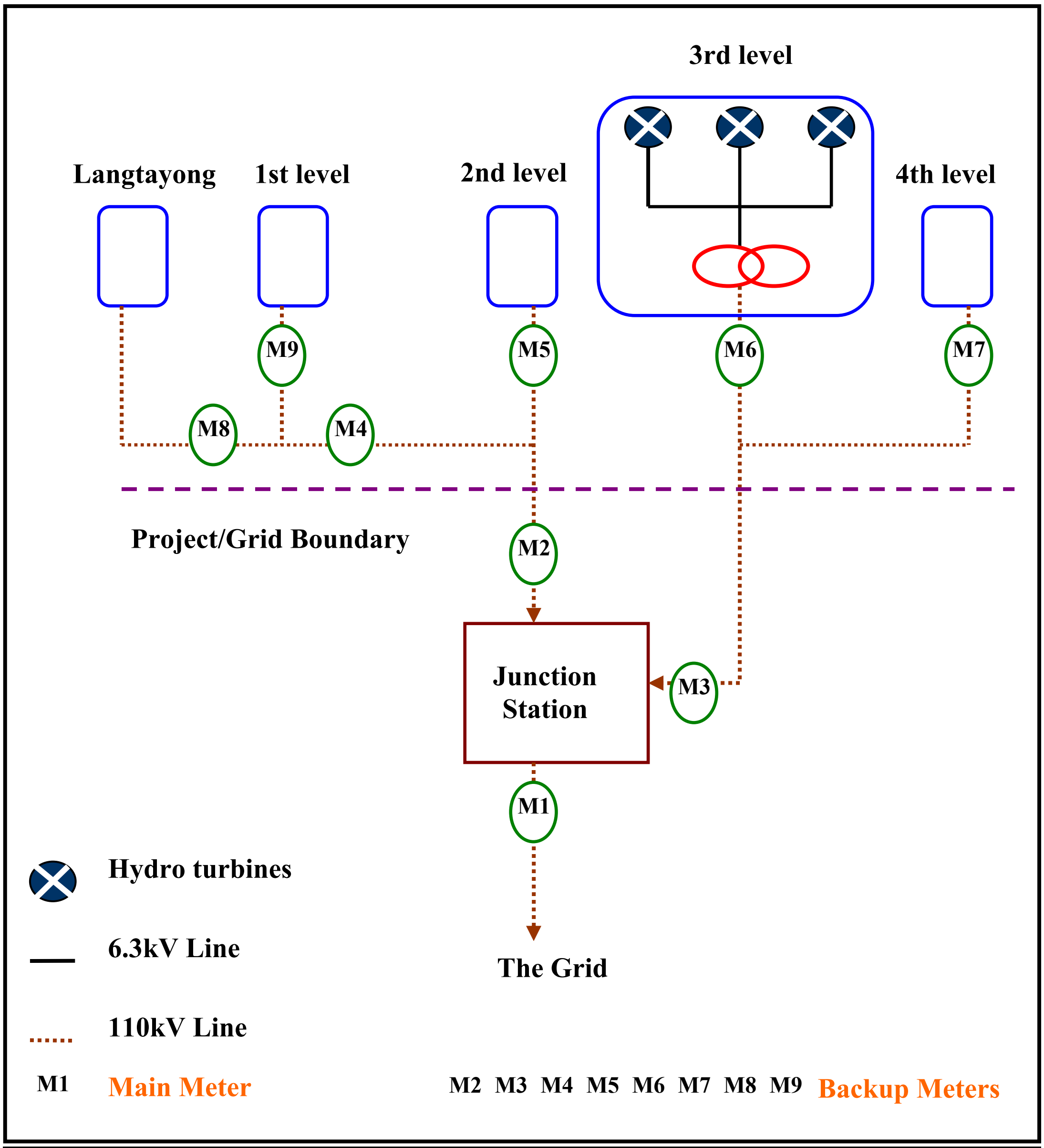
The objective of the monitoring plan is to assure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner is responsible for the implementation of the monitoring plan, and the Grid Company cooperates with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

* Estimated according to the 1‰ of the net electricity supplied to the grid from the specific project, and in the monitoring process, the actual monitoring data will be employed.

The project is connected to the grid through a transformer station which increases the voltage of the generated electricity to 110kV, then will be transferred to the Pulang transformer substation via the Junction Station, at last to the grid company.

The power supplied to the grid is metered by the project entity at the input of the Junction Station (see metering location M3 in figure B.2, then the power will be figured out by using the equation: $EG_{s,y} = EG_{m1,y} \times \frac{EG_{m3,y}}{EG_{m2,y} + EG_{m3,y}} \times \frac{EG_{m6,y}}{EG_{m6,y} + EG_{m7,y}}$, detailed information of m1, m2, m3, m6 and m7 is given in Table B.7). In case of emergencies, the hydropower station could also receive power for auxiliary power consumption from the Pulang transformer substation of the grid. Power supplied by the grid to the project will be deducted from gross supply. Net electricity supply will be used in the calculations (note that for the calculation of the emission reductions).

Fig.B.2. Simplified electrical grid connection diagram



Nine meters (bio-direction) are required, and detailed information is given in Table B.7.

Table B.7 Details of the metering instruments:

Metering Location	Use	Recorded by	Recording
M1 (main meter)	Monitoring the total electricity supplied to the Grid of the five Hydropower Stations	Grid Company	Monthly
M2 (backup meter)	Monitoring the electricity supplied to the Grid of Langtayong, 1st Level & 2nd Level Hydropower Stations	Grid Company &Project Entity	Monthly
M3	Monitoring the electricity supplied to the Grid of	Grid Company	Monthly

(backup meter)	3rd Level & 4th Level Hydropower Stations	&Project Entity	
M4 (backup meter)	Monitoring the electricity supplied to the Grid of Langtayong & 1st Level Hydropower Stations	Project Entity	Monthly
M5 (backup meter)	Monitoring the electricity supplied to the Grid of 2nd Level Hydropower Station	Project Entity	Monthly
M6 (backup meter)	Monitoring the electricity supplied to the Grid of 3rd Level Hydropower Station	Project Entity	Monthly
M7 (backup mater)	Monitoring the electricity supplied to the Grid of 4th Level Hydropower Station	Project Entity	Monthly
M8 (backup meter)	Monitoring the electricity generation of Langtayong Hydropower Station	Project Entity	Monthly
M9 (backup meter)	Monitoring the electricity generation of 1st Level Hydropower Station	Project Entity	Monthly

Note: 1. The five hydropower stations refer the Langtayong, Langdu River 1st Level, Langdu River 2nd Level, Langdu River 3rd Level, Langdu River 4th Level Hydropower Stations.

2. 1st Level, 2nd Level, 3rd Level, 4th Level are for short of Langdu River 1st Level, Langdu River 2nd Level, Langdu River 3rd Level, Langdu River 4th Level respectively.

3. The electricity use of power plant supplied by the grid is monitored by according meters of each hydropower station.

<u>Location of the meters:</u>

M1 is fixed at the output of the Junction Station.
M2 and M3 are fixed at the input to the Junction Station.
M4 is fixed at the high-voltage side of the booster station which is shared by Langtayong hydropower station and Langdu River 1st level hydropower station.
M5, M6 and M7 are fixed at the high-voltage side of the booster station of Langdu River 2nd level hydropower station, Langdu River 3rd level hydropower station and Langdu River 4th level hydropower station respectively.
M8 and M9 are fixed at the input of the booster station of Langtayong and Langdu 1st Level hydropower stations respectively.

Therefore, the net electricity supplied to the grid will be calculated as following equations:

$$EG_{s,y} = EG_{m1,y} \times \frac{EG_{m3,y}}{EG_{m2,y} + EG_{m3,y}} \times \frac{EG_{m6,y}}{EG_{m6,y} + EG_{m7,y}}$$

$$PR_{g,y} = PR_{m1,y} \times \frac{PR_{m3,y}}{PR_{m2,y} + PR_{m3,y}} \times \frac{PR_{m6,y}}{PR_{m6,y} + PR_{m7,y}}$$

$$EG_y = EG_{s,y} - PR_{g,y}$$

Of which,

$EG_{m1,y}$, $EG_{m2,y}$, $EG_{m3,y}$, $EG_{m6,y}$ & $EG_{m7,y}$ are on behalf of the data of M1, M2, M3, M6&M7.

$PR_{m1,y}$, $PR_{m2,y}$, $PR_{m3,y}$, $PR_{m6,y}$ & $PR_{m7,y}$ are on behalf of the data of M1, M2, M3, M6&M7.

Calibrations of all locations are carried out annually by the provincial electric power bureau, and the results will be submitted to the project entity and the grid company. After calibration, the meters will be sealed. The minimal accuracy of all metering instruments will be Accuracy Class 0.5S. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, the instruments will be recalibrated.

All recordings, sales receipts and the results of calibration will be collected by the project entity. The project entity will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

Damages to metering equipment:

In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the proposed project activity according to the following procedure:

1. **In case metering equipment (M1)operated by grid company is damaged only:**
   The metering data of **M2** and **M3** logged by project entity and grid company, evidenced by electronic records will be used as record of net power supplied to the grid for the days for which no record could be recorded.
2. **In case one of the monitoring equipments (M2 or M3) operated by grid company is damaged only:**
   The value of the metering instrument for which no data can be recorded will be calculated by deducting the value of the other correctly working meter from the value of metering instrument **M1**.
3. **In case one of the monitoring equipments (M6 or M7) operated by project entity is damaged only:**
   The value of the metering instrument for which no data can be recorded will be calculated by deducting the value of the other correctly working meter from the value of metering instrument **M3**.

In case all metering equipment operated by project entity and grid company is damaged:
The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating
► the background to the damage to metering equipment
► the assumptions used to estimate net supply to the grid for the days for which no record could be recorded
► the estimation of power supplied to the grid
The statement will be signed by both a representative of the project entity as well as a representative of the grid company.

The project entity will furthermore document all efforts taken to restore normal monitoring procedures.

Emergencies:

In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the following procedure for declaring the emergency period to be over:

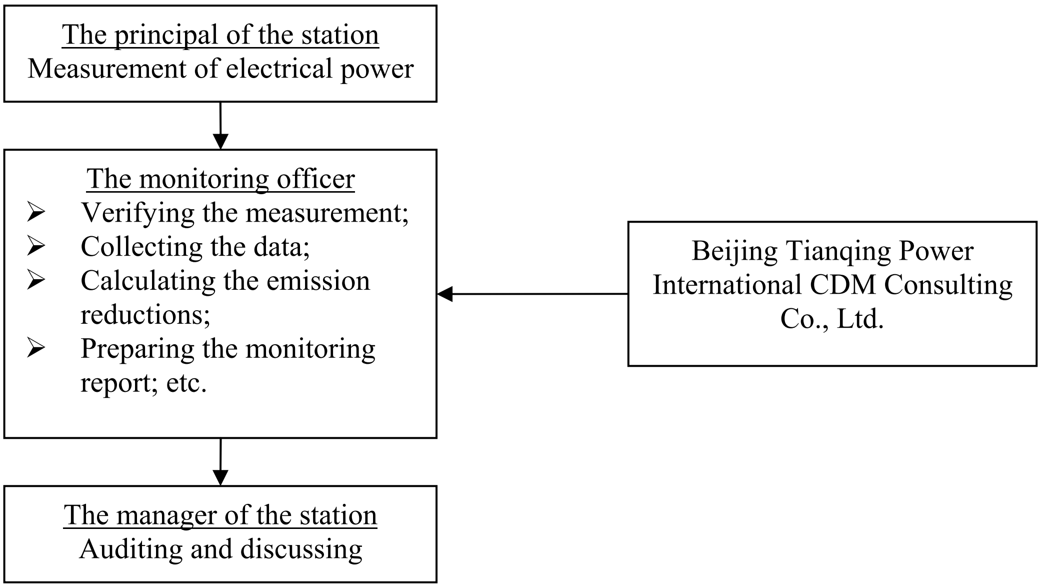
1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.3. The manager of the station will hold the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the principal of the station.

The project entity will appoint a monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, the calculation of the emissions reductions and preparation of the monitoring report. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the hydropower station including operating periods, power delivered to the grid, equipment defects, etc. Finally, the monitoring reports will be reviewed by the manager of the station.

Fig.B.3. Management structure in order to monitor emission reductions



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

Date of completion: 20/11/2007
Name of persons determining the baseline:

Beijing Tianqing Power International CDM Consulting, Co., Ltd.
Tel: +86-10-68298491; 68298496
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Daniel Jiang
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The persons above belong to Beijing Tianqing Power International CDM Consulting, Co., Ltd.

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:

01/12/2006(Start Construction Date)

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

The expected operational lifetime of the project activity is 20 years.

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

C.2.1. Renewable crediting period

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

01/12/2008 (or date of registration, whichever is later)

C.2.1.2.Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1.Starting date:

C.2.2.2.Length:

SECTION D. Environmental impacts

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

According to the relevant environmental law and regulations, an environmental impact assessment had been carried out, and the environmental impact assessment report had been approved by the Environmental Protection Bureau of Diqing Zang Autonomous Prefecture. The main assessment conclusions are provided below:

1、 Impact on the Air environment quality

The main air pollutants are TSP and waste gas coming from construction machine, conveyance during the construction period. The measures such as optimizing construction technology, including optimization of blasting manner, reducing dosage, wet method operation etc., sealing transportation, appropriate humidification, ventilation and fixing dust trap will be carried out to reduce the impact on the air environment quality.

2、 Impact on the water environment

The impacts on the water quality mainly root in production wastewater and domestic sewage. Production wastewater mainly comes from dam excavation, sandstone washing and concrete mixing, placing etc. The sink filtering tank, rectangle setting tank and separation tank will be used to disposed the production wastewater; the domestic sewage will be disposed by septic tank.

3、 Noise impact on the environment

The noise will be generated mainly by construction machinery of concrete mixing and sandstone fabrication, vehicles etc. The noise pollution will be reduced by taking these measures of using low-noise construction machine, maintaining equipment and providing noise-proof appliance to workers.

4、 Impact of solid waste on the environment

The solid waste includes construction wastes and domestic refuses. The construction wastes will be dumped on the excavation waste dumps, earth wall and drainage facility will be set up around the excavation waste dumps. The virescence and revegetation will be made for excavation waste dumps; and domestic refuses will be dumped on excavation waste dumps.

5、 Impact on water and soil loss

The measures of setting reasonable slope and、drainage, adopting slope shield and setting residue wall will be taken to reduce the negative impact of water and soil loss.

6、 Impact of Land Requisition on Land Utilization and Immigration

There is no emigration of the project.
The requisitioned land is 1.1893hectares which the most is forest land and barren. The temporary occupied land is 2.6793hectares which the most is forest land and barren. The project owner will make a series of land requisition compensation measures according to Chinese laws and regulations

7、 Impact on the ecological environment

There are no national protected plants and animals in the project region. During the construction period, heavy fishing, hurting the aquatic life and wild animals will be forbidden. When the construction finishes, 1.03m^3/s will be guaranteed for ecology purpose, and the ecological compensation and revegetation will be taken to protect the integrity and sustainability of construction area's ecological environment.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

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

SECTION E. Stakeholders' comments

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

In order to know the opinions and advices of this project from all stakeholders and provide benefit to the residents of the areas which probably be affected, the project owner had distributed questionnaires for local residents to investigate the suggestion from them on the construction of Shangri-La Langdu River 3rd Level Hydropower Station, including the impact on society, economy and life.

Furthermore, a special stakeholder consultation meeting of the project was organized at meeting room of Shangri-La County Minhe Hydroelectric Development Co., Ltd. from AM 8:30 to 11:00 on Aug. 3, 2007, aiming at investigating opinions of all the potential stakeholders, such as local residents and so on. Project owner published a bulletin for the meeting on the newspaper of *Diqing Daily* on Aug. 1, 2007, and publicized the meeting bulletin via the website of www.tqcdmchina.com on Aug. 1, 2007. In the bulletin, the company noticed that all the potential stakeholders could know the detailed information on the project. In the meeting, the project owner and the consultant invited the participants to express their comments and concerns on the project and CDM. And the representatives asked some following questions focused on CDM and the project, and then they got satisfied answers from experts.

The following is the questions that the questionnaires and the stakeholder consultation meeting referred:

1. Whether the construction of the project is good or not?
2. Is there short of electricity?
3. What are the local residents live on?
4. Which negative impact on local will have caused by the construction? Such as electric using or migrating?
5. Will the project construction bring noise and drinking water pollution? How far is the station site from the nearest local residents?
6. What kinds of resources are used for daily life? What is the main income for local residents? After the construction of the station, is there any increase for the income for local residents? If yes, how to increase the income?
7. Before the project construction, what is the site used for? Whether the local residents have some following questions, such as tilled land reduction and so on? If there are such kinds of questions, have they been resolved? Whether the standard of compensation has been complied with the national policy?
8. Will the project bring any negative impacts on local ecological environment?
9. What're the attitudes of residents and government for the CDM project? Support or oppose?
10. Do they agree with the project construction?

E.2. Summary of the comments received:

Some residents who may be impacted by the project were investigated, 31 investigation questionnaires were distributed, and 31 investigation questionnaires came back.

The profile of the participants is as follows:

- About 45% are female.
- 100% are graduated from senior high school or inferior.
- About 97% are elder than twenty years old.

The investigation results are following:

- 100% of the investigated residents think the lack of electricity exist in local area.
- 100% of the investigated residents think the hydropower station will bring benefit to their lives.
- 100% of the investigated residents think the hydropower station will cause little negative impacts on local residents.
- 100% of the investigated residents think the hydropower station doesn't cause negative impact on environment.
- 100% of the investigated residents agree with the construction of the project.

There were 22 residents and government staff attended the stakeholders meeting. The project owner made a meeting minute.

From the questionnaires and stakeholder consultation meeting, we can find that the local government and residents all agree with the project construction. All stakeholders think that: the construction will not bring negative influence on ecological environment. The project will make best use of local water resource, mitigate the electricity supplying shortage. Meanwhile, the project didn’t involved in emigration and removing, and the project will make local residents use electricity more conveniently, carry out the electricity substitute firewood, and the environment will be protected. At the same time, the construction of the project will bring more employment opportunities that increase the income of local residents and improve the living standard.
In addition, the project owner made no small contribution to the local residents, including construction a road of more than 100kilometers and a Buddhism tower, offering scholarship to students who gain admissions to university.

The impact brought by the project is positive, so all of them support the construction of this project.

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

According to all the comments and advice, action has been taken or will be taken to address the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

	2001	2002	2003	2004	2005
Electricity Generation of Thermal power plant (MWh)	162,910,000	185,168,000	222,780,000	263,574,000	287,187,000
Electricity Generation of Hydro power plant (MWh)	79,971,000	83,093,000	83,271,000	84,072,000	94,919,000
Other Power (MWh)	15,135,000	21,012,000	29,089,000	28,530,000	30,632,000
Total Electricity Generation of the Southern Grid (MWh)	258,016,000	289,273,000	335,140,000	376,277,000	412,738,000
the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation（%）	36.86%	35.99%	33,53%	29.95%	30.42%

Data Source: China Electric Power Yearbook, 2002-2006.

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

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	143,351,000	17,079,000	43,295,000	19,055,000
Rate of Electricity Consumption of the Power Plant (%)	5.50	8.43	7.40	8.01
Power Supplied to the Grid(MWh)	135,466,695	15,639,240	40,091,170	17,528,695
Total Supplied to Grid of the Thermal Power (MWh)		208,725,800		
Net import Power from the Central China Power (MWh)		11,100		
The total Power for the Southern Grid (MWh)		208,736,900		

Data Source: China Electric Power Yearbook 2004, State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04-12_dljh.htm.

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

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

Data Source: China Electric Power Yearbook 2005, State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04-12_dljh.htm.

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

	Guangdong	Guangxi	Guizhou	Yunnan
Thermal Power Generation (MWh)	176,453,000	25,023,000	58,430,000	27,281,000
Rate of Electricity Consumption of the Power Plant (%)	5.58	7.95	7.34	6.94
Power Supplied to the Grid(MWh)	166,606,923	23,033,672	54,141,238	25,387,699
Total Supplied to Grid of the Thermal Power (MWh)		269,169,531		
Net import Power from the Central China Power (MWh)		96,363,000		
The total Power for the Southern Grid (MWh)		365,532,531		

Data Source: China Electric Power Yearbook 2006, State Power Information Network: http://www.sp.com.cn/zgdl/spw/05_12y/05_12_dljh.htm.

Table 5– Calculation of average emission factor for the Central China Grid from 2003 to 2005

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

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

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

Data Source: China Energy Statistical Yearbook 2004.

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

Fuel	Unit	Fuel Consumption in the SCPG (E)	Emission Factor （tC/TJ） (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume)
Raw coal	Ten thousand Tons	8,898.01	25.80	100	20,908	175,993,455.05
Clean coal	Ten thousand Tons	0.05	25.80	100	26,344	1,246.07
Other washed coal	Ten thousand Tons	56.75	25.80	100	8,363	448,971.84
Coke	Ten thousand Tons	0.50	25.80	100	28,435	13,449.76
Coke oven gas	10^8 Cubic meter	0.04	12.10	100	16,726	2,968.31
Other gas	10^8 Cubic meter	14.48	12.10	100	5,227	335,797.81
Crude oil	Ten thousand Tons	6.85	20.00	100	41,816	210,055.71
Gasoline	Ten thousand Tons	0.02	18.90	100	43,070	596.95
Diesel oil	Ten thousand Tons	32.66	20.20	100	42,652	1,031,759.27
Fuel oil	Ten thousand Tons	627.52	21.10	100	41,816	20,301,304.48
LPG	10^8Cubic meter	0.00	17.20	100	50,179	0.00
Refinery gas	10^8Cubic meter	2.85	18.20	100	46,055	87,592.00
Natural gas	10^8Cubic meter	0.00	15.30	100	38,931	0.00
Other petroleum products	Ten thousand Tons	11.35	20.00	100	38,369	319,357.98
Other coking products	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Other E (standard coal)	Ten thousand Tce	115.56	0.00	100	0	0.00
CO_2 emission of power import from CCPG		0.7974423×11,100= 8,851.61tCO_2e				
Total emission (Q)		198,755,406.84tCO_2e				
Supply to SCPG (P)		208,736,900MWh				
OM Emission Factor (=Q/P)		0.952181tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2004；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p. 1.21-1.24.

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

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

Data Source: China Energy Statistical Yearbook 2005.

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

Fuel	Unit	Fuel Consumption in the SCPG (E)	Emission Factor （tC/TJ） (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume)
Raw coal	Ten thousand Tons	11,717.88	25.80	100	20,908	231767573.55
Clean coal	Ten thousand Tons	0.21	25.80	100	26,344	5233.50
Other washed coal	Ten thousand Tons	0.00	25.80	100	8,363	0.00
Coke	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Coke oven gas	10^8 Cubic meter	0.00	12.10	100	16,726	0.00
Other gas	10^8 Cubic meter	2.58	12.10	100	5,227	59831.38
Crude oil	Ten thousand Tons	16.89	20.00	100	41,816	517932.98
Gasoline	Ten thousand Tons	0.00	18.90	100	43,070	0.00
Diesel oil	Ten thousand Tons	50.71	20.20	100	42,652	1601975.28
Fuel oil	Ten thousand Tons	957.71	21.10	100	41,816	30983494.25
LPG	10^8Cubic meter	0.00	17.20	100	50,179	0.00
Refinery gas	10^8Cubic meter	2.86	18.20	100	46,055	87899.34
Natural gas	10^8Cubic meter	0.48	15.30	100	38,931	104833.40
Other petroleum products	Ten thousand Tons	1.66	20.00	100	38,369	46707.86
Other coking products	Ten thousand Tons	0.00	25.80	100	28,435	0.00
Other E (standard coal)	Ten thousand Tce	79.42	0.00	100	0	0.00
CO_2 emission of power import from CCPG		0.8264484×10,951,240=9,050,630.40tCO_2e				
Total emission (Q)		274,226,116.64tCO_2e				
Supply to SCPG (P)		258,317,469MWh				
OM Emission Factor (=Q/P)		1.061586tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2005；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p. 1.21-1.24.

Table 10–2005 data for primary fuel input for thermal power supply to the Southern Grid

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

Data Source: China Energy Statistical Yearbook 2006.

Table 11- Calculation of the OM Emission Factor for the Southern Grid in 2005

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

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

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

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

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

Fuel		Unit	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal	Average NCV (MJ/t,km^3)	Emission Factor （tC/TJ）	Oxidation Rate (%)	CO_2 Emission (tCO_2e)	Ratio
Coal	Raw coal	10^4tons	6,696.47	1,435.00	3,312.31	1,975.55	13,319.33	20,908.00	25.80	100	263,442,602	-
	Clean coal	10^4tons	0.00	0.00	0.00	0.15	0.15	26,344.00	25.80	100	3,738	-
	Other washed	10^4tons	0.00	0.00	10.39	33.88	44.27	8,363.00	25.80	100	350,238	-
	Coke	10^4tons	4.79	0.00	0.00	8.05	12.84	28,435.00	25.80	100	345,390	-
	Total	-	-	-	-	-	-	-	-	-	**264,141,967**	89.48%
Oil	Crude oil	10^4tons	10.91	0.00	0.00	0.00	10.91	41,816.00	20.00	100	334,556	-
	Gasoline	10^4tons	0.68	0.00	0.00	0.00	0.68	43,070.00	18.90	100	20,296	-
	Diesel oil	10^4tons	0.00	0.00	0.00	0.00	0.00	43,070.00	19.60	100	0.00	-
	Fuel oil	10^4tons	31.96	2.02	0.00	1.81	35.79	42,652.00	20.20	100	1,130,639	-
	LPG	10^4tons	887.21	0.00	0.00	0.00	887.21	41,816.00	21.10	100	28,702,703	-
	Other petroleum	10^4tons	1.70	0.00	0.00	0.00	1.70	38,369.00	20.00	100	47,833	-
	Total	-	-	-	-	-	-	-	-	-	**30,236,028**	10.24%
Gas	Natural gas	10^7m^3	9.30	0.00	0.00	0.00	9.30	38,931.00	15.30	100	203,115	-
	Coke oven gas	10^7m^3	0.00	0.00	0.00	7.90	7.90	16,726.00	12.10	100	58,624	-
	Other gas	10^7m^3	18.70	0.00	0.00	159.60	178.30	5,227.00	12.10	100	413,486	-
	LPG	10^4tons	0.00	0.00	0.00	0.00	0.00	50,179.00	17.20	100	0.00	-
	Refinery gas	10^4tons	4.92	0.00	0.00	0.00	4.92	46,055.00	18.20	100	151,211	-
	Total	-	-	-	-	-	-	-	-	-	**826,436**	0.28%
Total		-	-	-	-	-	-	-	-	-	**295,204,431**	100%

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

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

The emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9117 \text{ tCO}_2\text{e/MWh.}$$

Table15–The Installed Capacity of the Southern Grid 2003

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Tianshengqiao	Subtotal
Thermal power(MW)	27,231.40	3,190.10	3,556.80	6,465.80	0.00	40,444.10
Hydro power(MW)	8,107.20	4,525.20	6,543.20	3,713.70	2,520.00	25,409.30
Nuclear power(MW)	3,780.00	0.00	0.00	0.00	0.00	3,780.00
Wind power and other(MW)	83.40	0.00	0.00	0.00	0.00	83.40
Total (MW)	39,202.00	7,715.30	10,100.00	10,179.50	2,520.00	69,716.80

Data Source: China Energy Statistical Yearbook 2004.

Table16–The Installed Capacity of the Southern Grid 2004

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Subtotal
Thermal power(MW)	30,172.90	4,378.10	4,306.90	7,801.80	46,659.70
Hydro power(MW)	8,584.60	5,040.40	7,058.60	6,896.50	27,580.10
Nuclear power(MW)	3,780.00	0.00	0.00	0.00	3,780.00
Wind power and other(MW)	83.40	0.00	0.00	0.00	83.40
Total (MW)	42,620.90	9,418.50	11,365.50	14,698.30	78,103.30

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

Table17–The Installed Capacity of the Southern Grid 2005

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

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

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

	2003	2004	2005	New addition 2003-2005	The Ratio in new addition
Thermal power(MW)	40,444.10	46,659.70	54,507.00	14,062.9	74.01%
Hydro power(MW)	25,409.30	27,580.10	30,347.10	4,937.8	25.99%
Nuclear power(MW)	3,780.00	3,780.00	3,780.00	0.00	0.00%
Wind power (MW)	83.40	83.40	83.40	0.00	0.00%
Total(MW)	69,716.80	78,103.30	88,717.50	19,000.70	100.00%
Ratio of installed capacity in 2005	78.58%	88.04%	100.00%	-	-

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

The OM is calculated as 1.0119tCO_2e/MWh, the BM is calculated as 0.6748tCO_2e/MWh. And the baseline emission factor equal to the combined margin with equally weighted average of the operating margin emission factor and the build margin emission factor.

According to ACM0002 (version 6), the default weight of hydropower is:

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

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

Annex 4

MONITORING INFORMATION

In this monitoring plan, we monitor power supplied to the grid and the electricity use of power plant supplied by the grid, provided the relative information in section B.7.2.