CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title: "Yunnan Province, Tengchong County, XiShanHe Hydropower Station Project"
Version: 03
Date: 31 January 2009

A.2. Description of the small-scale project activity:

The Tengchong project (hereafter referred to as "the proposed project" or "the project") is a small run-of-river hydropower station located on the downstream of XiShanHe river, which is in the Hehua Xiang of TengChong County of BaoShan city in Yunnan province and about 31 km to Tengchong County center. The project's power density is 980.822 W/m^2 according to the FSR[1].The main construction of the plant includes dam, water diversion canal, fore-bay, pressured pipe and workshop. The total installed capacity will be 6.7 MW, provided by two turbines of 3.35 MW. The project is expected to supply to the grid an annual average electricity of 33,202 MWh and is taking into account 6,220 h working hours per year. Tengchong County Qinghe Hydropower Development Co. Ltd is responsible for the development of this project.

The electricity generated by the project will displaced part of the electricity generated by the China Southern Power Grid (hereafter referred to as "CSPG") which is mainly dominated by thermal power plants, and thus it will achieve a GHG emission reduction of 196,007 tCO2e in the first 7 years of crediting period. The annual average estimated reduction is 28,001 tCO_{2e}.

The participants of the project recognize that the project helps China fulfil its goals of promoting sustainable development. The project will contribute to the China's developmental challenges as follows:

- It will contribute to the achievement of an energy structure adjustment and to the better use of natural local resources;
- It will improve local life quality and generate local area employment opportunities. The new plant will require a whole team of around 25 persons, for construction, operation, management and maintenance;
- It will reduce the emissions of greenhouse gases due to the decrease of fossil fuel combustion.

[1] Feasibility Study Report of Yunnan province, Tengchong County, XiShanHe Hydropower Station Project, page 1

A.3. Project participants:

Tab. A. 1: Project Participants

Name of Party Involved (host)	Private and/or public entity(ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
China (host)	Tengchong County Qinghe Hydropower Development Co., Ltd. (private company) (project owner)	No
Switzerland	International Clean Fund LLC, Lewes, Mendrisio Branch (private company) (buyer of CERs)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale 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:

TengChong County.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located in the west of Hehua Xiang of TengChong County. The hydro-power plant is located on the Xishanhe river between BangLao Village and XiangYan bridge.

XiShanHe Small Hydropower Station is located in the following geographical coordinates: 24°55’ - 25°12’ N and 98°12' - 98°28' E.

Fig. A. 1: Dislocation of Yunnan Province in China

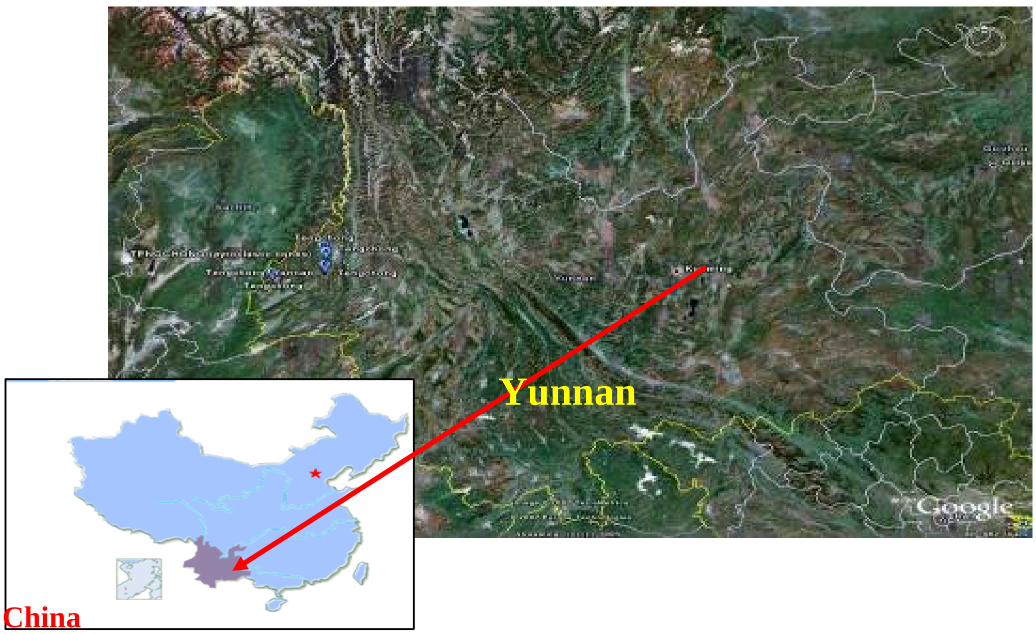


Fig. A. 2: Dislocation of the project

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project is a small run-of-river hydro power station with a total installed capacity of 6.7 MW which will supply to the grid with average annual electricity of 33,202 MWh.

The distance between XiShanHe Hydropower station and LangYan transformer substation is less than 500 m and the electricity will be transmitted through a 35 kV transmission line to the CSPG.

Tab. A. 2: Main technical parameters

Parameter	Value
Water turbine	
Type	HLA671-WJ-95
Number of units	2 sets
Rated flow rate (m^3/s)	5.8
Rated output (kW)	3,489.6
Generator	
Type	SF3350-10/1730
Number of units	2 sets
Rated voltage (kV)	6.3
Power factor	$\cos\varphi$ =0.8 (lagged)
Rated output (kW)	3350

There will be no international technology transfer involved on this project, since China possesses the technological capacity to manufacture the necessary components for a small hydroelectric plant. And the technology would result in a significantly better performance than any commonly used technologies in host country[2].

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The project activity uses the renewable crediting period (7×3 years) the estimation of the emission reductions during the first crediting period is presented in the table below.

Tab. A. 3: Total emission reductions for the first crediting period

Year	Annual Estimation of emission reductions in tonnes CO_{2e}
2010[3]	28,001
2011	28,001
2012	28,001
2013	28,001
2014	28,001
2015	28,001
2016	28,001
Total estimated reductions: (tonnes of CO_{2e})	**196,007**
Total number of crediting years:	7

[2] See the Feasibility Study Report, the page 24.

[3] Using 12-month periods from the start of the crediting period, not calendar years

Annual average over the crediting period of estimated reductions: (tonnes of CO_{2e})	28,001

A.4.4. Public funding of the small-scale project activity:

No public funding was received for this Project Activity

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Based on the information provided in Appendix C of the simplified modalities and procedures for small scale CDM activities, since there is no registered small-scale CDM project activity with the same project participants; and they did not registered the same project category within 1 km of the project boundary in 2 years, the project is not a debundled component of a larger project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The methodology applied for this project is the approved small scale CDM baseline and monitoring methodology：

AMS-I.D "Grid connected renewable electricity generation" (version 13),"Grid connected renewable electricity generation".

Tool for the demonstration and assessment of additionality - Version 05.2

Tool to calculate the emission factor for an electricity system -Version 01.1

Please for detailed information; refer to UNFCCC CDM Executive Board website in the following link: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2 Justification of the choice of the project category:

The project activity involves the construction of a new renewable hydro plant in order to generate power and export it to the CSPG. Since, the capacity of the CDM project is 6.7 MW which is less than the qualifying capacity of 15 MW, the project activity is considered as small-scale CDM project activity and falls under the category I.D - "Grid connected renewable electricity generation"

B.3. Description of the project boundary:

According to methodology AMS-I.D, 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. Therefore it includes the dam, water diversion canal, fore-bay, pressured pipe, workshop, water turbine, generator and voltage transformation equipment; the China Southern Power Grid and all the plants connected to it. The CSPG includes the following provincial grids: Guangdong, Guangxi, Guizhou and Yunnan according to the latest guideline[4] issued by Chinese DNA on August 9 of 2007.

[4] Notification on 2008 Baseline Emission Factor for Regional Power Grids in China, issued by China on July 18,2008(http://cdm.ccchina.gov.cn/web/SearchNews.asp)

B.4. Description of baseline and its development:

For the analysis of the scenario options relevant laws and regulations were considered, as well as investment analysis. The baseline possible scenarios are described as follows:

Scenario 1. The specific hydropower activity, without being registered as a CDM project activity;

Scenario 2. A thermal power plant with equivalent annual power generation;
Scenario 3. Other renewable energy power plant with equivalent annual power generation;
Scenario 4. The equivalent annual electricity is supplied by the China Southern Power Grid;

Scenario 1 complies with all mandatory applicable legislation and regulations; however it is not feasible economically. Section B.5 shows that without CERs sales revenues the IRR of the total investment of the project is lower than the benchmark. The project faces significant economic and financial barriers without CDM revenue, so the first scenario is not feasible.

Scenario 2 consists of the building of thermal power plant with the same annual electricity generation as the project activity. However, according to Chinese regulations, coal fired power plants of less than 135MW[5] are prohibited for construction in the areas covered by the large grids such as provincial grids. Moreover, the construction of thermal units under 100MW is strictly limited[6]. It can be concluded that the second scenario is not a feasible scenario.

Scenario 3 is not feasible since the region where the project proposed is located lacks of unfavorable environmental conditions to develop a wind power project. The effective wind power density is less than 50 W/m^2. The annual hours with wind speed more than 3 m/s is under 2,000 hours and the annual hours with wind speed more than 6 m/s is under 150 hours[7], Furthermore, solar power, wave power and biomass energy has not been widely used in China[8]. Hence, scenario 3 is not a feasible baseline scenario.

Scenario 4 is in compliance with relevant Chinese laws and regulations and does not meet much difficulty to overcome the economic barriers.

From above analysis it can be concluded that the fourth scenario is the only feasible baseline scenario.

---

[5] Notice of the General Office of the State Council concerning the Strict Prohibition of the Construction of Thermal Power Units with a Capacity of 135MW or below, issues by the General Office of the State Council, Guo Ban Fa Ming Dian [2002] Document No.6.

[6] Prescribe on construction and supervise of the small scale thermal power generation units, August 1997. Chinese new energy website http://www.newenergy.org.cn/html/2006-2/2006217_7650.html.

[7] Chinese new energy website http://www.newenergy.org.cn/html/0039/2003991.html
8 http://www.ocn.com.cn/free/200802/nengyuandianli041.htm

http://www.agri.ac.cn/DecRef/AgriCyc/200705/14220.html

http://www.newenergy.org.cn/html/0065/2006511_10000.html

http://www.china5e.com/www/dev/news/viewinfo-newpower-200805050020.html

http://www.gov.cn/zwgk/2007-12/26/content-844159.htm

AMS-I.D (Version 13): The baseline methodology is “the net electricity supplied to the Grid from the project multiplied by an emission coefficient (measured in tCO_{2e}/MWh) calculated in a transparent and conservative manner. And the emission factor of grid in the baseline scenario will be calculated as per the procedures in the “Tool to calculate the emission factor for an electricity system” the details of which be provided in B.6.1.

The baseline scenario boundary of the project is the China Southern Power Grid, so the project boundary for calculation EF_{OM} and EF_{BM} will be limited to the China Southern Power Grid.
The full process of the calculation of the Emission Factors mentioned before and all underlying data are presented in Annex 3.

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 small-scale CDM project activity:

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. The income through CDM will raise the IRR for the project to 13.68% which is above the 10% benchmark.

Below implementation key events of the project are summarized. The project owner has realized the poor financial indicators of the project when FSR was finalized in Jun.2006. As described in the FSR, the IRR of total investment of the project is only 8.57% without CERs revenues. Therefore, the project faced high investment risk. Through serious consideration and discussion, the project owner held the board meeting[9] in Jan.2007 and decided to apply for the project as CDM project due to the high investment risk and the low IRR. Since then, the project owner began to seek the CER buyer for the project. Only after considering the CDM revenue seriously, the project owner signed Hydro Turbine Affiliated Equipments purchase contract in January, 2007 and then got the Construction Permission in February, 2007. Afterwards, CDM consultancy contract was signed in February, 2007. Then ERPA was signed in March, 2007 and Construction Contract was signed in October, 2007. Soon Loa of China DNA was acquired in January, 2008. One month later, DOE performed interviews in January, 2008. Key events of the CDM consideration process of the project is summarized in the table below.

Tab. B. 1 **:** Key events of the project

Date	**Key Events**
14/11/2006	EIA approved
5/1/2007	Feasibility Study Report(FSR) approved
5/1/2007	The Board Resolution of CDM implement has been made and signed by all the board members.
14/1/2007	Hydro Turbine Affiliated Equipments purchase contract signed
1/2/2007	Construction permission approved
16/2/2007	CDM consultancy contract signed
8/3/2007	Signing of Emission Reduction Purchase Agreement
1/10/2007	Signing Construction Contract
1/2008	Loa of China DNA approved
1/2008	DOE Validation

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

[9] See the document “Decisions on CDM project by TengChong County QingHe Hydropower Development Co,.Ltd Board of Directors”

According to Attachment A to Appendix B of the *"Simplified modalities and procedures for CDM small scale project activities"* project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers: (a) investment barrier, (b) technological barrier, (c) prevailing practice and (d) other barriers (such as financial resources).

The barrier selected in order to demonstrate the necessity of CDM benefits to develop the project is the investment barrier.

Investment barrier

With reference to *Economic Evaluation Code for Small Hydropower Station Projects (SL16-95)*[10], the benchmark internal rate of return (after tax) for Chinese small hydropower projects(less or equal than 25 MW) is 10%; Therefore, when IRR is above 10%, the proposed project is believed to be a financial attractive project. Hence, the IRR 10% is set as benchmark return rate.

The Tables below show the financial analysis for the project activity. As shown, the project IRR (without carbon finance) is lower than benchmark return rate. Therefore the project is not an economically attractive course of action without CERs revenue.

For IRR calculation the input number are the revenue, variable costs, depreciation, income tax and investment. The cash flow result is provided in the following tables:

Tab. B. 2: Main financial data

Main Financial data		
Annual electricity output (MWh)	33,202	FSR
Expected electricity sale excluding VAT (RMB/kWh)	0.1444	FSR
Installed capacity (MW)	6.7	FSR
Total investment (10 thousand RMB)	3,425.04	FSR
Life time of this project (years)	31	FSR
Urba construction tax /value-added tax (%)	1	FSR
Education tax / value-added tax (%)	3	FSR
VAT (%)	17	FSR
Income tax rate(%)	33	FSR
Depreciation rate (%)	3.3	FSR
Annual operation cost (10 thousand RMB)	101.43	FSR

[10] Pls refer to: http:www.cws.net.cn/guifan/bz/SL16-95/

Tab. B. 3: Financial analysis result

Financial analysis result	Revenue without CER	Revenue with CER
CER Price (USD/ton)	$ 0	$ 10
Total investment IRR	8.57%	13.68 %

In consideration of uncertainty of some data in financial analysis, sensitivity analysis is conducted on four main elements, namely total investment, tariff, annual electricity output and annual O& M cost. The IRR of the proposed project (without revenue from CER) varies to different extent in the following table. Furthermore, the respective change ranges of the four factors at which the IRR will be equal to 10% were calculated as follows:

Tab. B. 4: Sensitivity analysis

Range / Parameters	-51.5%	-11.9%	-10%	-5%	0%	5%	10%	+10.95%
Floating total investment		**10%**	9.75%	9.13%	8.57%	8.06%	7.59%	
Tariff			7.24%	7.91%	8.57%	9.23%	9.88%	**10%**
Annual electricity output			7.24%	7.91%	8.57%	9.23%	9.88%	**10%**
Annual O& M cost	**10%**		8.85%	8.71%	8.57%	8.43%	8.29%	

As for total investment, when it decreases by 11.9%, the IRR can reach the benchmark of 10%. The FSR of the proposed project was conducted in 2006 and the investment estimation was based on the price standard at that time. However, as the price standards have been increasing in past two years, it is very unlikely the price in China will go down according to the official statistics (price authority of NDRC), the material cost for production was on increasing from 1998 to 2007[11]. Therefore, there will be no possibility for large decrease by 11.9%.

As for tariff, when the tariff increases by 10.95%, the IRR can reach the benchmark of 10%. But due to the instability and uncertainty of hydropower, the Grid Company is reluctant to purchase electricity from hydropower generation. Moreover, the Station is connected the Baoshan Grid which leads to the on-grid tariff relatively lower than other stations connected the Southern Grid[12] and on-grid tariff in Baoshan City hasn't been adjusted for over ten years[13], And the actual tariff in future may be lower than it due to the increasing competition from large power grid companies[14]. For example, the on-grid tariff(excluding

[11] National Bureau of Statistics of China, Ex-Factory Price Indices of Industrial Products in 2007 http://www.stats.gov.cn/tjsj/ndsj/2007/html/I0913C.HTM & http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm

[12]Baoshan People's government issued "on the in the 11th five-year plan's power industry development views. Augest-2008 / http://xxgk.yn.gov.cn/BS_Model/newsview.aspx?id=137068

[13]China Waterpower & Electrification. Superficial Discussion on the Existing Problems and Solutions on Hydropower Development of Baoshan City. April-2007

[14] http://lw.china-b.com/gxlx/20090509/1799128_1.html

VAT) is 0.146 RMB/kWh for the Yunan Weixi Gedeng Hydropower Project in Yunan Province(ref.1775). The expected on-grid tariff is 0.1382 RMB/kWh(without VAT) for Expansion Project of Sanjiangkou Hydro-electric Power Station in the reach of Supa River, Yunan province, China (ref.2075). So small-scale hydropower projects have obviously in inferior position in competition with large-scale ones. These facts further prove that the increase of more than 10% unlikely occurs on the project. Therefore, it is unlikely that tariff will be increased and as a result, it is not possible to improve the economic revenue through an increase in tariff.

As for annual electricity output, the electricity must be increased by 10.95%, the IRR can reach the benchmark of 10%. However, the annual electricity was calculated by a qualified third unit and based on long series of hydrology data, the hydrological condition and hydrological analysis from the year 1953 to 2005[15]. As if the electricity of the project increases more than 10%, then it means that the site has experienced a great climate change, which shall bring a great threat to the project site, or damage. So it is impossible for the electricity to increase by 10.95%.

As for annual O& M cost, it can be seen from table B.3 that the impact of the annual O& M cost is relatively slight, and even when the annual O& M cost decrease by 51.5% the IRR of the project can reach 10%. However, according to the statistics of China Renewable Energy Ration Station, the management and labor costs of hydropower stations rose by 8% in 2008 compared to 2007[16]. So the annual O& M cost decreased by 51.5% is unrealistic. Therefore, the project is always lack of financial attractiveness within the reasonable range of annual O& M cost.

From above analysis, the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Calculation of the emission factor of China Southern Power Grid

The GHG emission calculation of the proposed project was based on the instruction of AMS .I.D . All the data employed in the calculation is based on the available data from CSPG. The baseline emission factor (EF_y) is calculated as a combined margin, consisting of the combination of operating margin (OM) and build margin (BM) factors, according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”.

The EF_y is calculated through the following steps:

Step 1. Identify the relevant electric power system

P. R. China is divided into regional electricity systems which are defined by the DNA of P, R. China[17]. The project is located in Yunnan Province which belongs to the China Southern Power Grid (CSPG). Therefore, the relevant electric power system is identified as the CSPG.

---

[15] Feasibility Study Report of Yunnan province, Tengchong County, XiShanHe Hydropower Station Project, page 16

[16] http://www.hydrocost.org.cn/price/priceIndex.jsp

[17] See http://cdm.cchina.gov.cn/Website/CDM/UpFile1364.pdf

Step 2. Select an operating margin (OM) method

The "Tool to calculation the emission factor for an electricity system" offers four methods to calculate the OM emission factor ($EF_{grid, OM,y}$) :

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

If dispatch data of the grid is available (dispatch sequence of grid system, hourly electricity volume dispatched among all power plants), dispatch data analysis should be the first methodological choice. When dispatch data analysis is not applicable, (a) simple OM, or (b) simple adjusted OM, or (d) average OM may be used taking into account the previsions outlined hereafter:

The Simple OM method (a) can only be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production.

Simple Adjusted OM (b) is a variation on Simple OM method, where the power sources (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*j*). The Load Duration Curve is required for applying this method.
The average emission rate method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply option (b) is not available, and where detailed data to apply option (c) above is unavailable.

Of these procedures, method (a) is applied. This is because low-cost / must run resources constitute less than 50% of total grid generation in average of the five most recent years：30.938% in 2005, 29.912% in 2004, 41.752% in 2003, 32.983% in 2002 and 33.705% in 2001.[18].

According to the methodological tool, following data vintages was selected:

Ex ante option: A 3-year generation weighted average, based on the most recent statistics available at the time of submission of the CDM-PDD for validation, without requirement to monitor and recalculate emission factor during the crediting period.

Step 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Option A: Based on data of fuel consumption and net electricity generation of each power plant/unit, or

[18] China Electric Power Yearbooks 2002-2006

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

In China, due to plant level data unavailability for options A and B, option C is the one used in this project. Therefore, the simple OM emission factor($EF_{OM,simple,y}$) is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_{grid,y}} \quad (1)$$

Where:

$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
NCV_i	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO_2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
$EG_{grid,y}$	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year *y*;
j	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option).

Annex 3 presents the detailed datasheets and calculations.

STEP 4. Identify the cohort of power plants to be include in the build margin

The sample group of power units *m* used to calculate the build margin emission factor consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently (if 20% falls on part capacity of a unit, that unit is fully included in the calculation).

The set of power units that comprises the larger annual generation should be used.

In terms of vintage of data, one of the following two options can be chosen:

- Option 1: For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build

margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

This PDD chooses option 1.

Taking in account that the information on:

a) The five power units that have been built most recently, and

b) The set of power capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently

is considered confidential and thus not publicly available, this PDD adopts the following deviation which has been accepted by the EB[19]:

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

It is also suggested by the EB that the efficiency level of the best technology commercially available in the provincial/regional or national grid of China should be used, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin factor (BM).

STEP 5. Calculate the Build Margin emission factor ($EF_{BM,y}$)

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (2)$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* in (MWh);
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh).

[19] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

m Power units included in the build margin
y Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in step 3 (a) for the simple OM, using options B1, B2 or B3, using for *y* the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.

Since currently available statistics data does not separate coal, oil and gas from thermal power generation, the following calculation steps suggested by the Chinese DNA[20] are taken in lieu:

- Step (a): make use of the latest energy balance data from *China Energy Statistical Yearbook (2006 edition)* to calculate total emissions from coal, oil and gas fuels and determine their respective ratios in the total emission from total thermal power generation in the CSPG in 2005;
- Step (b): based on the ratios in step (a) and the emission factors derived from the efficiency levels of the best technologies commercially available in China, calculate the thermal power emission factor of the grid;
- Step (c): multiply the thermal power emission factor obtained in step (b) with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition of the grid. The result is the BM emission factor of the grid

Step (a): Calculate the proportion of the CO_2 emissions from coal, oil and gas fuelled power generation in total emission from the total thermal power generation in CSPG in 2005.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (3)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (4)$$

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

Where,

$F_{i,j,y}$ the amount of fuel *i* in province *j* in year *y* (tce);

$COEF_{i,j,y}$ emission factor of fuel *i* (tCO_2/tce), taking into account the carbon content and oxidation rate of fuel *i* consumed in year *y*;

COAL, OIL and GAS are subscripts of coal, oil and gas fuel, respectively.

Step (b): Calculate the emission factor of thermal power:

[20] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

$$EF_{Thermal} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \quad (6)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors of coal, oil and gas power generation based on efficiency levels of the best technologies commercially available in China.

Step (c): Calculate the BM emission factor of the grid:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} * EF_{Thermal} \quad (7)$$

Where:

CAP_{Total} total capacity addition; and

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

Annex 3 presents the detailed datasheets and calculations.

Step 6: Calculate the combined margin emissions factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \quad (8)$$

Where:

$EF_{grid,OM,y}$ Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EF_{grid,BM,y}$ Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

w_{OM} Weighting of operating margin emission factor (%)

w_{BM} Weighting of build margin emission factor (%)

The default values used for w_{OM} and w_{BM} for this PDD are 0.5 and 0.5.

Annex 3 presents the detailed datasheets and calculations.

<u>Calculation of GHG emission reductions</u>

According to AMS I.D., baseline emissions are determined by multiplying the annual amount of MWh generated by the project by the emission factor of the electricity grid where the electricity is being displaced.

The Project is expected to deliver 33,202 MWh annually to the CSPG. The greenhouse gas emission reductions achieved by the project activity during a given year *y* (ER_y) is estimated:

$ER_y = BE_y - PE_y - L_y = BE_y = EG_y \; x \; EF_y$

Where:

ER_y	= Project emission reductions (tCO_{2e}/y)
BE_y	= Baseline emissions (tCO_{2e}/y)
PE_y	= Project emission (tCO_{2e}/y)
L_y	= Leakage (tCO_{2e}/y)
EG_y	= Net Electricity supplied to the grid by the project (MWh/y)
EF_y	= The Emission Factor of the CSPG (tCO_2/MWh)

Project activity emissions calculation

As per methodology AMS .I.D the project activity's emissions (PE_y) will be 0 tCO_{2e}.

Leakage

As per methodology AMS .I.D. the leakage of the project (L_y) will be 0 tCO_{2e}.

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

Data/Parameters	NCV_i
Data unit:	MJ/t, or MJ/km³t
Description:	Net calorific value per mass or volume unit of a fuel *i*
Source of Data used:	*China Energy Statistical Yearbook*
Value applied:	*Based on http://cdm.ccchina.gov.cn and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	$OXID_i$
Data unit:	
Description:	Oxidation factor of the fuel *i*
Source of Data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories Workbook*
Value applied:	*IPCC world wide defaults value and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of AMS .I.D, the proposed project should use the IPCC default values
Any comment:	*IPCC data*

Data/Parameters	$EF_{CO2,i。y}$
Data unit:	tC/TJ
Description:	CO_2 emission factor of fossil fuel type *i in year y*
Source of Data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories Workbook*
Value applied:	*IPCC world wide defaults value and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the proposed project should use the IPCC default values
Any comment:	*IPCC data*

Data/Parameters	$F_{i,j,y}$
Data unit:	10^4t or 10^6 m^3
Description:	Amount of fuel *i* (in a mass or volume unit) consumed by province *j* in year(s) *y*
Source of Data used:	*China Energy Statistical Yearbook*
Value applied:	*Based on http://cdm.ccchina.gov.cn and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	$G_{j,y}$
Data unit:	MWh
Description:	Electricity (MWh) generation by province *j* in year *y*
Source of Data used:	*China Electric Power Yearbook*
Value applied:	*Based on http://cdm.ccchina.gov.cn and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	$\eta_{j,y}$
Data unit:	%
Description:	Rate of electricity self-consumption by sources in province *j* in year *y*
Source of Data used:	*China Electric Power Yearbook*
Value applied:	*Based on http://cdm.ccchina.gov.cn and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	$CAP_{y,j}$
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 China Southern Power Grid in the recent years
Source of Data used:	*China Electric Power Yearbook*
Value applied:	*Based on http://cdm.ccchina.gov.cn and detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	
Data unit:	%
Description:	Fuel consumption for best technology commercially available
Source of Data used:	*Based on* http://www.ccchina.gov.cn/source/fa/fa2002082803.htm
Value applied:	*Detailed in Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released made by Chinese DNA ; publicly accessible and reliable data source
Any comment:	*Official data*

Data/Parameters	Installed Capacity
Data unit:	MW
Description:	The installed capacity
Source of Data used:	*The feasibility study report*
Value applied:	*6.7*
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is from the feasibility study report
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions calculation

Calculating with the methods presented above, the OM emission factor ($EF_{OM,y}$) of China Southern Power Grid is 1.0119 tCO_2/MWh, and the build margin emission factor ($EF_{BM,y}$) is 0.6748 tCO_2/MWh. The detailed calculations and data are listed in Annex 3.

The baseline emissions factor (EF_y) of CSPG is calculated as 0.84335 tCO_2/MWh.

According to the Feasibility Study report of the project, the electricity net output of the project activity is estimated as 33,202 MWh per year.

Emission reductions calculation

$$ER_y = BE_y = EG_y \; x \; EF_y$$

Where:

ER_y = Project emission reductions (tCO_{2e}/y)
BE_y = Baseline emissions (tCO_{2e}/y)
EF_y = The Emission Factor of the CSPG (tCO_2/MWh)
EG_y = Net electricity supplied to the grid by the project (MWh/y)

The *ex-ante* total emission reductions are estimated as **196,007** tCO_{2e} in the first 7 years of crediting period.

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

Tab. B. 5: Emission reductions for the first crediting period.

Year	Estimation of baseline emissions (tCO_{2e})	Estimation of project activity emissions (tCO_{2e})	Estimation of Leakage (tCO_{2e})	Estimation of overall emission reductions (tCO_{2e})
2010	28,001	0	0	*28,001*
2011	28,001	0	0	*28,001*
2012	28,001	0	0	*28,001*
2013	28,001	0	0	*28,001*
2014	28,001	0	0	*28,001*
2015	28,001	0	0	*28,001*
2016	28,001	0	0	*28,001*
Total (tCO2e)	***196,007***	**0**	**0**	***196,007***

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

B.7.1 Data and parameters monitored:

The monitoring methodology is based on direct measurement of the quantity of electricity supplied by the power plant to the China Southern Power Grid.

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project activity in the year *y*
Source of data to be used:	*Electricity meter*
Value of data:	33,202
Brief description of measurement methods and procedures to be applied:	Data will be measured hourly with an electricity meter and will be aggregated monthly and yearly.
QA/QC procedures to be applied:	*The uncertainty level of data is low. Electricity meter will be maintained and calibrated regularly to ensure the accuracy of the measurement instrument. Electricity supplied by the project activity to the grid will also be recorded on sales receipts. In this way data will be crosschecked.*
Any comment:	*The main data source meter is operated by the Tengchong power company. All calibration and maintenance standards and procedures will follow the industrial codes and regulations and will be according to the manufacturers' specifications.* *Data will be hourly measured, recorded monthly and archived electronically for a minimum of two years after the end of the crediting period.*

B.7.2 Description of the monitoring plan:

The main purpose of the monitoring plan is to guarantee successful implementation of the project emission reduction monitoring during the crediting period. The project owner is the user of the monitoring plan and will be responsible for it. The project owner must maintain credible and transparent data estimation, calculation, measurement and collection systems in order to obtain and keep all the information required for a CDM project.

Data monitored

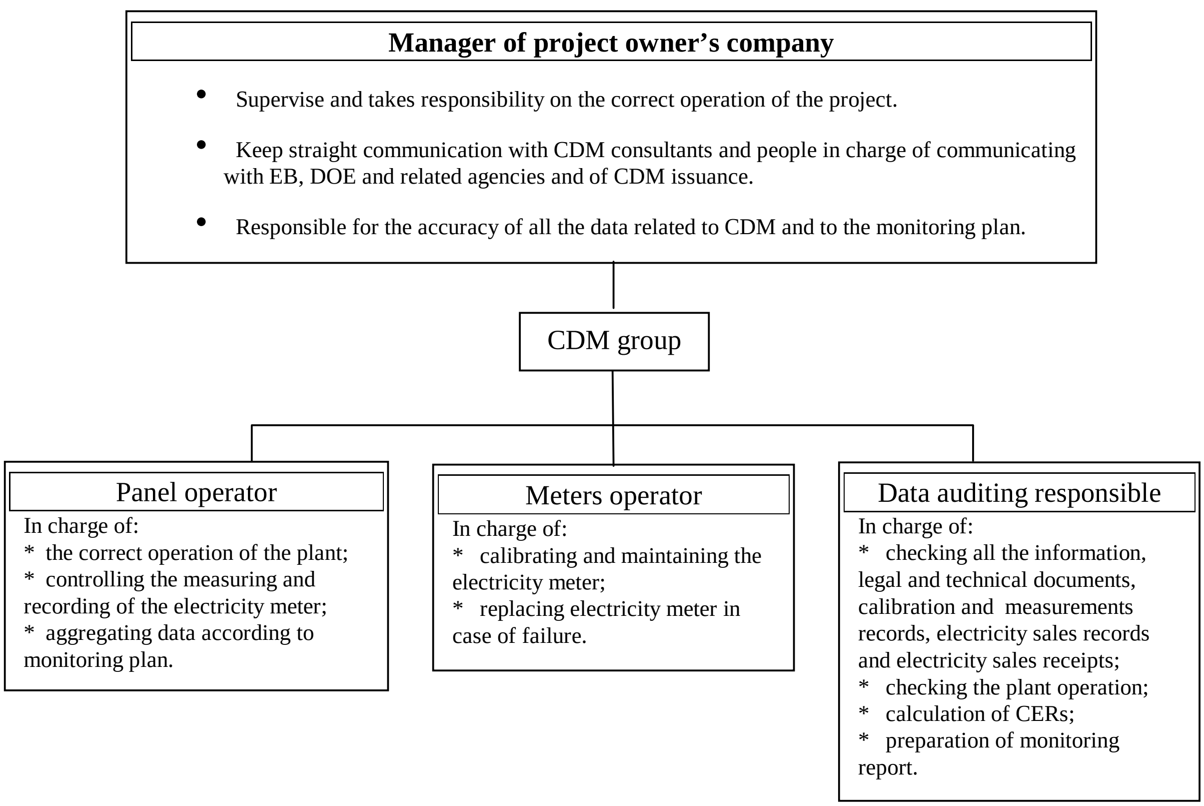
According to methodology AMS.I.D the data that has to be monitored is the net amount of power supplied to the grid by the hydropower station, which will be measured through electricity meters.

Monitoring Organization

Before the starting of the crediting period, the organisation of the CDM group will be established in the project owner's company and will be responsible for the implementation of the monitoring plan, specially for collecting data, supervising, and dealing with the process of measurement and record. The responsible staff will be supported by the technical department and the financial department of the proposed project.

The organization chart with the involved persons and its responsibilities is shown above.

Fig. B. 1: Organization Chart



As it can be seen in the organization chart the manager of the project company take responsibility for the monitoring plan and of all the procedures and data related to it.
The monitoring plan consists of the daily measurement of the electricity supply to the grid which will be carried out by the panel operator, who will also be responsible for the correct recording of data.
The meters operator, together with the panel operator will look after the proper operation of the electricity meters and will fixed or replace them if they are out of order.
Data auditing responsible based on daily monitoring data, will compile the monthly monitoring. This monthly monitoring reports will be provided to the manager for checking purposes. Before verification procedure, the data auditing responsible will perform an internal audit and prepare the monitoring report to be submitted to DOE.
Finally, the manager of the project will review the internal audits and final monitoring reports.

Monitoring plan
A manual with all the monitoring procedures will be established prior to the start of the project. The monitoring procedures will include:

a) CDM personnel training.
b) Reading and recording data.
c) Data collection.
d) Data quality control and quality procedures.
e) Calibration procedures.
f) Procedures in case of equipment failures.
g) Emergency situation.

The project manager is responsible for ensuring that the procedures are followed on site and for the establishment of the monitoring system

Monitoring equipments and installation
Electric energy metering equipment will be properly configured according to relevant local standard, and the metering equipment will be checked by both the project owner and the grid company before the project is in operation. All the meters have at least 0.5s level accuracy. The net electricity delivered to grid is obtained in a transparent way.

Two meters are required, the first meter (backup meter) at the exit of the proposed project transmission station to measure the total output electricity from the hydropower station (self-consumed electricity included). The second meter (main meter) will be installed at the connection point between proposed project and the power grid, to measure the net electricity supplied to the grid. When the main meter encounters problems, the electricity supplied to the grid will be estimated based on the contract with the Grid Company. All meters will be sealed and will measure on a continuous basis.

Electric power supply to the grid by the hydropower station is metered at two locations. The plant operator measures the power supply at the switching/transformer station that will be installed at the project site and the grid company will meter the power supply at the connection point to the grid. A power interchange agreement between plant operator and Grid Company will define the metering arrangements and the required quality control procedures to ensure accuracy. All meters will be sealed and will measure on a continuous basis.

The value measured by the grid company will be taken as the actual net electricity supply to the grid. The net value will be used in the calculation of the project's emission reductions.

Besides, the value measured by the electricity meter owned by the plant operator will be used in order to check of the value metered by the grid company. All records will be double-checked with the sales receipt. In case of discrepancy the higher value will be use.

The operating staff of the power plant will monitor the electricity supplied to the grid on an hourly basis and document both on paper as well as in electronic form the daily and monthly totals.

Calibration
The meters will be calibrated annually by the qualified metrical organization according to relevant national electricity measurement standards. The net energy output registered by the meters will be used for the purpose of billing and emission reduction verification.
Data management system
Data will be achieved at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM, a hard copy printout will be achieved. The project owner will collect sales receipts for the power delivered to the grid as a cross-check. Physical document such as operation manual, drawings, maintenance instructions and environmental assessments will be archived in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results will be indexed. All paper based information will be stored by the technology department of the project owner and all the material will have a copy for backup. And all the relevant data records will be kept for 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later

Quality Control& Quality Assurance

QA&QC procedures for recording, maintaining and archiving data shall be improved as part of this project activity.

If any reading of the main meter is inaccurate, $EG_{,y}$ shall be determined by:

a. Reading the backup meter.
b. In case of failure of both main meter and backup meter, the readings will according to the agreement signed by the project owner and the Grid Company

The following corrective actions will be taken by the project owner when erroneous measurements and deviations occur:
a. Actions to correct deviations from the monitoring plan and guidebook for the hydropower plant operation and monitoring will be implemented as these deviations are observed by the operator;
b. The project owner will perfect the whole monitoring procedure by developing the CDM guidebook: tracking information from the primary source to the end data calculations in paper document format.
c. Corrective actions are also set down in case of equipment or systems malfunction.

Monitoring report
After the proposed project is registered and begins its operation, the monitoring report should be submitted for the verification process. The report should cover the monitoring of grid-connected power

station, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration.

The project will perfect the whole monitoring procedure by developing the CDM Manual: tracking information from the primary source to the end data calculations in paper document format. It is the responsibility of the project owner to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be stored by the project owner.

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

The baseline and monitoring study was completed on 20 July 2007.

Person responsible for the application of the baseline and monitoring methodology to the project activity:

Aria Engineering S.r.l.
Olga M.C. Passarelli
o.passarelli@asja.biz
Mobile: +39 335 5962791
Aria Engineering S.r.l. 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:

14/1/2007[21]

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 years * 3 = 21 years

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

01/04/2010 or registration date whichever is later.

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

[21] According to Hydro Turbine and Affiliated Equipments purchase contract of Yunnan Province, Tengchong County, XiShanHe Hydropower Station Project

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Environmental Impact Assessment (EIA) has been carried out for the project which indicates that there will be some effects on the local environment during construction. The EIA has been approved by the "Baoshan City Environment Protection Bureau" on 14th of Nov. 2006. There will be no immigration during construction period, the main environment impact on local area is the "three wastes" (waste slag, waste gas and waste liquid) and noise.

Being a small hydro project, it does not require any displacement (rehabilitation & resettlement) of human population and thus during construction period so the main environment impact on local area is the "three wastes" (waste slag, waste gas and waste liquid) and noise.
The environmental protection measures will maximum decrease the negative effects on water, atmosphere, environment noise and residents' health from. The EIA gives analysis on the environment impacts and the control measures of the proposed project.

Water
The main impaction factor for water is high concentration suspended solids and high PH value. The treatment of the construction's wastewater can be done with a physical method: the waste water goes into sedimentation tank to remove SS and acid is added to adjust PH value to neutrality. The water can satisfy required water quality standard through waste water treatment. The main domestic waste water is feces from living area and workshop area, so waste water disposal facility will be built and the public toilet should be periodic cleaned and disinfected.

Air
The main air pollutants during construction period are the fuel exhaust gas from construction machine/vehicles, and the dust from blasting and constructing. The following methods can be used for dust removal: concrete automatic mixing, conduit joint sealing, cement tank with bag type dust collector and earthwork excavation with dust controlled by water. For removing dust from route construction, the dust can be controlled by watering the transportation routes regularly. New road construction will choose bitumen or concrete as material. For preventing air pollution from cement transportation, tankers or sealed transportation will be adopted. The labour protection method is necessary and used, such as, mouth-muffle.

Solid waste
During construction period, the solid waste is mainly from earthwork excavation and construction castaway slag. The surplus earthwork will be put at slag field, which will be level for recultivation when the project finish.

Eco-environment
The influence on eco-environment is the vegetation and wild animals disturbed by permanent and temporary occupied land. The ecological recovery measures for occupied land are: environmental afforestation, strictly protect plants and vegetation in reservoir area. Special funds will be invested on ecological recovery and soil erosion and water loss. During construction period, wild animals' habitat and wildlife passageways should be given highly protection.

Noise

The main noise during construction period is from vehicles transportation, sand and stones processing and concrete mixing. The main noise control measures are: improve construction technology, improve machine maintenance, and improve labour protection measures, shorten working hours. Installing soundproof facilities for crushing system, arrange appropriate working schedule. Blasting and horn-blowing is forbidden in the night.

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:

Even though hydro electricity is considered a clean resource of energy, an EIA was carried out in order to comply with the local regulations and to take care of all the environmental aspects. The report states that the project will generate only little environment influence on the local environment. The negative effects can not be wholly avoided, but the project does not result in great environment losses. The environment benefits are more than environment losses.

SECTION E. Stakeholders' comments

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

A Stakeholders' consultation was carried out in order to receive the public's opinion and suggestions for the Yunnan Province, Tengchong County, XiShanHe Hydropower Station Project. Before requesting the public's opinion everyone was informed about the characteristic of the project and the potential impacts of the proposed project activity. A total amount of 15 questionnaires were prepared and distributed between local government, social organizations and local residents. All of them had been answered and returned.
The questionnaires consisted in the following questions:

1. Questionnaire contents for local government and social organization:
Date: July 2007

1. Are you familiar with the Yunnan Province, Tengchong County, XiShanHe Hydropower Station Project?
2. Do you think the power plant will bring benefits to the local economy development?
3. Do you think the construction of the power plant will affect the local environment?
4. In general, the environment affection in project site will bring more advantages or disadvantages?
5. Do you support the construction of the hydropower project?
6. Do you have any comment, advice or suggestion on the project?

2. Questionnaire contents for local residents:
Date: Jun 2005

1. Are you familiar with the Yunnan Province, Tengchong County, XiShanHe Hydropower Station Project?
2. Do you think the power plant will bring benefits to the local economy development?
3. Do you think the construction of the power plant will affect the local environment?
4. Do you think the construction of the power plant will affect the local water pollution?
5. Do you think the construction of the power plant will affect the local soil erosion and water loss?
6. Do you think the construction of the power plant will affect the eco-environment?
7. Do you know the collected land of the project will affect the contract land?
8. Are you satisfied with the compensation for collected land?
9. Do you have any comment, advice or suggestion on the project?

E.2. Summary of the comments received:

1. Feed back from questionnaires for local government and social organization: Generally, the survey shows local government and social organization believe that the project will promote economic development and they agree with the construction of the hydropower plant.

2. Feed back from questionnaires for local residents:

- All the people know the hydropower plant will be built;
- 90% thinks the project will bring benefits to local economy; 10% are neutral;
- 80% thinks the project will give little influence on the local environment; 20% are neutral;
- 90% thinks the project will give little influence on the local water pollution; 10% are neutral;

- 90% thinks the project will give little influence on soil erosion and water loss;
- 100% thinks the project will give little influence on eco-environment;
- 60% know the project will occupy the contract land;
- 80% satisfied with compensation for collected land;

To summarized, stakeholders supported the construction of the project and believed it will contribute to the local economical development.

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

Below a description on how comments received were taken into account:

- Hope the project owner give better eco-environment protection and minimize the negative influence on natural environment;

Current local eco-environment situation and eco-environment recovery measures have been fully considered and analyzed in EIA in order to reduce the impact on local environment.

- Hope the project owner satisfied local residents with land occupied compensation and measures of returning cultivated land to forest;

The feasible and reasonable analysis on land occupied compensation has been done in EIA. According to local environment situation, the measures of land rehabilitation for temporary occupied land will be carried out once the project finished.

There has been no need to modify the project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Tengchong County Qinghe Hydropower Development Co., Ltd.
Street/P.O.Box:	Renmin Zhong Road, 23rd Floor
Building:	Meiya Building
City:	Kunming
State/Region:	Yunnan
Postfix/ZIP:	650021
Country:	People's Republic of China
Telephone:	0086 871 8886709
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Wen
Middle Name:	
First Name:	Yang Guo
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	ygw109@163.com

Organization:	International Clean Fund LLC, Lewes, Mendrisio Branch
Street/P.O.Box:	Via Vela, 5-P.O. Box 1518
Building:	
City:	Mendrisio
State/Region:	
Postfix/ZIP:	6850
Country:	Switzerland
Telephone:	+41 91.6403080
FAX:	+41 91.6403089
E-Mail:	
URL:	www.icf-fund.com
Represented by:	Legal Representative
Title:	
Salutation:	Mr.
Last Name:	Motta
Middle Name:	
First Name:	Rinaldo
Department:	
Mobile:	
Direct FAX:	+41 91.6403089
Direct tel:	+41 91.6403080
Personal E-Mail:	a.manzone@icf-fund.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the development of the Project.

Annex 3

BASELINE INFORMATION

Step 1: Calculation of the Operating Margin Emission Factor

Table Annex 3.1. Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific (kJ/kg,m^3)	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908	25.8	100%
Cleaned Coal	26344	25.8	100%
Other Washed Coal	8363	25.8	100%
Coke	28435	25.8	100%
Crude Oil	41816	20.0	100%
Caroline	43070	18.9	100%
Coke Oil	43070	19.6	100%
Diesel Oil	42652	20.2	100%
Fuel Oil	41816	21.1	100%
Other Oil	38369	20.0	100%
Natural Gas	38931	15.3	100%
Coke Oven Gas	16726	12.1	100%
Other Gas	5227	12.1	100%
LPG	50179	17.2	100%
Refinery Dry Gas	46055	18.2	100%

Data Source ：1) 2006 IPCC Guidelines for National Greenhouse Gas Inventories， Volume 2 Energy；

2)<China Energy Statistical Yearbook 2006>；

Table Annex 3.2 Simple OM Emission Factors Calculation of CSPG for year 2003

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission（tCO_2e）
							（tc/TJ ）	（%）	（MJ/t,km3）	I=G*H*F*E*44/12/10000（for mass unit ）
		A	B	C	D	E=A+B+C+D	F	G	H	I=G*H*F*E*44/12/1000 (for volume unit)
Raw Coal	10^4t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20908	175,993,455.05
Cleaned Coal	10^4t	0.05				0.05	25.8	100	26344	1246.07
Other Washed Coal	10^4t			36.38	20.37	56.75	25.8	100	8363	448.971.84
Coke	10^4t				0.5	0.5	25.8	100	20908	134,49.76
Coke Oven Gas	10^8m^3				0.04	0.04	12.1	100	28435	335,797.81
Other Gas	10^8m^3	3.21			11.27	14.48	12.1	100	16726	210,055.71
Crude Oil	10^4t	6.85			0.76	6.85	20	100	5227	596.95
Gasoline	10^4t	0.22				0.02	20	100	41816	103,175,9.27
Diesel Oil	10^4t	31.9				32.66	18.9	100	43070	0
Fuel Oil	10^4t	627.22	0.3			627.52	20.2	100	42652	1,079,777
LPG	10^4t					685.94	21.1	100	41816	22.191.288
Refinery Dry Gas	10^4t	2.85				0	17.2	100	50179	0
Natural Gas	10^8m^3					2.85	18.2	100	46055	0
Other Petroleum Products	10^4t	11.35				0	15.3	100	38931	1,729,751
Other Coking Products	10^4t					11.35	20	100	38369	18,852
Other energy	10^4t	93.21			23.5	0	25.8	100	28435	0
						115.56	0		**Total**	**198,746,555.23**

Data Source：<China Energy Statistical Yearbook 2004>;

Table Annex 3. 3 Thermal electricity generation of China Southern Power Grid in 2003

	Electricity generation	**Electricity generation**	**Auxiliary electricity consumption**	**Electrcity delivered to the grid**
	(10^9kWh)	**(MWh)**	**(%)**	**(MWh)**
Guangdong	1433.51	143351000	5.5	135,466,695
Guangxi	170.79	17079000	8.43	15,639,240
Guizhou	432.95	43295000	7.4	40,091,170
Yunnan	190.55	19055000	8.01	17, 528,695
Total				208,725,800

Data source:<China Electric Power Yearbook 2004>.

Net electricity imported from the Central China Grid in 2003 = 11,100 MWh
Total Electricity delivered to the grid in 2003 = 208,725,800 MWh +11,100 MWh
= 208,736,900 MWh
Average emission factor of the Central China Grid in 2003 = 0.797442 tCO_2e/MWh
Total emission of the China Southern Power Grid in 2003 = 198,746,555.23 tCO_2+11,100 MWh*0.77134 tCO_2e/MWh
= 198,755,407 tCO_2

Table Annex 3. 4 Simple OM Emission Factors Calculation of CSPG for year 2004

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission（tCO_2e）
							（tc/TJ）	（%）	（MJ/t,km3）	I=G*H*F*E*44/12/10000（for mass unit）
		A	B	C	D	E=A+B+C+D	F	G	H	I=G*H*F*E*44/12/1000 (for volume unit)
Raw Coal	10^4t	6017.7	1305	2643.9	1751.28	11717.88	25.8	100	20908	231767574
Cleaned Coal	10^4t	0.21				0.21	25.8	100	26344	5233
Other Washed Coal	10^4t					0	25.8	100	8363	0
Coke	10^4t					0	25.8	100	28435	0
Coke Oven Gas	10^8m^3					0	12.1	100	16726	0
Other Gas	10^8m^3	2.58				2.58	12.1	100	5227	59831
Crude Oil	10^4t	16.89				16.89	20	100	41816	517933
Gasline	10^4t					0	18.9	100	43070	0
Diesel Oil	10^4t	48.88			1.83	50.71	20.2	100	42652	1601975
Fuel Oil	10^4t	957.71				957.71	21.1	100	41816	30983494
LPG	10^4t					0	17.2	100	50179	0
Refinery Dry Gas	10^4t	2.86				2.86	18.2	100	46055	75825
Natural Gas	10^8m^3	0.48				0.48	15.3	100	38931	104833
Other Petroleum Products	10^4t	1.66				1.66	20	100	38369	46708
Other Coking Products	10^4t					0	25.8	100	28435	0
Other energy	10^4t	79.42				79.42	0	100	0	0
									Total	**265163407**

Data Source：<China Energy Statistical Yearbook 2005>;

Table Annex 3. 5 Thermal electrcitiy generation of China Southern Power Grid in 2004

	Electricity generation (10^8kWh)	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electrcity delivered to the grid (MWh)
Guangdong	1693.89	169389000	5.42	160,208,116
Guangxi	201.43	20143000	8.33	18,465,088
Guizhou	497.2	49720000	7.06	46,209,768
Yunnan	243.22	24322000	7.56	22,483,257
Total				247,366,229

Data source:<China Electric Power Yearbook 2005>.

Net electricity imported from the Central China Grid in 2004 = 10,951,240 MWh
Total Electricity delivered to the grid in 2004 = 247,366,229 MWh +10,951,240 MWh
= 258,317,469 MWh
Average emission factor of the Central China Grid in 2004 =0.82732 tCO_2e/MWh
Total emission of the China Southern Power Grid in 2004 = 265,163,407tCO_2+10,951,240 MWh*0.82732 tCO_2e/MWh
= 258,317,469 tCO_2

According to the Formula(2) of B.6.1, the $EF_{grid,OM,2004}$ is equal to 1.06158 tCO_2e/MWh.

Table Annex 3. 6 Simple OM Emission Factors Calculation of CSPG for year 2005

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tc/TJ)	(%)	(MJ/t,km3)	I=G*H*F*E*44/12/10000 (for mass unit)
		A	B	C	D	E=A+B+C+D	F	G	H	I=G*H*F*E*44/12/1000 (for volume unit)
Raw Coal	10^4t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442602
Cleaned Coal	10^4t				0.15	0.15	25.8	100	26344	3738
Other Washed Coal	10^4t			10.39	33.88	44.27	25.8	100	8363	350238
Coke	10^4t	4.79			8.05	12.84	25.8	100	28435	390906
Coke Oven Gas	10^8m^3				0.79	0.79	12.1	100	16726	58624
Other Gas	10^8m^3	1.87			15.96	17.83	12.1	100	5227	413486
Crude Oil	10^4t	10.91				10.91	20	100	41816	334556
Gasline	10^4t	0.68				0.68	18.9	100	43070	20296
Diesel Oil	10^4t	31.96	2.02		1.81	35.79	20.2	100	42652	1130639
Fuel Oil	10^4t	887.21				887.21	21.1	100	41816	28702703
LPG	10^4t					0	17.2	100	50179	0
Refinery Dry Gas	10^4t	4.92				4.92	18.2	100	46055	130441
Natural Gas	10^8m^3	0.93				0.93	15.3	100	38931	203115
Other Petroleum Products	10^4t	1.7				1.7	20	100	38369	47833
Other Coking Products	10^4t					0	25.8	100	28435	0
Other energy	10^4t	104.66	133.15		59.72	297.53	0	100	0	0
									Toal	**295,229,177**

Data Source ：<China Energy Statistical Yearbook 2006>;

Table Annex 3.7 Thermal electricity generation of China Southern Power Grid in 2005

	Electricity generation	Electricity generation	Auxiliary electricity consumption	Electrcity delivered to the grid
	(10^8kWh)	(MWh)	(%)	(MWh)
Guangdong	1764.53	176453000	5.58	166,606,923
Guangxi	250.23	25023000	7.95	23,033,672
Guizhou	584.3	58430000	6.94	54,141,238
Yunnan	272.81	27281000	7.34	25,387,699
Total				269,169,531

Data source:<China Electric Power Yearbook 2006>.

Net electricity imported from the Central China Grid in 2005 = 96,363,000 MWh
Total Electricity delivered to the grid in 2005 = 269,169,531 MWh +20,264,000 MWh
= 289,433,531 MWh
Average emission factor of the Central China Grid in 2005 = 0.77216 tCO_2e/MWh
Total emission of the China Southern Power Grid in 2005 = 295,229,177 tCO_2+96,363,000 MWh*0.77216 tCO_2e/MWh
= 369,521,975 tCO_2
According to the Formula(2) of B.6.1, the $EF_{grid,OM,2005}$ is equal to 1.010914 tCO_2e/MWh.

According to the Formula(2) of B.6.1, the $EF_{grid,OM,2006}$ is equal to *1.0119* tCO_2e/MWh.

Table Annex 3.8 Most recent three-year OM emission factor of CSPG

Year	**2003**	**2004**	**2005**
OM emission factor (tCO_2e/MWh)	**0.952181**	1.06158	1.010914
$EF_{grid,OM,y}$	*1.0119* tCO_2e/MWh		

Step 2: Calculation of the Building Margin Emission Factor

Sub-step 2a Calculating the weight of CO_2 emission from solid fuels, liquid fuels and gas fuels among total emission

Table Annex 3.9. Ratio of CO_2 emission from solid fuels, liquid fuels and gas fuels among total emission

		Guangdong	**Guangxi**	**Guizhou**	**Yunnan**	**Total**	**Emission factor**	**OXID**	**NCV**	**CO_2 Emission (tCO_2e)**
							(tc/TJ)	**(%)**	**(MJ/t,km^3)**	**I=G*H*F*E*44/12/10000 (for mass unit)**
Fuels	**Units**	**A**	**B**	**C**	**D**	**E=A+B+C+D**	**F**	**G**	**H**	**I=G*H*F*E*44/12/1000 (for volume unit)**
Raw Coal	10^4t	6696.47	1435	3212.31	1975.55	**13319.33**	25.8	100	20908	263,442,602
Cleaned Coal	10^4t	0	0	0	0	**0.15**	25.8	100	26344	3,378
Other Washed Coal	10^4t	0	0	10.39	33.88	**42.27**	25.8	100	8363	350,238
Coke	10^4t	4.79	0	0	0	**12.84**	20908	26.6	1	345,390
Total of solid fuels										**264,141,967**
Crude Oil	10^4t	10.91	0	0	0	**10.91**	20	100	41816	334,556
Gasoline	10^4t	0	0	0	0	**0.68**	18.9	100	43070	20
Diesel Oil	10^4t	31.96	2.02	0	1.81	**35.79**	20.2	100	43070	1,130,639
Fuel Oil	10^4t	887.21	0	0	0	**887.21**	21.1	100	42652	28,702,703
karaffin oil	10^4t	0	0	0	0	**0**	19.6	100	41816	0
Other Petroleum Products	10^4t	1.7	0	0	0	**1.7**	20	100	38369	47,833,296
Total of gas fuels										**30,236,028**
Natural gas	10^8m^3	9.3	0	0	0	**9.3**	15.3	100	38931	203,115
Coke oven gas	10^8m^3	0	8.4	0	20.6	**7.9**	12.1	100	16726	58,624
Other gas	10^8m^3	18.7			191.5	**178.3**	12.1	100	5227	413,486
LPG	10^4t	0	0	0	0	**0**	17.2	100	50179	0
Refinery gas	10^4t	4.92	0	0	0	**4.92**	18.2	100	46055	151,211

Total of gas fuels										**826,436**
Total of solid liquid and gas fuels										**336,190,122**

Data source ：<China Energy Statistical Yearbook 2006>

According to the above data and Formula(4) of B.6.1:

$$\lambda_{Coal} = 89.48\% ,\ \lambda_{Oil} = 10.24\% ,\ \lambda_{Gas} = 0.28\%$$

Sub-step 2b: Calculating the fuel-fired emission factor($EF_{Thermal}$)

Table Annex 3.10. Calculation of Emission Factor for Coal-fired, Oil-fired and Gas-fired Power

	Variable	Supply Efficiency	Emission Factor of fuel (tc/TJ)	Oxidation Rate	Emission Fator (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired	$EF_{Coal,Adv}$	35.28%	25.8	100%	0.9508
Gas-fired	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.4237
Oil-fired	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.5843

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

According to Formula(5) of B.6.1:

$$EF_{Thermal} = EF_{Coal,\ Adv\cdot}\ \lambda_{Coal} + EF_{oil,\ Adv\cdot}\ \lambda_{Oil} + EF_{gas,\ Adv\cdot}\ \lambda_{Gas}$$
$$=0.9508 *89.48\% +0.4237\ *10.24\% +0.5843*0.28\%$$
$$= 0.9117\ tCO_2e/MWh$$

Sub-step 2c: Calculating the Building Margin Emission Factor ($EF_{grid,BM,y}$)

Table Annex 3.11. Installed capacity of CSPG

Installed capacity in 2005	Unit	Kuangdong	Kuangxi	Yunnan	Guizhou	Total
Thermal power	MW	35182.6	4931.2	4758.4	9634.8	54507
Hydro power	MW	9035.7	6085.3	7993.1	7233	30347.1
Nuclear power	MW	3780	0	0	0	3780
Wind power and others	MW	83.4	0	0	0	83.4
Total	MW	48081.7	11016.5	12751.5	16867.8	88717.5

Installed capacity in 2004	Unit	Kuangdong	Kuangxi	Yunnan	Guizhou	Total
Thermal power	MW	30172.9	4378.1	4306.9	7801.8	46659.7
Hydro power	MW	8584.6	5040.4	7058.6	6896.5	27580.1
Nuclear power	MW	3780	0	0	0	3780
Wind power and others	MW	83.4	0	0	0	83.4
Total	MW	42620.9	9418.5	11365.5	14698.3	78103.2

Installed capacity in 2003	Unit	Kuangdong	Kuangxi	Yunnan	Guizhou	Total
Thermal power	MW	35182.6	5434	4758.4	9634.8	54507
Hydro power	MW	9035.7	7624	7993.1	7233	30347.1
Nuclear power	MW	3780	0	0	0	3780
Wind power and others	MW	83.4	0	0	0	83.4
Total	MW	48081.7	11016.5	12751.5	16867.8	69716.8

Data source: <China Electric Power Yearbook 2004-2006>

Table Annex 3.12. Newly Added Installed Capacity of CSPG from 2003-2005

	2003	2004	2005	Newly Added Installed Capacity from year 2003 to 2005	Percentage in Total Newly Installed Capacity
	A	B	C	D=C-A	
Fuel-fired (MW)	54507	46659.7	54507	14062.9	74.01%
Hydro (MW)	30347.1	27580.1	30347.1	4937.8	25.99%
Nuclear (MW)	3780	3780	3780	0	0.00%
Wind&others (MW)	83.4	83.4	83.4	0	0.00 %
Total (MW)	69716.8	78103.2	88717.5	19000.7	100.00%
Account for installed capacity in 2005	78.58%	88.04%	100%		

According to the above data and Formula(6) of B.6.1：

$EF_{grid,BM,y}$ = 0.9117 tCO_2e/MWh * 74.01% = 0.6748 tCO_2e/MWh

Step 3：Calculation of the Baseline Emission Factor ((EF_y)

According to Formula(7) of B.6.1：

$EF_{grid,CM,y} = 0.5 \times EF_{grid,OM,y} + 0.5 \times EF_{grid,BM,y}$ = 0.84335 tCO_2e/MWh

Annex 4

MONITORING INFORMATION

Regarding monitoring data, all the required information is shown in section B.7.2.