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

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

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Wanpahe Erji 5MW Hydropower Project in Yunnan Province

Version number of the document	Date	Remarks
01	06/08/2008	GSP

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

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Wanpahe Erji 5MW Hydropower Project in Yunnan Province (hereafter referred to as the Project) developed by Baoshan Wanpahe Power Development Co., Ltd. is located on the Wanpa River in Wayao Town, Longyang District, Baoshan City, Yunnan Province.

Purpose of the Project:

(a)The scenario existing prior to the start of the implementation of the Project is the electricity supplied by Yunnan Power Grid which is an integral part of the Southern China Power Grid (CSPG);

(b) The Project is a newly-built hydropower project with no reservoir and the total installed capacity of 5 MW. The project is consisted of a dam, a river diversion tunnel, a pressure adjustment tank, high pressure pipelines, a powerhouse and a step-up substation. It will utilize the water resources of Wanpa River to generate electricity, which will be delivered to CSPG without CO_2 emissions. The Project will achieve greenhouse gas (GHG) emission reductions by displacing equivalent electricity supplied by CSPG, which is predominated by fossil fuel-fired power plants.

(c) The baseline scenario of the Project is the same as the scenario existing prior to the start of implementation of the Project.

How the Project reduces GHG emissions:

The Project is estimated that the electricity supplied to the grid will be 23.595GWh annually. The Project will achieve greenhouse gas (GHG) emission reductions by avoiding CO_2 emission from the business-as-usual scenario, electricity generated by those fossil fuel-fired power plants connected into CSPG. The estimated emission reductions are 20,766tCO_2e per year.

Contributions of the project to sustainable development:

As a renewable energy project, the Project will produce positive environmental and socio-economic benefits and contribute to the local sustainable development through following aspects:

- To contribute to local economy development by providing electricity to meet local increasing energy demands;
- To reduce GHG emissions and to mitigate the emissions of other pollutants caused from local coal-fired power plants compared with a business-as-usual scenario by displacing part of electricity from fossil fuel-fired power plants;
- To be in accordance with the development priority of China energy industry, and to help diversify energy mix of CSPG by increasing the share of renewable energy;

² To create plenty of short-term employment opportunities during the project construction period and 18 permanent jobs during the operation time for the local people.

A.3. Project participants:

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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)
P.R.China (host)	Baoshan Wanpahe Power Development Co., Ltd. (project owner)	No
Switzerland	Vitol S.A. (purchasing party)	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

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):

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People's Republic of China

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

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Yunnan province

A.4.1.3. City/Town/Community etc:

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Anle Village, Wayao Town, Longyang District, Baoshan City

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

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The Project is on the Wanpa River in Wayao Town, Longyang District, Baoshan City, Yunnan Province, P.R.China. The location of the Project is 54.7km from the Baoshan City. The geographical coordinates of the dam is 99°13′48″E, 25°25′03″N, and the geographical coordinates of the power house is 99°14′45″E, 25°25′15″N. Figure 1 and Figure 2 show the detailed geographical location of the Project site.

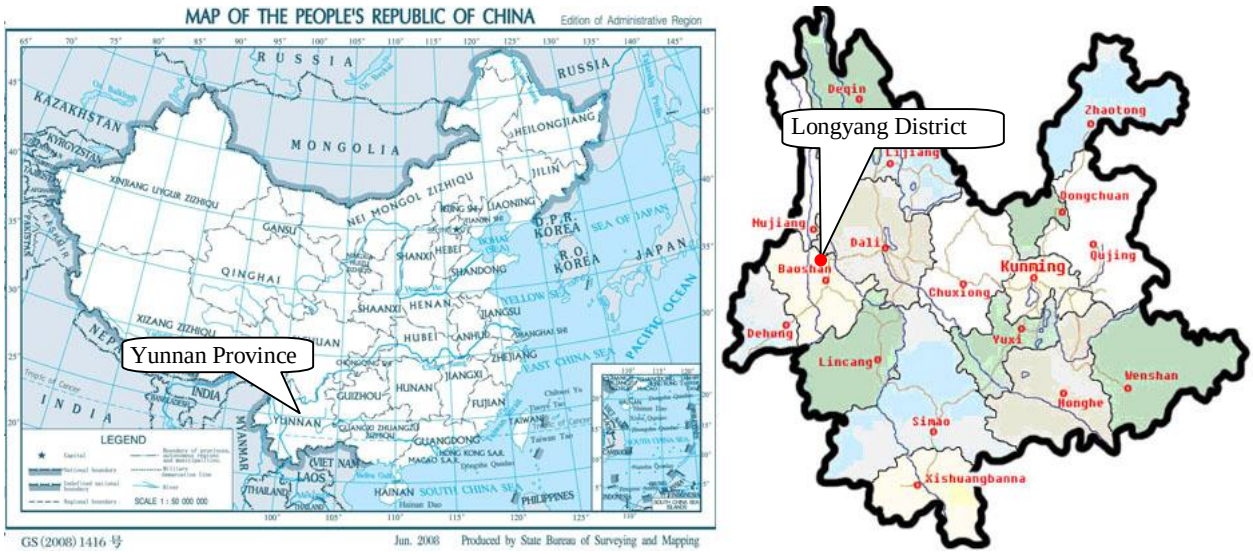

Figure 1. Map showing the location of Yunnan Province and Longyang Districtz

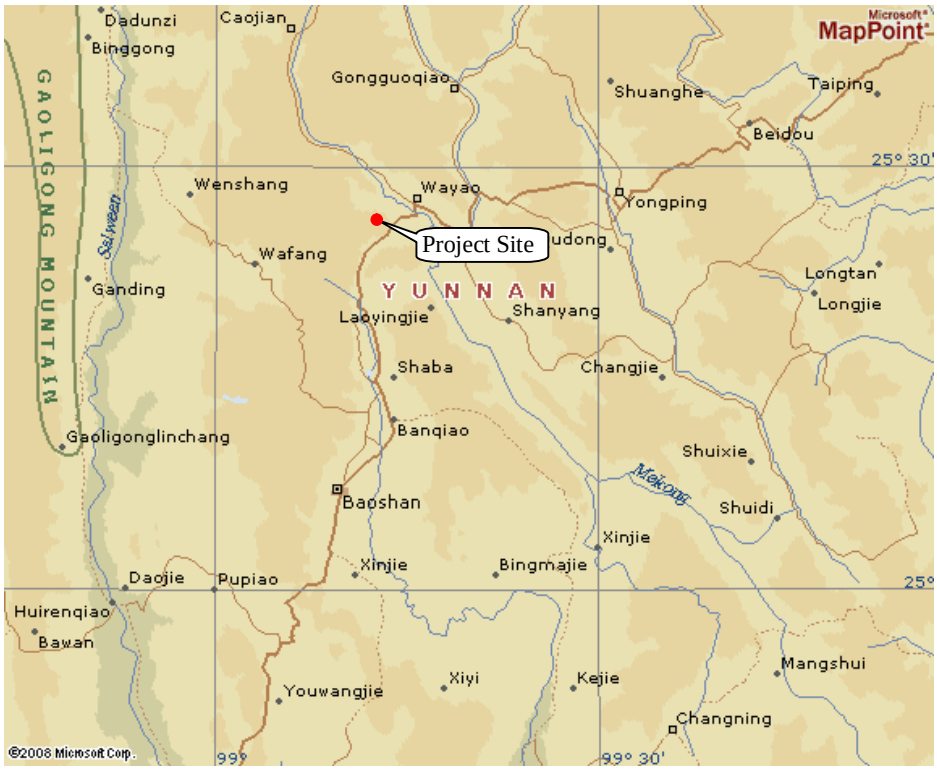

Figure 2. Map showing the location of the Project

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

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Using the categorization of Appendix B to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Project type and category are defined as follows:

Type I: Renewable energy projects
Category I.D.: Renewable Energy Generation for a Grid
Sub Category: Hydropower

Technology to be employed by the Project:

(a)The scenario existing prior to the start of the implementation of the Project is the electricity supplied by Yunnan Power Grid which is an integral part of CSPG; The key information about CSPG is listed in table 1:

Table 1 key information about CSPG

Emission Factor	$EF_{OM,y}$	$EF_{BM,y}$	$EF_{CM,y}$	Original Data Source
Value/Unit	1.0634tCO_2e/MWh	0.6968 tCO_2e/MWh	0.8801 tCO_2e/MWh	Notification on Determining Baseline Emission Factors of China Power Grid
Electricity grid included in CSPG	Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid.			

(b) The Project is a newly-built hydropower project with no reservoir and the total installed capacity of 5 MW. It is consisted of a dam, a river diversion tunnel, a pressure adjustment well, high pressure pipelines, a powerhouse and a step-up substation and will use two sets of hydro turbines(CJA237-W-125/2×11) and associated generators(SF2500-12/2150) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line. The Project will utilize the water resources of Wanpa River to generate electricity, which will be delivered to CSPG without CO_2 emissions. The Project will achieve greenhouse gas (GHG) emission reductions by displacing equivalent electricity supplied by CSPG, which is predominated by fossil fuel-fired power plants. It is estimated that the electricity supplied to the grid will be 23.595GWh annually. The estimated emission reductions are 20,766tCO_2e per year.

The project uses state of the art technology with all the equipment produced domestically. The technology of hydro plant of China is mature and advanced and there is no technology transfer from abroad. The key technical indicators of the hydro turbines and the generators of the Project are listed in table 2.

Table2. Key technical parameters of the hydro turbine and the generator

Hydro Turbine		Generator	
Turbine Type	CJA237-W-125/2×11	Generator Type	SF2500-12/2150
Rated capacity	2631.6kW	Rated capacity	2500kW
Rated head	240.72m	Power factor	0.8
Rated flow	1.27m^3/s	Rated voltage	6.3kV
Rated speed	500r/min	Rated speed	500r/min
Provider	Yibin Fuyuan Electricity Equipment Co,. Ltd.	Provider	Yibin Fuyuan Electricity Equipment Co,. Ltd.

Data Source: Feasibility Study Report

(c) The baseline scenario of the Project is the same as the scenario existing prior to the start of implementation of the Project.

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

The renewable crediting period is adopted by the Project. It is expected that the Project will generate emission reductions for about 20,766 tCO_2e per year over the first 7-year crediting period from Apr.1th 2009 to Mar.31th 2016.

Years	Annual estimation of emission reductions in tonnes of CO_2e
2009	15,575
2010	20,766
2011	20,766
2012	20,766
2013	20,766
2014	20,766
2015	20,766
2016	5,191
Total estimated reductions (tonnes of CO_2e)	145,362
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	20,766

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

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There is no public funding from Annex I Parties for the Project.

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

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The Project participants confirm that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants, in the same project category and technology/measure. According to Appendix C to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Project is not a debundled component of any larger 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 small-scale project activity:

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

"Tool to calculate the emission factor for an electricity system" (Version 01).

For more information regarding the methodology, please refer to the link:

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

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

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

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The Project is a newly-built hydropower project with the total installed capacity of 5 MW.

The electricity produced by the Project will be supplied to CSPG, which is predominated by fossil fuel-fired power plants.

Therefore, the Project is applicable for the use of the approved methodology AMS-I.D(Version 13).

B.3. Description of the project boundary:

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The electricity generated by the Project will be transferred to CSPG, therefore CSPG is defined as the project boundary of the Project. According to *Notification on Determining Baseline Emission Factors of China Power Grid*[1] issued by the National Development and Reform Commission of the Government of China (China DNA), CSPG is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid.

The spatial extent of the project boundary includes the Project power plant and all power plants connected physically into CSPG.

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the Project activity.	CO_2	Yes	Main emission resource.
		CH_4	No	Minor emission resource.
		N_2O	No	Minor emission resource.
Project Activity	Reservoir emissions	CO_2	No	Minor emission resource.
		CH_4	No	The power density of the Project is greater than 10 W/m^2.
		N_2O	No	Minor emission resource.

[1] China DNA (http://cdm.ccchina.gov.cn), Jul. 18th ,2008.

B.4. Description of baseline and its development:

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The baseline of the Project is determined based on the methodology AMS-I.D(Version 13).

The Project is connected into the CSPG. Therefore, the project boundary is defined as the CSPG. The baseline scenario of the Project is electricity delivered to CSPG by the Project that would otherwise be generated by the existing power plants and addition of new generation sources within CSPG.

According to the methodology AMS-I.D, the baseline emission is the baseline emission factor of grid multiplied by the electricity produced by the renewable unit. Therefore, the baseline emission of the Project is the baseline emission factor of CSPG multiplied by the electricity produced by the Project.

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:

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Additionality of the Project is demonstrated based on the requirement of Attachment A of Appendix B to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities.*

As a small hydropower project located in poor area, the Project faces problems such as low tariff and annual output, which make the Project an economically unattractive course of action. The investment barrier is the most prohibitive factor in implementing the Project. Detailed analyses are shown as follow:

Investment Barrier

The purpose of this part is to determine whether the Project is economically attractive or not without CDM revenues through appropriate analysis method.

Determine appropriate analysis method

Three methods can be applied for the investment barrier analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis. Considering that the Project will earn revenues from electricity sales, the benchmark analysis has been selected, and the IRR of the total investment is adopted here for the benchmark analysis.

According to *Economic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources (Document No. SL16-95), the benchmark IRR for small hydropower projects is 10%. Therefore, 10% is adopted as the financial benchmark IRR for the Project. If the total investment's IRR of the Project is less than 10%, the Project will be financially unfeasible and then be additional.

Calculation and comparison of financial indicators

The basic parameters for calculation of financial indicators of the Project are shown in Table 3.

Table 3. Basic parameters for calculation of financial indicators of the Project

Parameter	Unit	Amount	Data source
Installed capacity	MW	5	*Feasibility Study Report*
Estimated annual output	GWh	23.595	*Feasibility Study Report*
Project lifetime	Years	22	*Feasibility Study Report*
Total investment	Million RMB	27.14	*Feasibility Study Report*
Expected bus-bar tariff (excluding VAT)	RMB/kWh	0.17	*Feasibility Study Report*
VAT	%	6	*Feasibility Study Report*
Income tax	%	33	*Feasibility Study Report*
Tax of expense for city maintenance and construction	%	1	*Feasibility Study Report*
Tax of education fee addition	%	3	*Feasibility Study Report*
Period of depreciation	years	20	*Feasibility Study Report*
Rate of scrap value	%	0	*Feasibility Study Report*
Operation cost	Million RMB	0.889	*Feasibility Study Report*

Calculated based on these data, the total investments IRR of the Project is only 7.68% without the income from selling CERs. It is lower than the benchmark IRR. Therefore, the Project is not financially feasible and fulfils the requirement of additionality.

Taking into account the income from selling CERs(if the price of CERs is 8.5EUR/tCO_2e), the total investment's IRR of the Project will be increased to 15.29%, this is higher than the benchmark IRR of 10%. The Project is economically attractive, which means that the CDM revenues could help the Project overcome the investment barrier.

Sensitivity Analysis

The purpose of this step is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.
Three factors are considered in following sensitivity analysis:

The following key parameters have been selected as sensitivity indicators to test the financial attractiveness for the proposed project.

- Power Output
- Total Static investment
- O&M cost
- Grid Tariff

Assuming that the above three factors fluctuate within the range of –10%~+10%, the corresponding impacts on the total investment's IRR of the Project are shown in Table 4 and Figure 3.

Table 4. The results of the sensitivity analysis

Range Scope / IRR (%) / Para-meters	-10%	-5%	0	5%	10%
Power Output	6.26%	6.98%	7.68%	8.38%	9.06%
Total Static Investment	9.00%	8.31%	7.68%	7.11%	6.58%
O&M cost	7.99%	7.84%	7.68%	7.53%	7.37%
Grid Tariff	6.26%	6.98%	7.68%	8.38%	9.06%

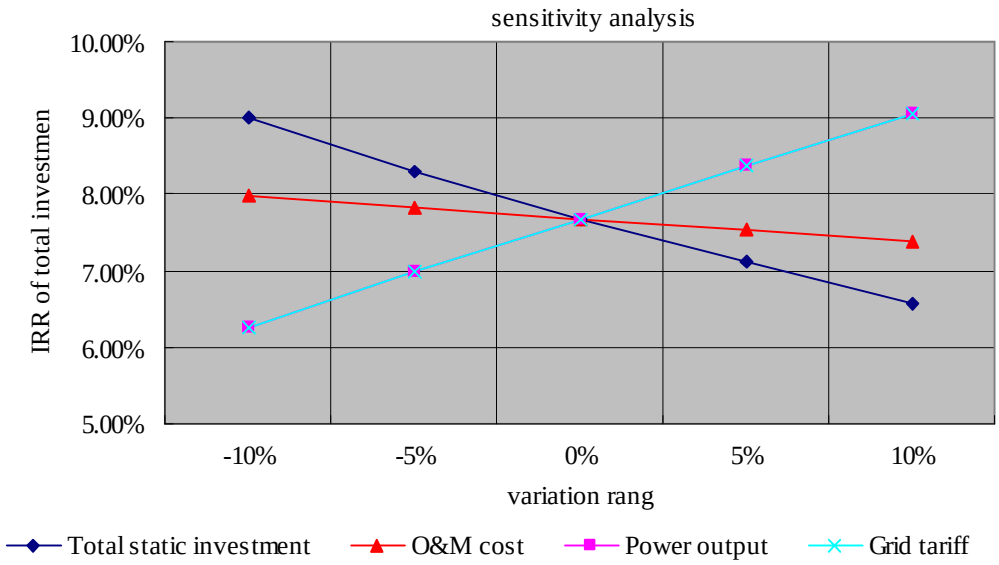

Figure 3. The total investment's IRR sensitivity analysis

As shown in the sensitivity analysis above, even when the factors fluctuated in the range of 10%, the total investment's IRR of the Project could not reach the benchmark (10%) and the conclusion stated above is still tenable.

To sum up, without the CDM revenues, the Project has obvious investment barrier and fulfils the requirement of additionality.

The incentive by the CDM was seriously considered in the decision to proceed with the project activity as follows:

The Feasibility Study Report(FSR), designed by Baoshan Design Institute of Water Conservancy and Hydroelectric Power in Yunnan Province, was finished in Augest, 2006.It indicated that with installed capacity of 5MW(2×2.5MW), the project IRR is only 7.68% , which is significant lower than the benchmark IRR of 10% and the suggestion of applying for CDM revenue was given in the FSR to make the project feasible.

For ensuring whether CDM is reliable, the project owner consulted to The People's Government of Longyang District and the positive response was given as a formal document[2], which was issued on Sep. 5th, 2006. Since the reliability of CDM was confirmed and the Potential CERs revenue could help the project to be financially attractive, the Board meeting was held on Sep. 12rd, 2006 to discuss the project and CDM issues. All stakeholders supported to continue promoting the project under considering CDM and apply for approval. The approval letter of the EIA[3] and FSR[4] were received on Oct. 16th, 2006 and Mar. 24th, 2007 respectively.

[2] Notice on promoting the hydropower project to apply for CDM by The People's Government of Longyang District. (Long Zheng Han[2006]37)

[3] Approval letter for EIA report of Wanpahe Erji Hydropower project by Baoshan Environment Protection Bureau. (Bao Huan Zhun Xu[2006]47)

[4] Approval letter for FSR report of Wanpahe Erji Hydropower project by Baoshan Development and Reform Committee. (Bao Fa Gai Nen gyuan[2007]133)

The project was just started to construct since the CDM Development Agreement had been signed on May. 9th, 2007 with Cleanergy Investment Service (Beijing) Co., Ltd. and Construction permit was issued by relevant authorities on Jul.16th, 2007. The main facilities purchasing contract, including turbine and generator, was signed on Jul. 25th, 2007.

From what discussed above, we can clearly drawn the conclusion that the incentive by the CDM was seriously considered in the decision to proceed with the project activity.

Table 5. Time Schedule of the project activity in the CDM context

Date(dd/mm/yy)	Main Events
05/2006	EIA Report was finished
08/2006	FSR was finished.
05/09/2006	The letter of supporting the project to apply for CDM revenue was issued by The People's Government of Longyang District.
12/09/2006	The board decision of applying for CDM revenue was done.
16/10/2006	The approval letter of the EIA was received.
24/03/2007	The approval letter of the FSR was received.
09/05/2007	The CDM Development Agreement was signed between the project owner and Cleanergy Investment Service (Beijing) Co., Ltd.
16/07/2007	The Construction permit was received.
25/07/2007	The main facilities purchasing contract, including turbine and generator, was signed.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The methodology AMS-I.D is applicable to the Project.

Baseline emissions

Based on the methodology AMS-I.D, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in tCO_2e/MWh) calculated in a transparent and conservative manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the *Tool to calculate the emission factor for an electricity system*, or
(b) The weighted average emissions (in tCO_2e/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

For the Project, method (a) is adopted. Therefore the baseline emissions (BE_y) can be expressed as:

$$BE_y = EG_y \times EF_{grid,CM,y} \quad (1)$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2/yr).

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

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest version of the *Tool to calculate the emission factor for an electricity system*.

The *Tool to calculate the emission factor for an electricity system* provides for a step-wise approach to calculate the $EF_{grid,CM,y}$. These steps include:

Step 1 Identify the relevant electric power system

As described in Section B.3, the spatial extent of the project boundary includes all power plants connected physically into CSPG. Therefore, the project electricity system is defined as CSPG.

The spatial extent of the project boundary includes the project site and all power plants connected physically to CSPG.
For CSPG, there are electricity imports from Central China Power Grid (CCPG)[5]. Therefore the connected electricity system is defined as CCPG. When determining the operating margin (OM) emission factor of CSPG, this PDD uses the weighted average operating margin emission factor of CCPG as the emission factor of net electricity imports ($EF_{grid,import,y}$) from CCPG, and the data used for calculation are adopted from the most recent 3 years. For detail information please refer to Annex3.

Step 2 Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

Among the total electricity generation of CSPG, the amount of low-cost/must run resources accounts for about 33% in 2002, 31% in 2003, 30% in 2004 29% in 2005 and 27% in 2006[6], all less than 50%. Therefore, method (a), simple OM is adopted to calculate the operating margin emission factor of CSPG in this PDD.

For the Project, the *ex-ante* option is adopted with using the data vintage as a 3-year generation-weighted averaged based on the most recent data for calculation of the simple OM emission factor ($EF_{grid,OMsimple,y}$) of CSPG.

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

[5] http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm, etc.

[6] China Electric Power Yearbook, 2003~2007 Edition.

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 on fuel consumption and net electricity generation of each power plant / unit, or

Option B: Based on data on 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 on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option A should be preferred. However, the data on fuel consumption and net electricity generation of each power plant / unit is not publicly available. Thus, Option A cannot be adopted for the Project. Similarly, the data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit are not available too. Thus, Option B cannot be adopted for the Project.

According to the *Notification on Determining Baseline Emission Factors of China Power Grid*, only nuclear and renewable power generations are considered as low-cost / must-run power sources in China. Furthermore, the quantity of electricity supplied to the grid by low-cost / must-run power sources is known. Therefore, Option C is adopted to calculate the simple OM emission factor of CSPG.

The simple OM emission factor 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co2,i,y}}{EG_{grid,y}} \quad (2)$$

Where:

$EF_{grid,OMsimple,y}$ = 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)

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

$EF_{co2,i,y}$ = 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

y = the three most recent years.

The data on electricity generation are obtained from the *China Electric Power Yearbook* from 2005 to 2007 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2005 to 2007 (published annually). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* Volume 2 Energy, Page 1.21 - 1.24.

Step 4 Identify the cohort of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin 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.

Since the set of power units described as (b) in CSPG comprises the larger annual generation than that of (a), the sample group (b) should be used for calculating the build margin of CSPG. Power plant registered as CDM project activities should be excluded from the sample group *m*.

In terms of vintage of data, the PDD choose the option as below:

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.

Step 5 Calculate the build margin emission factor

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:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \qquad (3)$$

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* (MWh).

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh).

m = Power units included in the build margin.

y = Most recent historical year for which power generation data is available.

Currently in China, the capacity margin data of sampling plants group *m* are publicly unavailable. Taking notice of this situation, CDM EB accepts the following deviation in application of methodology AMS-I.D in China[7]:

- Use of capacity additions exceeds 20% of total generation for estimating the build margin emission factor for grid electricity.
- Use of weights estimated using installed capacity in place of annual electricity generation.

And 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.

For the Project: Firstly, calculate the share of different power generation technology in recent capacity additions. Secondly, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

Due to the installed capacities of coal based, oil based and gas based can not be separated and determined directly at present, BM is calculated with following steps and formula:

SubStep 5.a Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the Energy Balance Table of the most recent year.

$$l_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (4)$$

$$l_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (5)$$

$$l_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{co2,i,j}} \quad (6)$$

Where:

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

[7] http://cdm.unfccc.int/Projects/Deviations

$NCV_{i,j}$ = Net calorific value (energy content) of fossil fuel type *i* consumed by province *j* (GJ / mass or volume unit).

$EF_{co2.i.j}$ = CO_2 emission factor of fossil fuel type *i* consumed by province *j* (tCO_2/GJ).

COAL, *OIL* and *GAS* are footnote group for solid fuels, liquid fuels and gas fuels.

SubStep 5.b Calculate emission factor for thermal power of each grid based on the result of SubStep 5.a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal} = l_{Coal} \times EF_{Coal,Adv} + l_{Oil} \times EF_{Oil,Adv} + l_{Gas} \times EF_{Gas,Adv} \quad (7)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.

SubStep 5.c Calculate BM of the grid based on the result of SubStep 5.b and the share of thermal power of recent 20% capacity additions.

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

Where:

CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Electric Power Yearbook* from 2005 to 2007 (published annually) and the *China Energy Statistical Yearbook* from 2005 to 2007 (published annually). The emission factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories,* Volume 2 Energy, Page 1.21 -1.24

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid*, the weighted average fuel consumption for power generation of 600 MW sub-critical coal-fired power generators built in 2006 (329.94 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (252 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

Step 6 Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (9)$$

Where:

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

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

w_{OM} = Weight of operating margin emissions factor (%)

w_{BM} = Weight of build margin emissions factor (%)

The weight w_{OM} and the weight w_{BM} are both taken 0.5 as default for the first crediting period.

Project activity emissions

The project is to generate clean electricity by water power without any fossil fuel involved. Therefore, the annual project emissions by the project activity are zero, then PE_y =0 tCO_2e.

Leakage

As run-of river hydropower plants, there is no energy generating equipment be transferred from another activity and no existing equipment be transferred to another activity involved in the project activities. No leakage is considered in the Project, as $L_y = 0$ tCO_2e.

Emission reductions

The emission reductions (ER_y) by the Project activity during a given year y is the difference between baseline emissions (BE_y), project activity emissions (PE_y) and leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \quad (10)$$

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

>>

Data / Parameter:	*Electricity generation*
Data unit:	*MWh*
Description:	*The total electricity generation and the electricity generated by those low-cost/must run power plants of CSPG on 2002, 2003, 2004,2005 and 2006.*
Source of data used:	*China Electric Power Yearbook 2003, 2004, 2005 ,2006 and 2007 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data.*
Any comment:	-

Data / Parameter:	$EG_{grid,y}$
Data unit:	*MWh*
Description:	*The net electricity generated and delivered to CSPG on 2004, 2005 and 2006, excluding those generated by low-cost/must run power plants/units.*
Source of data used:	*China Electric Power Yearbook 2005, 2006 and 2007 Edition.*

Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data.*
Any comment:	-

Data / Parameter:	*Installed Capacity*
Data unit:	*MW*
Description:	*The installed capacity by different sources of CSPG in 2004, 2005 and 2006.*
Source of data used:	*China Electric Power Yearbook 2005, 2006 and 2007 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data.*
Any comment:	-

Data / Parameter:	$FC_{i,y}$
Data unit:	$10^4 t$ or $10^8 m^3$
Description:	*Different fuel consumptions for power generation in CSPG in 2004, 2005 and 2006.*
Source of data used:	*China Energy Statistical Yearbook 2005, 2006 and 2007 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data.*
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/t or $GJ/10^3 m^3$
Description:	*Average low calorific values of fuels for electricity generation.*
Source of data used:	*China Energy Statistical Yearbook 2007 Edition, P287.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Country-specific values are adopted. (Official data)*
Any comment:	-

Data / Parameter:	$EF_{co2,i,y}$
Data unit:	tCO_2/TJ
Description:	*Emission factors of fuels for electricity generation.*
Source of data used:	*"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Chap 1, Page 1.21-1.24,Table 1.3 and Table 1.4 .*
Value applied:	*Detailed in Annex 3*
Justification of the choice of data or description of	*IPCC world-wide default values are adopted.*

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	*Electricity import*
Data unit:	*MWh*
Description:	*Electricity import from CCPG in 2004, 2005 and 2006*
Source of data used:	*China Electric Power Yearbook 2005, 2006 and 2007Edition*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data*
Any comment:	-

Data / Parameter:	*Average operating margin (OM) emission rate*
Data unit:	*tCO_2e/MWh*
Description:	*Average operating margin (OM) emission rate of CCPG in 2004, 2005 and 2006*
Source of data used:	*Notification on Determining Baseline Emission Factors of China Power Grid*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data*
Any comment:	-

Data / Parameter:	$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ $EF_{Gas,Adv}$
Data unit:	-
Description:	*The efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.*
Source of data used:	*"Notification on Determining Baseline Emission Factors of China Power Grid"*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Official data.*
Any comment:	-

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

>>

Baseline emissions calculation

The OM emission factor ($EF_{grid,OM,y}$) of CSPG is calculated as 1.0634tCO_2e/MWh, and the build margin emission factor ($EF_{grid,BM,y}$) of CSPG is calculated as 0.6968 tCO_2e/MWh. The detailed calculations and data are listed in Annex 3.

Based on formula (9) in section B.6.1, the baseline emissions factor ($EF_{grid,CM,y}$) of CSPG is calculated as 0.8801 tCO_2e/MWh.

Based on *Feasibility Study Report* of the Project, the annual output supplied to the grid (EG_y) is estimated to be 23.595GWh. So it is estimated that the baseline emissions of the Project (BE_y) will be 20,766tCO_2e based on formula (1) in section B.6.1.

Project activity emissions calculation

As described in section B.6.1, the Project activity emissions (PE_y) will be 0 tCO_2e.

Leakage

As described in section B.6.1, the leakage of the Project (L_y) will be 0 tCO_2e.

Emission reductions calculation

Based on formula (10) in section B.6.1, the ex-ante annual emission reductions are estimated as 20,766 tCO_2e.

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

>>

The renewable crediting period is adopted by the Project. It is expected that the Project will generate emission reductions for about 20,766 tCO_2e per year over the first 7-year crediting period from Apr.1th 2009 to Mar.31th 2016.

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2009	0	15,575	0	15,575
2010	0	20,766	0	20,766
2011	0	20,766	0	20,766
2012	0	20,766	0	20,766
2013	0	20,766	0	20,766
2014	0	20,766	0	20,766
2015	0	20,766	0	20,766
2016	0	5,191	0	5,191
Total (tCO_2e)	**0**	**145,362**	**0**	**145,362**

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

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	EG_{y1}
Data unit:	*GWh*
Description:	*Electricity supplied to the grid by the Project.*

Source of data:	*Project activity site.*
Measurement procedures (if any):	*Please refer to Part B.7.2.*
Monitoring frequency:	*Hourly measurement and monthly recording*
QA/QC procedures:	*Please refer to Part B.7.2.*
Any comment:	-

Data / Parameter:	EG_{y2}
Data unit:	*GWh*
Description:	*Electricity purchased from the grid by the Project.*
Source of data:	*Project activity site.*
Measurement procedures (if any):	*Please refer to Part B.7.2.*
Monitoring frequency:	*Hourly measurement and monthly recording*
QA/QC procedures:	*Please refer to Part B.7.2.*
Any comment:	-

Data / Parameter:	EG_{y}
Data unit:	*GWh*
Description:	*Net electricity supplied to the grid by the Project.*
Source of data:	*Project activity site.*
Measurement procedures (if any):	*Calculated as:* $EG_y = EG_{y1} - EG_{y2}$
Monitoring frequency:	*monthly recording*
QA/QC procedures:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

>>

In this PDD, emission factor of the Project is determined ex-ante. Therefore the electricity supplied to the grid and purchased from the grid by the Project is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring of the electricity output of the Project and import of the Project.

1. Implementation of the monitoring plan

The Project owner will take the responsibility of the monitoring plan implementation. A CDM working team is established and consists of project manager, CDM manager, technical staff, and statistic staff. Organizing structure of the CDM team is shown as figure 4.

The appointed staffs will undertake the monitoring tasks including watching metering equipments daily, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, reporting to company administrator or supervisor.

The staff concerned will receive training on monitoring and measurement to ensure the implementation of this monitoring plan before project operation. In the following years within the crediting period, the training will also be provided.

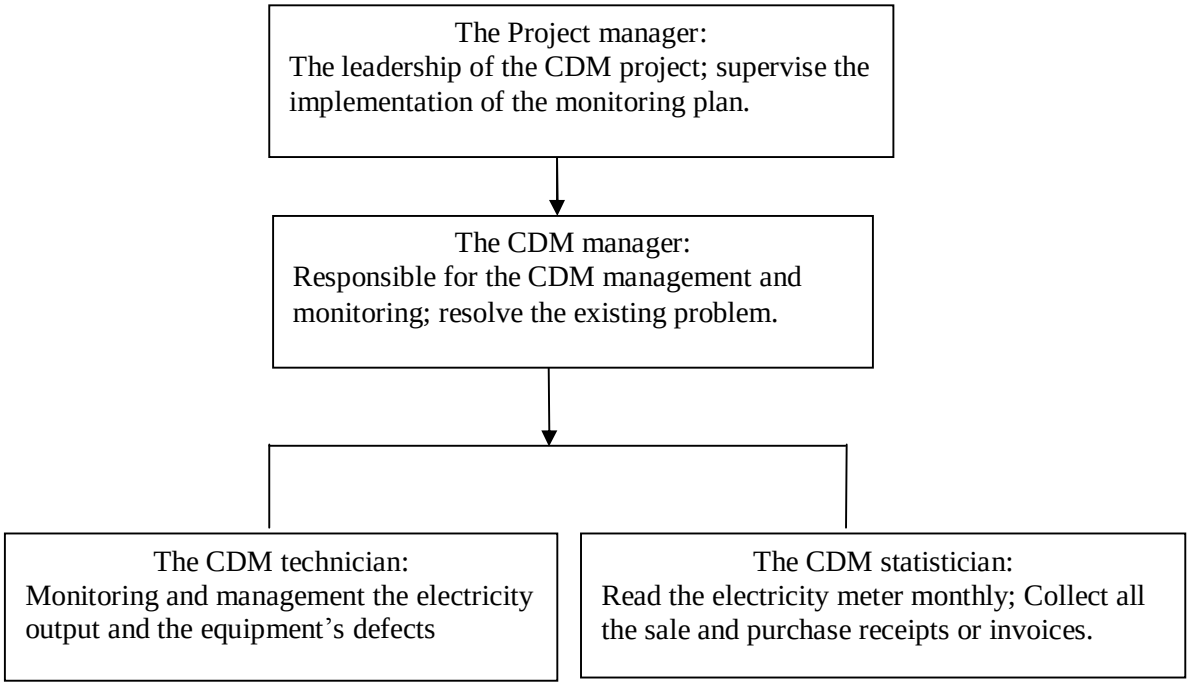

Figure 4 Structure of the CDM team

2. Monitoring of the electricity supplied to and purchased from the grid by the Project

The electricity supplied to and purchased from CSPG by the Project will be continuously monitored through the double-way gateway meters. The precision of the gateway meters will meet national standards.

The net electricity supplied to the CSPG will be calculated by the electricity supplied to the CSPG minus the electricity purchased form the CSPG. Moreover, the net electricity to the CSPG will be used to calculate the emission reduction of the project.

Staffs from the Project owner will be responsible for measured data collecting and recording on site monthly. All the relevant data records will be kept by the Project owner during the crediting period and two years after for DOE's verification.

3. Quality assurance and quality control

The quality assurance and quality control procedures involve data monitoring, recording, archiving, and equipment maintaining and calibration.

The electricity supplied to and purchased from CSPG by the Project will be monitored through the gateway meters and cross-checked against relevant electricity sales receipts and/or records from the grid company for quality control. Since the data required to be monitored is consistent with the data required during project operation by the Project owner and the grid company, the Grid Connection Agreement and the Power Purchase Agreement between these two parties can be used as guidance on data collection and documentation.

Calibration of Meters & Metering should be implemented periodically according to national standards, *DL/T448-2000 the Technical Management Rules for Electric Power Measuring Installations*, and all the records should be documented and maintained by the Project owner for DOE's verification.

Problem occurred in monitoring and measurement process will be recorded and reported to the CDM manager or the project manager. Consequently, the corrective resolution will be adopted to deal with that problem and to avoid it occur again in future.

4. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually.

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

>>

Completion date: 06/08/2008

Entity: Cleanergy Investment Service (Beijing) Co., Ltd.

Address: Capital Times Square, 88 Xichang'an Jie, Beijing, China, 100031.

Tel: +86-10-83914567

Fax: +86-10-83914555

The entity is not the project participants listed in Annex 1.

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:

>>
16/07/2007

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

>>
22 y-0m.

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:

>>
01/04/2009

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.

SECTION D. Environmental impacts

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

>>

Dali Bai Autonomous Prefecture Research Institute of Environmental Sciences was commissioned by the Project owner to conduct the *Environmental Impact Assessment (EIA)* of the Project. The EIA of the Project has been approved by the Environment Protection Bureau of Baoshan City（Document number: Dahuanzhunxu[2006]47）.

According to the *EIA* and *Feasibility Study Report* of the Project, environmental impacts possibly caused by the Project and protect measures adopted by the project owner are analyzed as follows:

Waste water

Wastewater includes production wastewater and sanitary wastewater. The production wastewater of the Project mainly consists of water produced by flushing structural material, mixing concrete and so on, and the pollutants are primarily suspending particulates. The wastewater produced by flushing structural material will be recycled after being treated in the sedimentation tank. The wastewater produced by mixing concrete will be treated in the primary sedimentation tank first, then in the secondary sedimentation tank with acidic matter which is used to adjust the pH in the wastewater. The sanitary wastewater will be orderly treated in the septic tank and the secondary sedimentation tank. All the wastewater can not be drained unless it is disposed in advance to reach the class I of Chinese environmental standard specified as "*Sewage Discharge Standard" (GB8978-1996).*

Air pollution and noise

The Project will generate noise, exhaust gas and dust pollution as a result of construction activities of facilities operating, excavating, filling, milling, cement loading and unloading, and increased traffic. The Project owner will mitigate the impacts on workers and inhabitants near the Project from exhaust gas, noise and dust through virescence, sprinkling at irregular intervals, working in airproof and wet condition, constructing sound arrester, strengthening labour protection measures and so on. These impacts will be eliminated with the achievements of the construction.

Water and solid loss

Water and solid loss will come along with the construction of the Project because of excavation of earth, construction and solid waste dumping. The *Report of Water and Solid Conservation Plan* has been approved by the Water Resources Bureau of Dali Bai Autonomous Prefecture, and the Project owner will strictly enforce this plan during the construction period to mitigate the water and solid loss.

Ecological impacts

The plants destroyed due to construction activities are mostly local plants which are widespread, and there are not protected plants and animals, special species and ancient trees. With the implementation of protecting measure in operation period, the impacted vegetation can be recovered. Therefore, the Project has little impacts on the wildlife.

Fish in the drainage basin of the Project are not abundant. There is no valuable and rare fish and other

aquatic wildlife. Therefore, the Project has little impacts on fishery resources. Meanwhile, in order to protect the environment at lower reaches of Bi River, the project owner will ensure the ecological flow with 0.169m^3/s.

Occupied land and settlement of migrants

4.01hm^2 land will be occupied by the Project due to construction. The Project owner has compensated the owner for occupied land according to relevant laws and regulations. There is no migrant involved in the Project activity, therefore, the settlement of migrants will not be considered.

To sum up, negative impacts on the environment caused by the Project mainly focused on the construction period which will disappear along with the completion of the Project construction. In conjunction with the implementation of a series of environment protection measures during the construction and operation, the Project will not have significant impacts on the 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:

>>

The Project will not have significant impacts on local environment in general, and the EIA of the Project has been approved by the local environmental protection administration.

SECTION E. Stakeholders' comments

>>

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

>>

In order to collect public comments and attitudes towards the Project, the Project owner had carried out a survey to local residents which may be impacted in the area where the Project is sited on Jun.2007. The survey was conducted through distributing and collecting a questionnaire.

Questionnaires were distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner. Totally 30 questionnaires were returned with 100% response rate. Detailed information of respondents lists as follows:

Table 4 Detailed information of respondents

Subject	Age			Education level				Occupations		
	<20	20-40	>40	Elementary school	junior middle school	senior middle school	College and above	farmer	official	student
No.	2	20	8	12	12	2	4	25	4	1

E.2. Summary of the comments received:

>>

The following is a summary of the key findings based on returned questionnaires.

- 30 persons （accounting for 100%) of the respondents know the Project.
- 30 persons （accounting for 100%) of the respondents consider the Project is good for local economic development, improvement of environment and increase of employment opportunities.
- 30 persons （accounting for 100%) of the respondents know the compensation plan of the Project for land occupation and satisfy with the compensation.
- The respondents consider the construction of the Project will produce noise (accounting for 100%), occupy land(accounting for 13.3%).
- 30 persons （accounting for 100%) of the respondents support the construction of the Project. No respondent objects the construction of the Project.

It shows that the local residents strongly support the Project, and they consider the Project will bring various positive impacts on environment, economy and their lives. Some people expressed their concerns on construction noise and land occupation.

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

>>

The Project owner will pay much attention to the comments and suggestions of stakeholders and will put all of the measures listed in the EIA into effect during construction and operation period, so as to achieve environmental benefits, social benefits and economic benefits.

Some respondents expressed their concerns on construction noise. The Project owner will mitigate the impacts on workers and inhabitants near the Project from noise through constructing sound arrester, strengthening labour protection measures. These impacts will be eliminated with the achievements of the construction.

Some respondents also expressed their concerns on land occupation. The Project is a run-of-river hydropower project with no reservoir. The land occupied by the Project was mostly flood land and badland and the Project owner has compensated for occupied land according to relevant laws and regulations. The owner of the land occupied by the Project satisfied with the compensation.

To sum up, the local residents are very supportive on the Project. The Project owner has taken full consideration of the comments and suggestions given by stakeholders during the project implementation. The Project owner will also keep regular communication with the public regarding the construction and operation of the Project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Title:	Legal Representative
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the Project.

Annex 3

BASELINE INFORMATION

Data and calculation method recommended in the *Notification on Determining Baseline Emission Factors of China power Grid* for CSPG are adopted in this PDD.

1. Calculation of OM Emission Factor of CSPG

Table A1. Thermal power generation data within the CSPG in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	169,389,000	5.42	160,208,116
Guangxi	20,143,000	8.33	18,465,088
Guizhou	49,720,000	7.06	46,209,768
Yunnan	24,322,000	7.56	22,483,257
Total			247,366,229

Data source: China Electric Power Yearbook 2005.

Table A2. Thermal power generation data within the CSPG in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	176,453,000	5.58	166,606,923
Guangxi	25,023,000	7.95	23,033,672
Guizhou	58,430,000	7.34	54,141,238
Yunnan	27,281,000	6.94	25,387,699
Total			269,169,531

Data source: China Electric Power Yearbook 2006.

Table A3. Thermal power generation data within the CSPG in 2006

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	188429000	5.27	178,498,792
Guangxi	27967000	4.45	26,722,469
Guizhou	76039000	6.06	71,431,037
Yunnan	39791000	4.12	38,151,611
Total			314,803,908

Data source: China Electric Power Yearbook 2007.

Table A4 shows the low calorific values and emission factors of fuels consumed for electricity generation that are to be used in the following OM emission factor calculation and BM emission factor calculation.

Table A4. Data of fuels consumed for electricity generation

Fuel type	Low calorific value	Emission factor (tc/TJ)
Raw coal	20908 kJ/kg	25.80
Cleaned coal	26344 kJ/kg	25.80
Other washed coal	8363 kJ/kg	25.80
Briquettes	20908 kJ/kg	26.60
Coke	28435 kJ/kg	29.20
Crude oil	41816 kJ/kg	20.00
Gasoline	43070 kJ/kg	18.90
Kerosene	43070 kJ/kg	19.60
Diesel	42652 kJ/kg	20.20
Fuel oil	41816 kJ/kg	21.10
Other petroleum products	38369 kJ/kg	20.00
Other coking products	28435kJ/kg	25.80
Natural gas	38931 kJ/m^3	15.30
Coke over gas	16726 kJ/m^3	12.10
Other coal gas	5227 kJ/m^3	12.10
LPG	50179 kJ/m^3	17.20
Refinery gas	46055 kJ/m^3	15.70

Data sources: China Energy Statistical Yearbook 2007 Edition, P287;
"2006 IPCC Guidelines for National Greenhouse Gas Inventories", Volume2, Chap 1, Table 1.2, Table 1.4

Table A5~A7 show the calculation of simple OM emission factor of CSPG in 2004, 2005 and 2006.

Table A5. Calculation of simple OM emission factor of the CSPG in 2004

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	NCV (MJ/t or 1000m^3) H	Emission (tCO_2e) H=G*F*E*44/12/100 (mass unit) H=G*F*E*44/12/10 (volume unit)
Coal	10^4t	6,017.7	1,305	2,643.9	1751.28	11,717.88	25.8	20,908	231767573.55
Cleaned coal	10^4t	0.21	0	0	0	0.21	25.8	26,344	5233.50
Other washed coal	10^4t	0	0	0	0	0	25.8	8,363	0.00
Coke	10^4t	0	0	0	0	0	29.2	28,435	0.00
Coke oven gas	10^8m^3	0	0	0	0	0	12.1	16,726	0.00
Other coal gas	10^8m^3	2.58	0	0	0	2.58	12.1	5,227	59831.38
Crude oil	10^4t	16.89	0	0	0	16.89	20	41,816	517932.98
Gasoline	10^4t	0	0	0	0	0	18.9	43,070	0.00
Diesel	10^4t	48.88	0	0	1.83	50.71	20.2	42,652	1601975.28
Fuel oil	10^4t	957.71	0	0	0	957.71	21.1	41,816	30983494.25
LPG	10^4t	0	0	0	0	0	17.2	50,179	0.00
Refinery gas	10^4t	2.86	0	0	0	2.86	15.7	46,055	75825.26
Natural gas	10^8m^3	0.48	0	0	0	0.48	15.3	38,931	104833.40
Other petroleum products	10^4t	1.66	0	0	0	1.66	20	38,369	46707.86
Other energy	10^4tce	79.42	0	0	0	79.42	0	0	0.00
Net electricity import from the Central China Power Grid (MWh)									10,951,240
Average emission factor of the Central China Power Grid (tCO_2e/MWh)									0.827319
Total emission of CSPG (tCO_2e)									274,223,576
Fossil power supply of CSPG (MWh)									247,366,229

Data sources: China Energy Statistical Yearbook 2005 Edition

Table A6. Calculation of simple OM emission factor of the CSPG in 2005

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	NCV (MJ/t or $1000m^3$) G	Emission (tCO_2e) H=G*F*E*44/12/100 (mass unit) H=G*F*E*44/12/10 (volume unit)
Raw Coal	10^4t	6,696.47	1,435	3,212.31	1,975.55	13,319.33	25.8	20,908	263,442,601.85
Clean Coal	10^4t	0	0	0	0.15	0.15	25.8	26,344	3,738.21
Other washed coal	10^4t	0	0	10.39	33.88	44.27	25.8	8,363	350,237.59
Coke	10^4t	4.79	0	0	8.05	12.84	29.2	28,435	390,906.18
Coke oven gas	10^8m^3	0	0	0	0.79	0.79	12.1	16,726	58,624.07
Other coal gas	10^8m^3	1.87	0	0	15.96	17.83	12.1	5,227	413,485.84
Crude oil	10^4t	10.91	0	0	0	10.91	20	41,816	334,555.88
Gasoline	10^4t	0.68	0	0	0	0.68	18.9	43,070	20,296.31
Diesel	10^4t	31.96	2.02	0	1.81	35.79	20.2	42,652	1,130,638.84
Fuel oil	10^4t	887.21	0	0	0	887.21	21.1	41,816	28,702,703.26
LPG	10^4t	0	0	0	0	0	17.2	50,179	0.00
Refinery gas	10^4t	4.92	0	0	0	4.92	15.7	46,055	130,440.66
Natural gas	10^8m^3	0.93	0	0	0	0.93	15.3	38,931	203,114.71
Other petroleum products	10^4t	1.7	0	0	0	1.7	20	38,369	47,833.35
Other energy	10^4tce	104.66	133.15	0	59.72	297.53	0	0	0.00
Net electricity import from the Central China Power Grid (MWh)									20,264,000
Average emission factor of the Central China Power Grid (tCO_2e/MWh)									0.77216
Total emission of CSPG (tCO_2e)									310,876,215
Fossil power supply of CSPG (MWh)									269,169,531

Data sources: China Energy Statistical Yearbook 2006 Edition

Table A7. Calculation of simple OM emission factor of the CSPG in 2006

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	NCV (MJ/t or $1000m^3$) G	Emission (tCO_2e) H=G*F*E*44/12/100 (mass unit) H=G*F*E*44/12/10 (volume unit)
Raw coal	10^4t	7303.19	1490.01	4001.54	2735.88	**15530.62**	25.8	20908	307179636.00
Cleaned coal	10^4t					**0**	25.8	26344	0.00
Other washed coal	10^4t			19.53	45.8	**65.33**	25.8	8363	516851.63
Briquettes	10^4t	133.75	0	0	0	**133.75**	26.6	20908	2727466.02
Coke	10^4t				1.31	**1.31**	29.2	28435	39882.17
Coke oven gas	10^8m^3		0.84		2.06	**2.9**	12.1	16726	215202.29
Other gas	10^8m^3	0.89			19.15	**20.04**	12.1	5227	464736.75
Crude oil	10^4t	0.87				**0.87**	20	41816	26678.61
Gasoline	10^4t					**0**	18.9	43070	0.00
Diesel	10^4t	29.92	1.26		3	**34.18**	20.2	42652	1079777.46
Fuel oil	10^4t	685.85	0.09			**685.94**	21.1	41816	22191287.60
LPG	10^4t					**0**	17.2	50179	0.00
Refinery gas	10^4t					**0**	15.7	46055	0.00
Natural gas	10^8m^3	7.92				**7.92**	15.3	38931	1729751.05
Other petroleum products	10^4t	0.67				**0.67**	20	38369	18851.97
other coking products	10^4t					**0**	25.8	28435	0.00
Net electricity import from the Central China Power Grid (MWh)									21,730,840
Average emission factor of the Central China Power Grid (tCO_2e/MWh)									0.87599
Total emission of CSPG (tCO_2e)									355,226,156
Fossil power supply of CSPG (MWh)									314,803,908

Data sources: China Energy Statistical Yearbook 2007 Edition

The Simple OM emission factor is the weighted average value of the Simple OM emission factors in the year 2004, 2005and 2006, i.e.

$EF_{grid,OM,y}$ = (274223576 +310876215 +355226156)/(258317469 +289433531+336534748) = 1.0634 tCO_2e/MWh

2. Calculation of BM Emission Factor of CSPG

Build Margin emission factor is calculated according to the steps and formulae described in Section B.6.1.

Table A8 is data of the efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors with reference to the *Notification on Determining Baseline Emission Factors of China Power Grid* issued by Chinese DNA.

Table A8. The efficiency level of the best electricity generation technology commercially available in China

	Parameter	**Efficiency of supplying electricity**	**Fuel emission factor (tc/TJ)**	**Emission factor (tCO_2e/MWh)**
		A	B	C=3.6/A/1000*B*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	37.28%	25.8	0.9135
Gas-fired power plant	$EF_{Gas,Adv}$	48.81%	15.3	0.4138
Oil-fired power plant	$EF_{Oil,Adv}$	48.81%	21.1	0.5706

Table A9. Data for calculating the thermal power emission factors

Fuel type	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	NCV	Emission factor	CO_2 emissions (tCO_2e)
		A	B	C	D	E=A+B+C+D	F	G	H=E*F*G* 44/12/100
Raw coal	10^4t	7303.19	1490.01	4001.54	2735.88	15530.62	20908	25.8	307179636
Cleaned coal	10^4t	0	0	0		0	26344	25.8	0
Other washed coal	10^4t	0	0	19.53	45.8	65.33	8363	25.8	516851.63
Briquettes	10^4t	133.75	0	0	0	133.75	20908	26.6	2727466
Coke	10^4t		0	0	1.31	1.31	28435	29.2	39882.173
Sub-total									310463836
Crude oil	10^4t	0.87	0	0	0	0.87	41816	20	26678.608
Gasoline	10^4t		0	0	0	0	43070	18.9	0
Kerosene	10^4t	0	0	0	0	0	43070	19.6	0
Diesel	10^4t	29.92	1.26	0	3	34.18	42652	20.2	1079777.5
Fuel oil	10^4t	685.85	0.09	0	0	685.94	41816	21.1	22191288
Other petroleum products	10^4t	0.67	0	0	0	0.67	38369	20	18851.969
Other coking products	10^4t	0	0	0	0	0	28435	25.8	0
Sub-total									23316596
Natural gas	10^7m^3	79.2	0	0	0	79.2	38931	15.3	1729751
Coke oven gas	10^7m^3	0	8.4	0	20.6	29	16726	12.1	215202.29
Other gas	10^7m^3	8.9	0	0	191.5	200.4	5227	12.1	464736.75
LPG	10^4t	0	0	0	0	0	50179	17.2	0
Refinery gas	10^4t		0	0	0	0	46055	15.7	0
Sub-total									2409690.1
Tatal									336190122

Data sources: China Energy Statistical Yearbook 2007

Calculate with data provided in Table A9:

l_{Coal} = 92.35%, l_{Oil} = 6.94%, l_{Gas} =0.71%

Based on Table A8, the emission factor for thermal power is:

$EF_{Thermal} = l_{Coal} \cdot EF_{Coal,Adv} + l_{Oil} \cdot EF_{Oil,Adv} + l_{Gas} \cdot EF_{Gas,Adv}$ =0.8862tCO_2e/MWh.

Table A10. Installed capacity of the CSPG in 2004

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

Data source: China Electric Power Yearbook 2005.

Table A11. Installed capacity of the CSPG in 2005

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	35,182.6	4,931.2	4,758.4	9,634.8	54,507
Hydro power (MW)	9,035.7	6,085.3	7,993.1	7,233	30,347.1
Nuclear power (MW)	3780	0	0	0	3,780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	48,081.7	11,016.5	12,751.5	16,867.8	88,717.5

Data source: China Electric Power Yearbook 2006.

Table A12. Installed capacity of the CSPG in 2006

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	40615	5434	14350	8564	68963
Hydro power (MW)	9320	7624	7534	9698	34176
Nuclear power (MW)	3780	0	0	0	3780
Wind power and Other (MW)	183	0	0	0	183
Total (MW)	53898	13058	21884	18262	107102

Data source: China Electric Power Yearbook 2007.

Table A13. Calculation of BM emission factor of the CSPG

	Installed capacity in 2004 (MW) A	Installed capacity in 2005 (MW) B	Installed capacity in 2006 (MW) C	Capacity additions from 2005 to 2006 (MW) D=C-B	Share in total capacity additions
Thermal power	46659.7	54507	68963	14456	78.63%
Hydro power	27580.1	30347.1	34176	3828.9	20.83%
Nuclear power	3780	3780	3780	0	0.00%
Wind power and Other	83.4	83.4	183	99.6	0.54%
Total	78103.2	88717.5	107102	18384.5	100.00%
Share in total installed capacity of 2005	72.92%	82.83%	100.00%		

BM emission factor of CSPG can be calculated as:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power, therefore,

$EF_{BM,y}$ = 0.8862 ×78.63%= 0.6968tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

Please refer to section B.7. No need to complement more information here.