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

CONTENTS

Annexes

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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Liujiashan 10 MW Small Hydropower Project in Jiangxi Province

Version number of the document: 04

Date: 28/11/2007

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

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Liujiashan 10 MW Small Hydropower Project in Jiangxi Province (hereafter referred to as the Project) developed by Zixi Sanjiang Hydropower Co., Ltd. is located on the Baita river in Zixi Conuty, Fuzhou City, Jiangxi Province. The purpose of the Project is to utilize the water resources of the Baita river to generate electricity to deliver to Central China Power Grid (CCPG) through the Jiangxi Power Grid (JXPG) without CO_2 emissions.

The Project is a 10 MW hydropower project with a reservoir of 19.9 million m^3 storage capacity. The reservoir surface area at full reservoir level is 1.07 square kilometre[1], and the power density (defined as installed capacity divided by the surface area) is 9.3 W/m^2. It is estimated that the electricity supplied to the grid will be 25.09 GWh annually. The Project activity 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 CCPG. The estimated emission reductions are 22207 tCO_2e per year.

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 CCPG by increasing the share of renewable energy;
- ✧ To create plenty of short-term employment opportunities during the project construction period and a number of permanent jobs during the operation time for the local people.

[1] Source: *Feasibility Study* (FS) of the Project.

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)	Zixi Sanjiang Hydropower Co., Ltd. (project owner)	No
Sweden	EcoSecurities Group PLC (buyer)	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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Jiangxi province

A.4.1.3. City/Town/Community etc:

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Luyang Town, Zixi County, Fuzhou 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 sited within Liujiashan Village of Luyang Town, Zixi County, Fuzhou City, Jiangxi Province, P.R.China. The Project's dam site is located in the Baita river canyon 1.2 km downstream from Liujiashan Village and about 6 km from Zixi County. The geographical coordinates of the Project site are 27°49′ N-117°07′ E in degree. Figure 1 and Figure 2 show the detailed geographical location of the Project site.

Figure 1. Map showing the location of Jiangxi Province

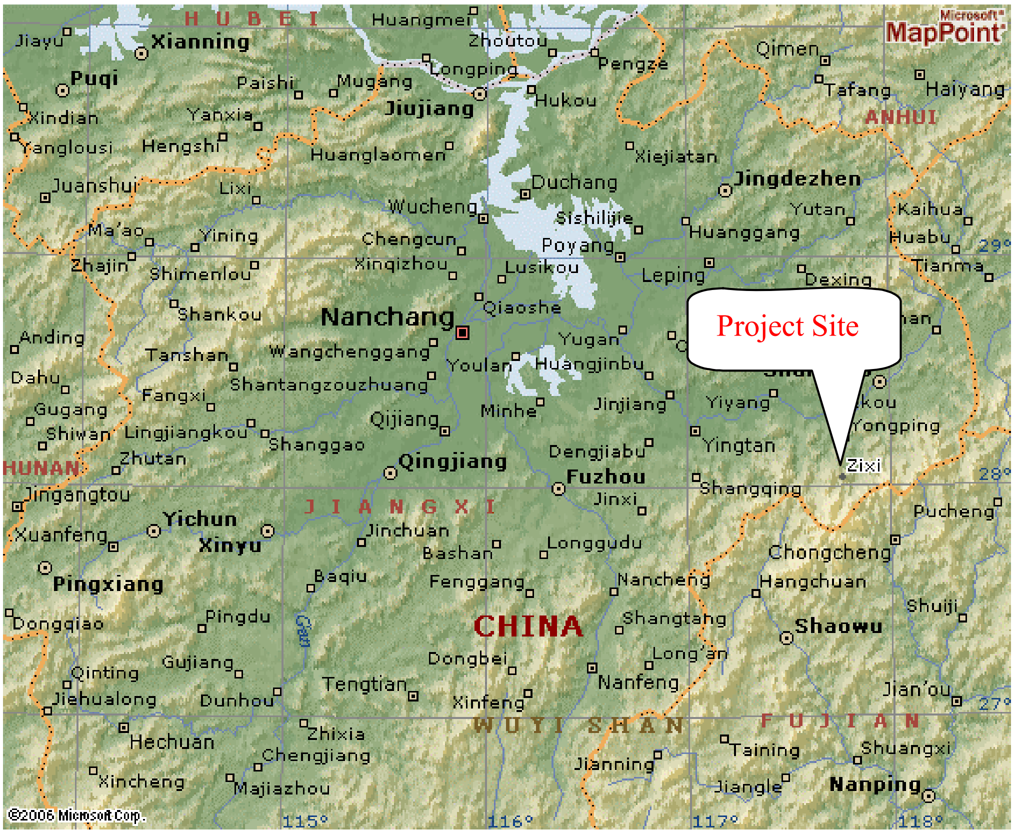

Figure 2. Map showing the location of the Project

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: Hydro

The Project is a diversion hydropower station. It is designed to deliver discharge flow of 22.48 m^3/s with 44.62 m water head. The total installed capacity of the Project is 10 MW with 0.98 MW of guarantee output. It is estimated that the feed-in electricity to CCPG from the Project is approximately 25.09 GWh per year through a 35KV transmission line.

The Project will install two sets of 5 MW hydro turbines (HLD74-LJ-120) and associated generators (SF4000-14/2600). Key technical parameters of the hydro turbine and the generator are listed in Table 1.

Table 1. Key technical parameters of the hydro turbine and the generator

Hydro Turbine		**Generator**	
Turbine Type	HLD74-LJ-120	Generator Type	SF4000-14/2600
Rated head	42.3 m	Rated Power	5000 kW
Wheel diameter	120 cm	Power factor	0.8
Rated flow	11.24 m^3/s	Rated voltage	6300 V
Rated speed	428.6 r/min	Rated current	458 A
Runaway speed	882 r/min	Rated frequency	0 HZ
Declared working condition efficiency	91.2%	Generator efficiency	0.95
Best efficiency	93%		
Installation draught-height	+1.5 m		

Facilities used in the Project are produced domestically without technology transfer.

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

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The renewable crediting period is adopted by the Project. It is expected that the Project will generate emission reductions for about 22207 tCO_2e per year over the first 7-year crediting period from Mar., 2008 to Feb., 2015.

Years	Annual estimation of emission reductions in tonnes of CO_2e
2008	22207
2009	22207
2010	22207
2011	22207
2012	22207
2013	22207
2014	22207
Total estimated reductions (tonnes of CO_2e)	**155449**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**22207**

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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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. The Project participants further 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.

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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The methodology applied for the Project is the approved methodology for small-scale CDM project- AMS-I.D. “Grid connected renewable electricity generation” (version 10). For more information regarding the methodology, please refer to the link: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

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

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The total installed capacity of the Project is 10 MW, which is less than 15 MW. Therefore, the Project qualifies as Type I, small-scale project activity. Furthermore, the Project is a newly built hydropower

project and the electricity produced by the Project will be supplied to CCPG, which is predominated by fossil fuel-fired power plants. Therefore, the Project category falls within Category I.D., renewable energy generation for a grid, and the approved methodology for small-scale CDM project- AMS-I.D.is applicable for the Project.

B.3. Description of the project boundary:

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Based on the methodology AMS-I.D., the project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the Project should be the electricity generated by CCPG. Therefore, the project boundary is defined as CCPG. The spatial extent of the project boundary includes the Project site and all power plants connected physically to CCPG.

According to *Notification on Determining Baseline Emission Factors of China Power Grid*[2] issued by the National Development and Reform Commission of the Government of China (China DNA), Jiangxi Power Grid is an integral part of CCPG which is composed of Jiangxi Power Grid, Henan Power Grid, Hubei Power Grid, Hunan Power Grid, Chongqing Power Grid and Sichuan Power Grid.

B.4. Description of baseline and its development:

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The baseline scenario of the Project is electricity delivered to CCPG by the Project that would otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. According to the methodology AMS-I.D., the baseline is the electricity produced by the Project multiplied by the emission factor of CCPG.

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 to Appendix B of the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*.

In the phase of FS approved by the local government on Dec. 2003, the Project is likely to be economically attractive for the total investment's IRR is 13.04% based on a electricity tariff of 0.38 RMB/kWh which is rated by the summation of costs, tax and profits. However, on Jul. 19th, 2004, the Development and Reform Comission of Jiangxi Province issued a policy document regulating that the electricity tariff for new small hydropower projects should be at the level of 0.25 RMB/kWh, then the Project must be economically unattractive. Considering this situation, the Project owner decided to develope the Project as a CDM project, and the Project accquired *Letter of*

[2] China DNA(http://cdm.ccchina.gov.cn), August 9th ,2007.

Loan Intent issued by the Zixi Subbranch of China Agriculture Bank on Sep. 15th, 2004, which indicated that the intent of loan was based on the Project owner's consideration of CDM.

The investment barrier is the most prohibitive factor in implementing the Project. Detailed analysis are shown as follows:

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 2.

Table 2. Basic parameters for calculation of financial indicators of the Project

Parameter	Unit	Amount	Source
Installed capacity	MW	10	FS
Estimated annual output	GWh	25.09	FS
Project lifetime	Years	20	FS
Total investment	10^4 RMB	4995.98	FS
Expected electricity tariff (including VAT)	RMB/kWh	0.25	Electricity tariff policy of Jiangxi Province
Rate of VAT	%	6	FS
Income tax	%	17	FS
Tax of expense for city maintenance and construction	%	1	FS
Tax of education fee addition	%	3	FS
Rate of depreciation	%	3	FS
Rate of scrap value	%	40	FS

Operation and maintenance cost	10^4 RMB	88.54	FS

Calculated based on these data, the total investment's IRR of the Project is only 7.08% without the income from selling CERs. It is lower than the benchmark IRR. Therefore, the Project is not financially feasible and fulfills the requirement of additionality.

Taking into account the income from selling CERs (calculated with the price of 10 US$/t$CO_2$e), the total investment's IRR of the Project will be increased to 10.98%, which 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:

- ✧ Total investment.
- ✧ Annual O&M cost.
- ✧ Electricity 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 3 and Figure 3.

Table 3.Data for sensitivity analysis

Range / Factor	-10%	-5%	0	5%	+10%
Total investment (%)	8.01%	7.44%	7.08%	6.43%	5.99%
Annual O&M cost (%)	7.09%	7.00%	7.08%	6.82%	6.73%
Electricity tariff (%)	5.81%	6.37%	7.08%	7.45%	7.99%

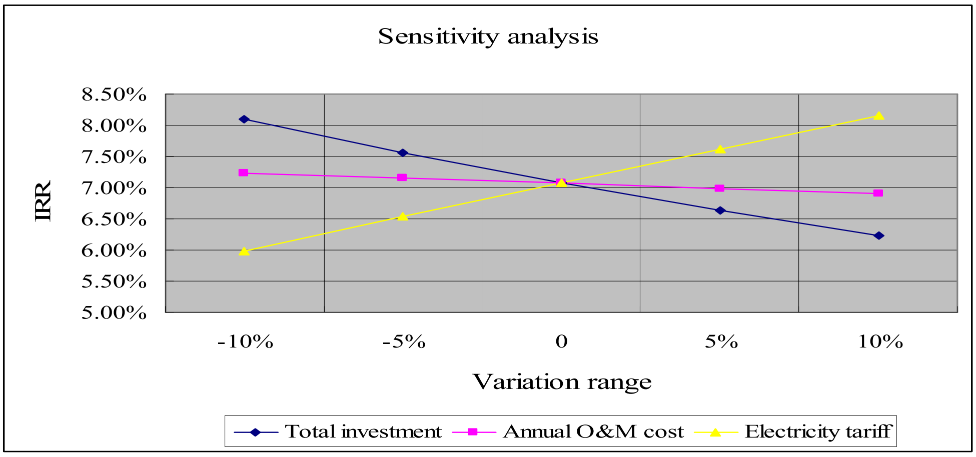

Figure 3. The total investment's IRR sensitivity analysis

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.

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 electricity 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 approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered, 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, option (a) is adopted to calculate the baseline emission coefficient.

According to ACM0002, to calculate the baseline emissions, emission factors of operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) were determined by ex-ante. Then the baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$.

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

According to methodology ACM0002, calculation of operating margin emission factor ($EF_{OM,y}$) should be based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

The justifications of the choice of method to calculate OM emission factor are as follows.

The application of method (c) requires availability of dispatch data. However, the detailed data of dispatch are taken as confidential business information by the grid company and not publicly available. Thus, method (c) cannot be adopted for the Project. Similarly, the data of annual load duration curve required by method (b) also can not be obtained publicly. Therefore, method (b) is also not applicable here.

From 2001 to 2005, among the total electricity generation of CCPG that the Project is connected into, the amount of low-cost/must run resources accounts for 37%, 36%, 34%, 39% and 38% respectively[3], all less than 50%, which can't fulfill the requirement of method (d), but can fulfill the requirement of method (a).

Therefore, method (a), simple OM is adopted to calculate the operating margin emission factor of CCPG.

For the Project, the simple OM emission factor ($EF_{OM,simple,y}$) of CCPG is calculated *ex-ante*.

According to ACM0002, the simple OM emission factor ($EF_{OM,simple,y}$) is calculated as:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \qquad (1)$$

where:

$F_{i,j,y}$ is the total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year(s) *y*,
j refers to the power sources serving the grid, excluding those low-operating cost and must-run power plants, and including imports to the grid[4],
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the oxidation rate of the fuel in year(s) *y*, and
$GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by the sources *j*.

The CO_2 emission coefficient $COEF_i$ is obtained from formula (2) as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (2)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of fuel *i* (here the country-specific values are adopted),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i* (here the IPCC default values are adopted),
$OXID_i$ is the oxidation factor of the fuel *i* (here the IPCC default values are adopted).

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2004 to 2006 (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 2004 to 2006 (published annually). The emission factors and oxidation

[4] An import from a connected electricity system should be considered as one power source *j*.

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, Chap 1, Page 1.21-1.24.

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

According to ACM0002, the build margin emission factor ($EF_{BM,y}$) is calculated using the following formula (3):

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (3)$$

where:

$F_{i,m,y}$, $COEF_{i,m,y}$ and $GEN_{m,y}$ are analogous to the variables described in step 1 above for plants *m*.

For the Project, the BM emission factor ($EF_{BM,y}$) of CCPG is calculated *ex-ante*.

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 AM0005 in China[5]:

- ✧ Use of capacity additions during the 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.

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.

Since methodology AM0005 has been replaced by the consolidated methodology ACM0002, the deviation above is also applicable to the consolidated methodology ACM0002. Therefore 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

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

calculate the emission factor using the efficiency level of the best technology commercially available in China.

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

Substep 2.1 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.

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

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

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

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*,

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/tCe), taking into account the carbon content of the fuels (coal, oil and gas) used by province *j* and the percent oxidation of the fuel in year(s) *y*, and *COAL*, *OIL* and *GAS* are footnote group for solid fuels, liquid fuels and gas fuels.

Substep 2.2 Calculate emission factor for thermal power of each grid based on the result of Substep2.1 and the efficiency level of the best technology commercially available in China.

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

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 2.3 Calculate BM of the grid based on the result of Substep2.2 and the share of thermal power of recent 20% capacity additions.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \tag{8}$$

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

The data for the calculation of BM emission factor are obtained from the *China Electric Power Yearbook* from 2004 to 2006 (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 2004 to 2006 (published annually). The emission factors and oxidation 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, Chap 1, 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 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China..

Step 3. Calculate the Baseline Emission Factor (EF_y)

Based on the approved methodology ACM0002, the baseline emission factor (EF_y) is calculated as the weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$), as

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \tag{9}$$

According to the approved methodology ACM0002, the weight w_{OM} and the weight w_{BM} are both take 0.5 as default.

Step 4. Calculate the Baseline Emissions

Baseline emissions are calculated with baseline emission factor (EF_y) and electricity supplied by the Project to the grid (EG_y), as follows:

$$BE_y = EG_y \times EF_y \qquad (10)$$

Project activity emissions

The power density of the Project is 9.3 W/m^2. According to the methodology ACM0002, if the power density of the project is greater than 4 W/m^2 and less than or equal to 10 W/m^2, the project activity emissions (PE_y) are calculated as:

$$PE_y = \frac{EF_{\mathrm{Res}} \times EG_y}{1000} \qquad (11)$$

where:

EF_{Res} is the default emission factor for emissions from reservoir, and the default value as per EB23 is 90 KgCO_2e/MWh, and

EG_y is the electricity supplied by the Project to the grid.

Leakage

As newly built 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:

$$ER_y = BE_y - PE_y - L_y \qquad (12)$$

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

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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 CCPG on 2001, 2002, 2003, 2004 and 2005.*
Source of data used:	*China Electric Power Yearbook 2002, 2003, 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in China Electric Power Yearbook 2002, 2003, 2004, 2005 and 2006 Edition.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CCPG is defined as the project boundary of the Project.* *According to ACM0002, method of simple OM can only be used where low-cost/must run resources constitute less than 50% of total grid generation.*
Any comment:	*Official data.*

Data / Parameter:	$GEN_{j,y}$
Data unit:	*MWh*
Description:	*The electricity generation supplied to CCPG on 2003, 2004 and 2005, excluding those generated by low-cost/must run power plants.*
Source of data used:	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CCPG is defined as the project boundary of the Project.* *According ACM0002, those low-operating cost and must-run power plants in CCPG are excluded for calculation of simple OM emission factor.*
Any comment:	*Official data.*

Data / Parameter:	*Installed Capacity*
Data unit:	*MW*
Description:	*The installed capacity by different sources of CCPG on 2002, 2003 and 2005.*
Source of data used:	*China Electric Power Yearbook 2003, 2004 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CCPG is defined as the project boundary of the Project.* *According to the deviation accepted by the CDM EB, the installed capacity is used in place of annual electricity generation for calculation of BM emission factor.*
Any comment:	*Official data.*

Data / Parameter:	$F_{i,j,y}$
Data unit:	*10^4t or 10^8m^3*
Description:	*Different fuel consumptions for power generation in CCPG on 2003, 2004 and 2005.*
Source of data used:	*China Energy Statistical Yearbook 2004, 2005 and 2006 Edition.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CCPG is the project boundary of the Project.*
Any comment:	*Official data.*

Data / Parameter:	NCV_i
Data unit:	*GJ/t or GJ/10^3m^3*
Description:	*Average low calorific values of fuels for electricity generation.*
Source of data used:	*China Energy Statistical Yearbook 2006 Edition, P287.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Chinese country-specific values are adopted.*
Any comment:	*Official data.*

Data / Parameter:	$EF_{CO2,i}$
Data unit:	*tC/TJ*
Description:	*Emission factors of fuels for electricity generation.*
Source of data used:	"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2.
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*IPCC world-wide default values are adopted.*
Any comment:	*Data issued by IPCC.*

Data / Parameter:	$OXID_i$
Data unit:	-
Description:	*Oxidation rates of fuels for power generation.*
Source of data used:	*"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2.*

Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*IPCC world-wide default values are adopted.*
Any comment:	*Data issued by IPCC.*

Data / Parameter:	*Best efficiency level of thermal power*
Data unit:	-
Description:	*Emission factors reflecting 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 :	*According to the deviation accepted by CDM EB, the efficiency level of the best technology commercially available in the national grid of China is used as a conservative value for calculation of BM emission factor.*
Any comment:	*Official data.*

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

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Baseline emissions calculation

The OM emission factor ($EF_{OM,y}$) of CCPG is calculated as 1.2909 tCO_2e/MWh, and the build margin emission factor ($EF_{BM,y}$) of CCPG is calculated as 0.6592 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_y) of CCPG is calculated as 0.9751 tCO_2e/MWh.

According to the *Feasibility Design Report* of the Project, the annual output supplied to the grid (EG_y) is estimated to be 25.09 GWh. So it is estimated that the baseline emissions of the Project will be 24465 tCO_2e based on formula (10) in section B.6.1.

Project activity emissions calculation

According to formula (11) in section B.6.1, the Project activity emissions (PE_y) will be 2258 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 (12) in section B.6.1, the ex-ante annual emission reductions are estimated as 22207 tCO_2e.

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

>>

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)
2008	2258	24465	0	22207
2009	2258	24465	0	22207
2010	2258	24465	0	22207
2011	2258	24465	0	22207
2012	2258	24465	0	22207
2013	2258	24465	0	22207
2014	2258	24465	0	22207
Total (tCO_2e)	**15806**	**171255**	**0**	**155449**

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

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	EG_y
Data unit:	*GWh*
Description:	*Electricity supplied to the grid by the Project.*
Source of data to be used:	*Measured by meters installed at the Project site.*
Value of data	*25.09*
Description of measurement methods and procedures to be applied:	*The electricity supplied to CCPG by the Project is measured continuously through electronic metering instruments at the Project site and will be recorded by designated staff on a monthly basis.*

QA/QC procedures to be applied:	*Please refer to Part B.7.2.*
Any comment:	-

Data / Parameter:	*Surface area of the reservoir*
Data unit:	*km^2*
Description:	*Surface area of the reservoir at full level*
Source of data to be used:	*FS*
Value of data	*1.07*
Description of measurement methods and procedures to be applied:	*The area will be monitored based on topographical data and the height of the dam*
QA/QC procedures to be applied:	-
Any comment:	*Monitored once at start of the project. Monitored data will be kept during the crediting period.*

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 by the Project is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring of the data.

1. Implementation of the monitoring plan

The Project owner, Zixi Sanjiang Hydropower Co., Ltd will take the responsibility of the monitoring plan implementation.

The staff from technology and financial departments will undertake the monitoring tasks including watching metering equipments daily, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, and 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.

2. Monitoring of the electricity supplied to the grid by the Project

The electricity delivered to CCPG by the Project will be continuously monitored through metering equipments installed in the Project site. On-duty staff will watch the operation status of metering equipments everyday on site. Furthermore, designated staff will collect the measured electricity data and

complete the corresponding records on a monthly basis. Before being archived, these records will be checked by other staffs to ensure the correctness. The data from these records will be digested and analyzed and the results will be reported to company administrator or supervisor.

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 involves of data monitoring, recording, maintaining and archiving, and monitoring equipment calibration.

The electricity delivered to CCPG by the Project will be monitored through metering equipment at the Project sites. The data should be cross-checked against relevant electricity sales receipts and/or records from the grid 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 Power Purchase Agreement between these two parties can be used as reference to data collection and documentation.

Calibration of Meters & Metering should be implemented according to national standards and rules (such as *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 company administrator or supervisor. 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: 28/11/2007

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:

>>

20/10/2004

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

>>

20 years.

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

C.2.1. Renewable crediting period

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

>>

01/03/2008

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:

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The *Environmental Impacts Assessment* of the Project was approved by the Environment Protection Bureau of Fuzhou City on Jan 14, 2005.

According to the EIA, environmental impacts possibly caused by the Project and protect, guard measures adopted by the project owner are analyzed as follows:

Waste water

Production wastewater, sanitary wastewater and pit wastewater will be generated during the construction and operation period of the Project. The pollutants in the production wastewater are primarily suspending particulates, and will be treated by means of coagulation and sedimentation. The sanitary wastewater will be treated in a temporary water-collecting basin and a sedimentation tank. For the pit wastewater, the treating procedure will include putting flocculation agent and statically settling for at least 2 hours. All the wastewater cannot 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

Noises from various construction machines, tail gas emitted by vehicles as well as dust during construction of the Project will have temporary impacts on the quality of local sound environment and air environment. The Project owner will reduce impacts of waste gas, noise and dust on the construction staff by means of virescence, sprinkling at irregular intervals, enhancing maintenance of machinery and equipment and adopting corresponding labor protective measures. 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 Fuzhou Water Conservancy Bureau, and the Project owner will strictly enforce this plan during the construction period.

Ecological impacts

The impacts on the vegetation are mainly from activities of construction and reservoir submerging. The plants destroyed due to construction activities are mostly secondary shrubbery and weed, and there have no impacts on valuable and rare plants. With the implementation of water and solid conservation plan, the impacted vegetation can be recovered. The submerged woodland is mainly composed of artificial vegetation, and the reservoir is low-head type with low impounded level, so the impacted area is small. Therefore, the Project has little impacts on the regional ecosystem and the vegetation.

There is no valuable, rare and endangered wildlife in the region of the Project, and the engineering has little impacts on terrestrial organisms. Fish in the drainage basin of the Project are mainly artificially bred in ponds or reservoirs, which are not considered to be abundant. There is no valuable and rare fish and other aquatic wildlife. Therefore, the Project has little impacts on fishery resources.

Compensation for submerged land and settlement of migrants

346667 m^2 of farmland and 166667 m^2 of woodland will be occupied by the Project due to reservoir submerging and construction, and 179 persons need to be migrated. The Project owner has signed the resettlement agreement and the land occupation agreement with local residents according to relevant laws and regulations, and the corresponding compensation are being enforced.

In conclusion, environmental impacts arising from the Project are considered insignificant.

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 Nov. 2006, staff from the project owner carried out a survey of local residents possibly be impacted in the area where the Project is sited to collect public comments and attitudes towards the Project. The survey was conducted through distributing and collecting responses to 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 62 questionnaires returned out of 65 with 95.4% response rate.

The survey had taken full account into the public advice of different ages, genders, and occupations. Of all the respondents, 37.1% are under the age of 40, 62.9% are over 41; 66.1% are male and 33.9% are female; 58 farmers, 3 civilians and 1 worker.

E.2. Summary of the comments received:

>>

The following is a summary of the key findings based on 62 returned questionnaires.

- ✧ 40 persons (64.5%) of the respondents support the construction of the Project, 21 persons (33.9%) hold a neutral attitude and 1 person (1.6%) leave the question blank.
- ✧ The respondents consider construction and operation of the Project may produce positive impacts of lessening of power cut (59.7%), decrease of electricity price (16.1%), improvement of traffic condition (59.7%), improvement of local environment (46.8%), increase of income (3.2%) and increase of employment opportunities (16.1%).
- ✧ The respondents are wondering whether construction and operation of the Project will produce negative impacts of construction noise (1.6%), decrease in water usage (1.6%), land occupation (79.0%) and decrease in farm output (19.4%).
- ✧ Some respondents suggest the Project owner to make more compensation, to offer employment opportunities and to decrease the price of electricity usage of migrants.

It shows that the local residents strongly support the Project, and they consider the Project will bring various positive impacts on their lives. The possible negative impacts focus on the occupation of lands and the decrease in farm output.

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.

The Project owner has signed the resettlement agreement and the land occupation agreement with local residents, and the compensation standards were set according to relevant laws, local regulations and negotiation with local residents, which have been confirmed by local government. At present the compensation agreement are being strictly enforced by the Project owner.

For those residents considering the decrease in farm output, the Project owner will provide some of subsidies for them to dig drains for irrigating farm. Then the impacts on farm output will be alleviated.

For the suggestion of "Offer employment opportunities", the Project owner has employed 62 local people through publicly inviting, training and checking. During the construction period, the Project has also provided a lot of short-term job for local residents.

Suggestions such as "Decrease the price of electricity usage of migrants" offered by some respondents are to be decided by the local grid company and out of reach of the Project owner, but the Project owner would like to help the migrants to communicate with the grid company about it.

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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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

The calculation method and data recommended in the *Notification on Determining Baseline Emission Factors of China power Grid*[6] for CCPG are adopted in this PDD.

1. Calculation of OM Emission Factor of CCPG.

Table A1. Thermal power supplied to CCPG in 2003

	Thermal power generation (MWh)	Auxiliary electricity consumption (%)	Thermal power supplied to the grid (MWh)
Jiangxi	27165000	6.43	25418290.5
Henan	95518000	7.68	88182218
Hubei	39532000	3.81	38025830.8
Hunan	29501000	4.58	28149854
Chongqing	16341000	8.97	14875212.3
Sichuan	32782000	4.41	31336314
Total	-	-	225987719

Data source: China Electric Power Yearbook 2004 Edition.

Table A2. Thermal power supplied to CCPG in 2004

	Thermal power generation (MWh)	Auxiliary electricity consumption (%)	Thermal power supplied to the grid (MWh)
Jiangxi	30127000	7.04	28006059.2
Henan	109352000	8.19	100396071
Hubei	43034000	6.58	40202362.8
Hunan	37186000	7.47	34408206
Chongqing	16520000	11.06	14692888
Sichuan	34627000	9.41	31368599
Total	-	-	249074186

Data source: China Electric Power Yearbook 2005 Edition.

Table A3. Thermal power supplied to CCPG in 2005

	Thermal power generation (MWh)	Auxiliary electricity consumption (%)	Thermal power supplied to the grid (MWh)
Jiangxi	30000000	6.48	28056000

[6] China DNA (http://cdm.ccchina.gov.cn), August 9th ,2007.

Henan	131590000	7.32	121957612
Hubei	47700000	2.51	46502730
Hunan	39900000	5	37905000
Chongqing	17584000	8.05	16168488
Sichuan	37202000	4.27	35613475
Total	-	-	286203305

Data source: China Electric Power Yearbook 2006 Edition.

Table A4 shows the low calorific values, emission factors and oxidation rates 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)**	**Oxidation rate**
Raw coal	20908 kJ/kg	25.80	1
Cleaned coal	26344 kJ/kg	25.80	1
Other washed coal	8363 kJ/kg	25.80	1
Coke	28435 kJ/kg	29.20	1
Crude oil	41816 kJ/kg	20.00	1
Gasoline	43070 kJ/kg	18.90	1
Kerosene	43070 kJ/kg	19.60	1
Diesel	42652 kJ/kg	20.20	1
Fuel oil	41816 kJ/kg	21.10	1
Other petroleum products	38369 kJ/kg	20.00	1
Natural gas	38931 kJ/m^3	15.30	1
Coke over gas	16726 kJ/m^3	12.10	1
Other coal gas	5227 kJ/m^3	12.10	1
LPG	50179 kJ/m^3	17.20	1
Refinery gas	46055 kJ/m^3	15.70	1

Data sources: China Energy Statistical Yearbook 2006 Edition, P287;
"2006 IPCC Guidelines for National Greenhouse Gas Inventories", Volume2, Chap 1, Table 1.3, Table 1.4

Table A5~A7show the calculation of the simple OM emission factor of CCPG in 2003, 2004 and 2005.

Table A5. Calculation of the simple OM emission factor of CCPG in 2003

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission factor	Oxidation rate	NCV	CO_2 emissions（tCO_2e）
									（tc/TJ）	（%）	（MJ/t,km^3）	K=G*H*I*J*44/12/10000 （mass unit）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (volume unit)
Raw coal	10^4t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100	20908	273971539.89
Clean washed coal	10^4t	0	0	0	0	0	0	0	25.8	100	26344	0.00
Other washed coal	10^4t	2.03	39.63	0	0	106.12	0	147.78	25.8	100	8363	1169146.40
Coke	10^4t	0	0	0	1.22	0	0	1.22	29.2	100	28435	37142.18
Coke oven gas	10^8m^3	0	0	0.93	0	0	0	0.93	12.1	100	16726	69013.15
Other gas	10^8m^3	0	0	0	0	0	0	0	12.1	100	5227	0.00
Crude oil	10^4t	0	0.5	0.24	0	0	1.2	1.94	20	100	41816	59490.23
Diesel	10^4t	0	0	0	0	0	0	0	18.9	100	43070	0.00
Fuel oil	10^4t	0.52	2.54	0.69	1.21	0.77	0	5.73	20.2	100	42652	181015.94
LPG	10^4t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157229.00
Refined gas	10^4t	0	0	0	0	0	0	0	17.2	100	50179	0.00
Natural gas	10^8m^3	1.76	6.53	0	0.66	0	0	8.95	15.7	100	46055	237285.34
Other petroleum products	10^4t	0	0	0	0	0.04	2.2	2.24	15.3	100	***38931***	***489222.52***
Other coking products	10^4t	0	0	0	0	0	0	0	20	100	38369	0.00
Other energy	10^4t Ce		11.04	0	0	16.2	0	27.24	0	100	0	0.00
Total emissions of CCPG (tCO_2e)												276371085
Thermal power supplied to CCPG (MWh)												225987719

Data sources: China Energy Statistical Yearbook 2004 Edition; China Electric Yearbook 2004 Edition

Table A6. Calculation of the simple OM emission factor of CCPG in 2004

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission factor	Oxidation rate	NCV	CO_2 emissions（tCO_2e）
									（tc/TJ）	（%）	（$MJ/t,km^3$）	K=G*H*I*J*44/12/10000（mass unit）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (volume unit)
Raw coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.29
Clean washed coal	10^4t	0	2.34	0	0	0	0	2.34	25.8	100	26344	58316.13
Other washed coal	10^4t	48.93	104.22	0	0	89.72	0	242.87	25.8	100	8363	1921441.23
Coke	10^4t	0	109.61	0	0	0	0	109.61	29.2	100	28435	3337011.41
Coke oven gas	10^8m^3	0	0	1.68	0	0.34	0	2.02	12.1	100	16726	149899.53
Other gas	10^8m^3	0	0	0	0	2.61	0	2.61	12.1	100	5227	60527.09
Crude oil	10^4t	0	0.86	0.22	0	0	0	1.08	20	100	41816	33118.27
Diesel	10^4t	0	0.06	0	0	0.01	0	0.07	18.9	100	43070	2089.33
Fuel oil	10^4t	0.02	3.86	1.7	1.72	1.14	0	8.44	20.2	100	42652	266627.32
LPG	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464893.14
Refined gas	10^4t	0	0	0	0	0	0	0	17.2	100	50179	0.00
Natural gas	10^8m^3	3.52	2.27	0	0	0	0	5.79	15.7	100	46055	153506.38
Other petroleum products	10^4t	0	0	0	0	0	2.27	2.27	15.3	100	38931	495774.61
Other coking products	10^4t	0	0	0	0	0	0	0	20	100	38369	0.00
Other energy	10^4t Ce	0	16.92	0	15.2	20.95	0	53.07	0	100	0	0.00
Total emissions of CCPG (tCO_2e)												346035810
Thermal power supplied to CCPG (MWh)												249074186

Data sources: China Energy Statistical Yearbook 2005 Edition; China Electric Yearbook 2005 Edition.

Table A7. Calculation of the simple OM emission factor of CCPG in 2005

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission factor	Oxidation rate	NCV	CO_2 emissions（tCO_2e）
									（tc/TJ）	（%）	（$MJ/t,km^3$）	K=G*H*I*J*44/12/10000（mass unit）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (volume unit)
Raw coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614496.76
Clean washed coal	10^4t	0.02	0	0	0	0	0	0.02	25.8	100	26344	498.43
Other washed coal	10^4t	0	138.12	0	0	89.99	0	228.11	25.8	100	8363	1804669.00
Coke	10^4t	0	25.95	0	105	0	0	130.95	29.2	100	28435	3986695.05
Coke oven gas	10^8m^3	0	0	1.15	0	0.36	0	1.51	12.1	100	16726	112053.61
Other gas	10^8m^3	0	10.2	0	0	3.12	0	13.32	12.1	100	5227	308896.88
Crude oil	10^4t	0	0.82	0.36	0	0	0	1.18	20	100	41816	36184.78
Gasoline	10^4t	0	0.02	0	0	0.02	0	0.04	18.9	100	43070	1193.90
Diesel	10^4t	1.3	3.03	2.39	1.39	1.38	0	9.49	20.2	100	42652	299797.78
Fuel oil	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959.09
LPG	10^4t	0	0	0	0	0	0	0	17.2	100	50179	0.00
Refined gas	10^4t	0.71	3.41	1.76	0.78	0	0	6.66	15.7	100	46055	176572.11
Natural gas	10^8m^3	0	0	0	0	0	3	3	15.3	100	38931	655208.73
Other petroleum products	10^4t	0	0	0	0	0	0	0	20	100	38369	0.00
Other coking products	10^4t	0	0	0	1.5	0	0	1.5	29.2	100	28435	45666.61
Other energy	10^4t Ce	0	2.88	0	1.74	32.8	0	37.42	0	100	0	0.00
Total emissions of CCPG (tCO_2e)												360328893
Thermal power supplied to CCPG (MWh)												286203305

Data sources: China Energy Statistical Yearbook 2006 Edition; China Electric Yearbook 2006 Edition.

The Simple OM emission factor is the weighted average value of the Simple OM emission factors in the year 2003, 2004 and 2005, i.e. $EF_{OM,y}$ **=(276371085 ＋ 346035810 ＋ 360328893)/(225987719+249074186+286203305)=1.2909 tCO_2e/MWh.**

2. Calculation of BM Emission Factor of CCPG

Build Margin emission factor is calculated as follows:

Table A8 is the calculation of the emission factor reflecting the efficiency level of the best electricity generation technology commercially available in China 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)**	**Oxidation rate**	**Emission factor (tCO_2e/MWh)**
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Table A9 shows the CO_2 emissions of CCPG in 2005.

Table A9. CO_2 emissions of CCPG in 2005

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission factor	Oxidation rate	NCV	CO_2 emissions （tCO_2e）
		A	B	C	D	E	F	G=A+…+F	H	I	J	K=G*H*I*J*44/12/100
Coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614497
Cleaned coal	10^4t	0.02	0	0	0	0	0	0.02	25.8	100	26344	498
Other washed coal	10^4t	0	138.12	0	0	89.99	0	228.11	25.8	100	8363	1804669
Coke	10^4t	0	25.95	0	106.5	0	0	132.45	29.2	100	28435	4032362
Sub-total												**358452026**
Crude oil	10^4t	0	0.82	0.36	0	***0***	0	1.18	20	100	41816	36185
Gasoline	10^4t	0	0.02	0	0	0.02	0	0.04	18.9	100	43070	1194
Kerosene	10^4t	1.3	3.03	2.39	1.39	1.38	0	9.49	20.2	100	42652	299798
Diesel	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959
Fuel oil	10^4t	0	0	0	0	0	0	0	20	100	38369	0
Other petroleum products	10^4t	0	0.82	0.36	0	0	0	1.18	20	100	41816	36185
Sub-total												**624136**
Natural gas	10^7m^3	0	0	0	0	0	3	3	15.3	100	38931	655209
Coke oven gas	10^7m^3	0	0	1.15	0	0.36	0	1.51	12.1	100	16726	112054
other coke gas	10^7m^3	0	10.2	0	0	3.12	0	13.32	12.1	100	5227	308897
LPG	10^4t	0	0	0	0	0	0	0	17.2	100	50179	0
Refinery gas	10^4t	0.71	3.41	1.76	0.78	0	0	6.66	15.7	100	46055	176572
Sub-total												**1252731**
Total												**360328893**

Data sources: China Energy Statistical Yearbook 2006 Edition.

Calculate with data provided in Table A9:

ω_{Coal} =358452026/360328893*100%=99.48%

ω_{Oil} =624136/360328893*100%=0.17%

ω_{Gas} =1252731/360328893*100%=0.35%

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

$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv}$ =0.9483 tCO_2e/MWh.

Table A10. Installed capacity of CCPG in 2005

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5906	26267.8	9526.3	7211.6	3759.5	7496	60167.2
Hydro power (MW)	3019	2539.9	8088.9	7905.1	1892.7	14959.6	38405.2
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	24	0	24
Total (MW)	8925	28807.7	17615.2	15116.7	5676.2	22455.6	98596.4

Data source: China Electric Power Yearbook 2006 Edition.

Table A11. Installed capacity of CCPG in 2003

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5407.8	17635.5	8173.3	6446.7	3126.2	6104	46893.5
Hydro power (MW)	2307.4	2438	7337.2	6603.1	1329.8	12341.5	32357
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	0	0	0
Total (MW)	7715.2	20073.5	15510.5	13049.8	4456	18445.5	79250.5

Data source: China Electric Power Yearbook 2004 Edition.

Table A12. Installed capacity of CCPG in 2002

	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power (MW)	5128.8	15904.5	8147.8	4975.6	3004.5	6142	43303.2
Hydro power (MW)	2197.4	2438	7213.9	6135.3	1195.5	11854.6	31034.7
Nuclear power (MW)	0	0	0	0	0	0	0
Wind power and Other (MW)	0	0	0	0	0	0	0
Total (MW)	7326.2	18342.5	15361.7	11110.9	4200	17996.6	74337.9

Data source: China Electric Power Yearbook 2003 Edition.

Table A13. Calculation of BM emission factor of CCPG

	Installed capacity in 2002	**Installed capacity in 2003**	**Installed capacity in 2005**	**Capacity additions during 2002-2005**	**Share in total capacity additions**
	A	**B**	**C**	**D=C-A**	
Thermal power(MW)	43303.2	46893.5	60167.2	16864	69.52%
Hydro power(MW)	31034.7	32357	38405.2	7370.5	30.38%
Nuclear power(MW)	0	0	0	0	0.00%
Wind power (MW)	0	0	24	24	0.10%
Total(MW)	74337.9	79250.5	98596.4	24258.5	100.00%
Proportion to the installed capacity in 2004	75.40%	80.38%	100%	-	-

BM emission factor of CCPG can be calculated as:

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

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

$EF_{BM,y}$ = 0.6952 × 0.9483 = 0.6592 tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

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