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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Title of the project activity: China Jintan Hydropower Project
Document version: 5
Date of completion: 15/12/2008

Version history:

Version Number	Date(dd/mm/yyyy)	Reason
Version 1	22/07/2007	PDD for GSP
Version 2	12/09/2007	Revised referring to the latest emission factor published by NDRC of China
Version 3	04/05/2008	Revised according to Validation Report (Draft)
Version 4	31/07/2008	Revised according to comments from DOE
Version 5	15/12/2008	Revised according to requests EB

A.2. Description of the project activity:

>>
The China Jintan Hydropower Project (hereinafter referred to as "the project") is a run-of-river hydropower station project. The project is located in the downstream of Jinzang River in Baishi Town, Sangzhi County, Zhangjiajie City, Hunan Province, the People's Republic of China. The project is a new hydropower plant, the total installed capacity is 20 MW with 2,901 utilization hours for electricity generation annually. The electricity is delivered to the Central China Power Grid (CCPG). When the project is completed, it can produce electricity of 58,020MWh with net electricity of 55,120MWh supplied to the grid annually[1].

CCPG mainly consists of fossil fuel-fired power plants. The electricity generated by the project can displace part of the electricity generated by the fossil fuel-fired power plants of CCPG. When the proposed project is put into operation, the expected annual GHG emission reductions are 52,428 tCO_2e.

The project activity will promote the local and national sustainable development powerfully in the following aspects:

- Reduce the GHG emission to mitigate the trend of global warming by providing clean electric power.
- Create about 100 job opportunities during the construction period, and 49 positions after the project is put into operation.
- Improve the local infrastructure by the project owner as a part of the project activities such as roads.

A.3. Project participants:

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[1] Hunan Sangzhi Jintan Hydropower Project Preliminary Design Report (PDR, November 2004), Xiangxi Investigation, Design & Research Institute of Water Resources and Hydropower which is an independent third party entity authorized by Ministry of Construction of the People's Republic of China (Grade B, No.181102). The PDR is approved by Water Resources Bureau of Hunan Province on 23 November 2004.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Hunan Sangzhi Jinzang Hydropower Co., Ltd.	No
Sweden	Carbon Asset Management Sweden AB	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 project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>
People's Republic of China (Host)

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

>>
Hunan Province

A.4.1.3. City/Town/Community etc:

>>
Baishi Town, Sangzhi County, Zhangjiajie City

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

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The project is located in the Baishi Town, Sangzhi County, Zhangjiajie City, Hunan Province, P. R. China. The geographical coordinates of the project are 110°34′45″E and 29°38′55″N. Fig. 1 below shows the location of the project.

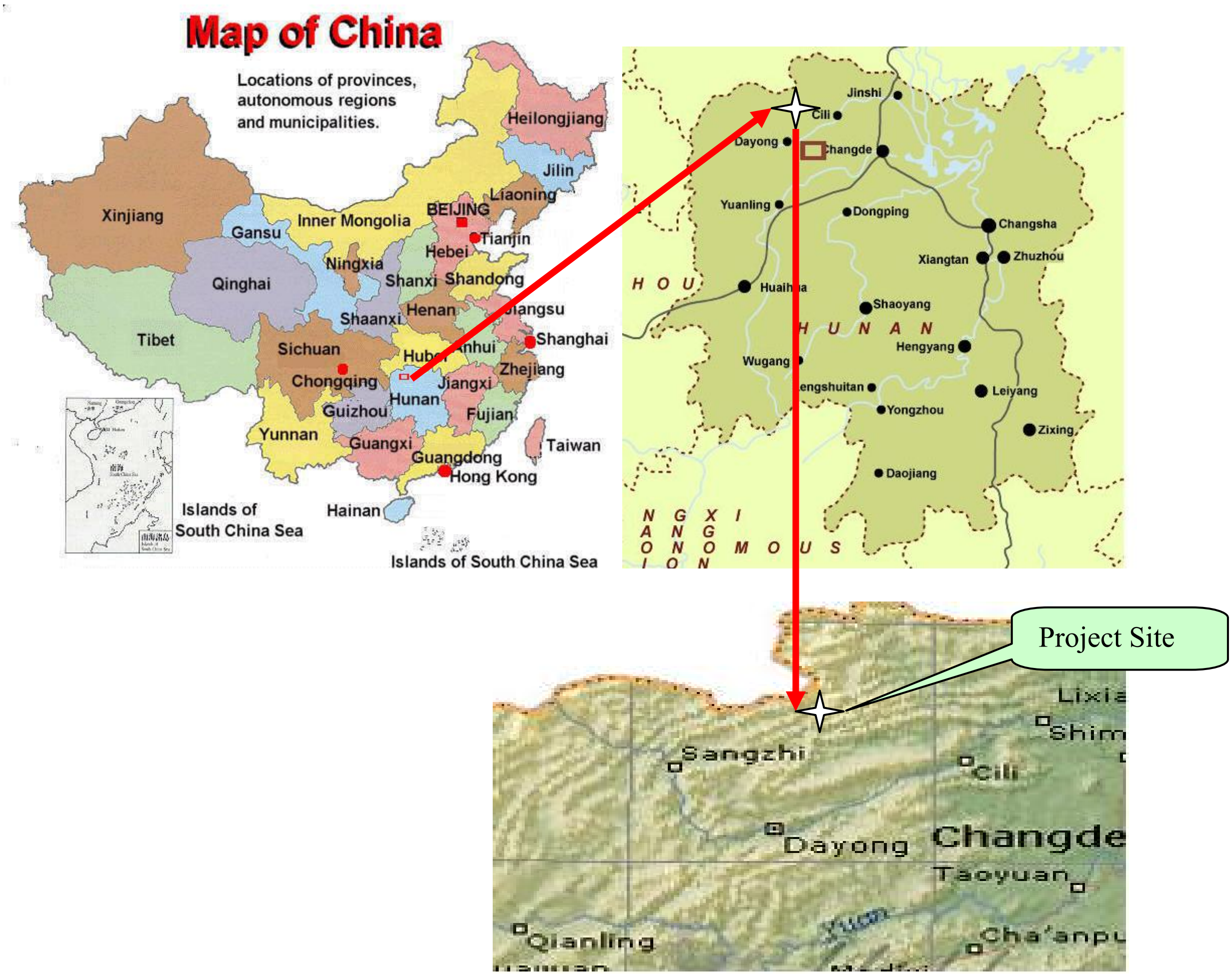

Fig. 1 Location of the Project

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

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The project falls into:

Sectoral Scope 1: Energy industries(renewable sources)

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

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The project is a newly-built hydropower station. The main buildings consist of a tunnel and a powerhouse. There are 2 water-turbine generator units with a single-unit capacity of 10 MW. The water pressure drives the power generation units to produce electricity which will be feed into the grid through the high-voltage power transmission lines with a length of 25 km. The technical parameters of generators and turbines are shown in Table 1:

Table 1 Main technical parameters of the project

Generator		Turbine	
Type	SF-J10-6/2400	Type	HLA179-LJ-103
Unit	2	Unit	2
Rated power	10MW	Rated power	10.417MW
Rated voltage	6.3kV	Rated flow	$3.7m^3/s$
Rated rotary speed	1000r/min	Rated rotary speed	1000r/min
Efficiency	96%	Rated head	320m
Power factor	0.80(lag)	Maximum water head	351m
		Minimum water head	320m

Environmentally Safe Technology:

The technology used in the project has been used in China widely and is safe to environment.

Technology transfer:

All equipment of the project is provided by domestic manufacturers. There is no technology transfer throughout the project activity.

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

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The ex-ante estimated amount of emission reductions over the first crediting period of the project is listed in Table 2 below:

Table 2 Ex-ante estimation of emission reductions over the first crediting period

Years	Annual estimation of emission reductions in (tCO_2e)
01/11/2008-31/10/2009	52,428
01/11/2009-31/10/2010	52,428
01/11/2010-31/10/2011	52,428
01/11/2011-31/10/2012	52,428
01/11/2012-31/10/2013	52,428
01/11/2013-31/10/2014	52,428
01/11/2014-31/10/2015	52,428
Total estimated reductions (tones of CO_2e)	366,996
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	52,428

A.4.5. Public funding of the project activity:

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There is no public funding from UNFCCC Annex I for the project.

SECTION B. Application of a baseline and monitoring methodology

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

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Title of the approved baseline methodology: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Title of the approved monitoring methodology: ACM0002-Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Methodological tool: Tool for the demonstration and assessment of additionality (Version 05, 16 May 2008)

Please click following link for more information about the methodology:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The project is a grid-connected renewable power generation project activity which meets all the applicability criteria stated in methodology:

1. The project is a run-of-river station without reservoir.

2. The project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

3. The geographic and system boundaries for CCPG can be clearly identified and information on the characteristics of the grid is available.

So the baseline and monitoring methodology ACM0002 are applicable to the project.

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

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According to ACM0002 (version 06), the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to. The project is connected to CCPG; the geographic extent of the grid boundary includes Jiangxi Grid, Henan Grid, Hubei Grid, Hunan Grid, Sichuan Grid and Chongqing Grid[2].
The GHG emissions sources and gases in the project boundary are shown in Table 3.

[2] Chinese DNA's Guideline of Emission Factors of Chinese Grids, Aug 9 2007.

Table 3 Sources and gases included in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Power supplied by CCPG	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification, it is conservative.
		N_2O	No	Excluded for simplification, it is conservative.
Project Activity	Power supplied by the project	CO_2	No	Power generation is from water resources, the CO_2 emissions are not considered.
		CH_4	No	The project is a run-of-river without reservoir, the project emissions are not considered.
		N_2O	No	Power generation is from water resources, the N_2O emissions are not considered.

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

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The possible baseline scenarios of the project activity include:
Scenario 1 The project activity undertaken without being registered as CDM project activity;
Scenario 2 Construct a fossil fuel-fired power plant with equivalent annual electricity supplied to CCPG;
Scenario 3 Other renewable energy power plants with equivalent annual electricity supply to CCPG;
Scenario 4 Equivalent annual electricity generation supplied by CCPG.

The scenarios above are analyzed as follows:

Scenario 1 The project activity undertaken without being registered as CDM project activity
The IRR of the project is only 7.87% which is less than the benchmark without CERs sale income, the project is not financially attractive, to see the analysis in B.5 for details, so scenario 1 is not feasible baseline scenario.

Scenario 2 Construct a fossil fuel-fired power plant with equivalent annual electricity supplied to CCPG
In China, the average annual utilization time of fossil fuel-fired power plants is 5,316h[3] which is larger than that of hydropower plants, so the installed capacity of the fossil fuel-fired plants with equivalent annual electricity generation to this project will be less than 20MW. According to the current laws and regulations in China, the thermal power plant with an installed capacity equal to or less than 135MW is strictly forbidden[4].

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[3] National Statistics Bulletin of Power Industry in 2007, China Electricity Council.

[4] Notice on Strictly Prohibiting the Construction of Fuel-fired power plants with installed Capacity of 135 MW or below, General Office of the State Council, April 15, 2002.

Therefore, the scenario 2 does not comply with current mandatory applicable legislation and regulations in China, it is not feasible baseline scenario.

Scenario 3 Other renewable energy power plants with equivalent annual electricity supplied to CCPG
There is neither potential for wave or tidal energy nor for geothermal energy in the project's area. No biomass-based power plant with a similar scale to the project has previously been built in the region. Moreover, other renewable energy alternatives, such as solar PV are considered to be too cost for generating the equivalent annual output. The wind resources in the region where the proposed project is located is poor with very low wind energy potential[5]. Thus there are no favorable conditions for other power plants based on renewable sources; construction and the economic return of other renewable power plants with similar scale would be of little attractiveness (without CDM). The scenario 3 is therefore not feasible and can not be considered the baseline scenario.

Scenario 4 Equivalent annual electricity generation supplied by CCPG
This scenario complies with the national laws and regulations, and doesn't face any economic or technological barriers, it is feasible baseline scenario to the project activity.

According to the analysis above, Scenario 4 Equivalent annual electricity generation supplied by CCPG is the only plausible and feasible baseline scenario.
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B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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According to the "Tool for the demonstration and assessment of additionality" (Version 05) approved by EB, the additionality of the project is demonstrated and assessed through the following steps:

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

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

The possible alternatives of the project include:
Alternative 1 The project activity undertaken without being registered as CDM project activity;
Alternative 2 Construct a fossil fuel-fired power plant with equivalent annual electricity supplied to CCPG;
Alternative 3 Other renewable energy power plants with equivalent annual electricity supplied to CCPG;
Alternative 4 Equivalent annual electricity generation supplied by CCPG.

The position where the project is situated is short of other renewable sources such as wind sources, biomass sources, solar sources and geothermal sources, so alternative 3 isn't feasible.

Sub-step 1b. Consistency with mandatory laws and regulations:
As the presentation in B.4., the installed capacity of the fossil fuel-fired plants with equivalent annual electricity generation to this project will be less than 20MW, but according to the current laws and

[5] http://www.newenergy.org.cn/html/2003-9/2003991.html.

regulations in China, the thermal power plant with an installed capacity equal to or less than 135MW is strictly forbidden[6], so the alternative is not consistent with the current laws and regulation, it is not realistic and credible alternative.
The alternative 1 and alternative 4 comply with current mandatory applicable legislation and regulations in China, but they are not mandatory by the laws and regulations.

Step 2. Investment analysis

The following sub-steps are used for determining whether the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method
According to "Tool for the demonstration and assessment of additionality", there are three analysis methods for investment analysis, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Simple cost analysis (Option I) can be used if the project activity generates no financial or economic benefits other than CDM related income. However, this option is not applicable to the project because the project activity will generate economic benefits from the sale of electricity generation.

Investment comparison analysis (Option II) can only be used if the project and the alternatives to the project activity are all investment projects. However, this option is not applicable to the project because the alternative to the project activity is equivalent annual electricity supplied by CCPG, this alternative is not a project activity.

Benchmark analysis (Option III). According to Preliminary Design report, the project IRR benchmark (after tax) for the project is 10% which is quoted from Economic Evaluation Code for Small Hydropower Project (SL 16-95). The Economic Evaluation Code for Small Hydropower Project (SL 16-95) issued by Ministry of Water Resources of P. R. China. Thus, the benchmark analysis is applicable to the project.
Thus, the option III is used in this PDD for investment analysis.

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

According to <Economic Evaluation Code for Small Hydropower Project (SL 16-95)> issued by Ministry of Water Resources of P. R. China, the benchmark Internal Rate of Return (IRR) of total investment for a hydropower project with the installed capacity of below 25MW is 10% (after tax). This benchmark IRR is used extensively in China for investment analysis of small-scale hydropower projects.

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

The main assumptions for the investment analysis are shown in Table 4 below:

Table 4 Basic parameters for financial evaluation

No.	Main Parameter	Unit	Value	Notes

[6] Notice on Strictly Prohibiting the Construction of Fuel-fired power plants with installed Capacity of 135 MW or below, General Office of the State Council, April 15, 2002.

1	Installed capacity	10,000 kW	2.00	Preliminary Design Report
2	Total investment	10^4 RMB yuan	10387.78	Supplement to Budget of Preliminary Design Report
3	Net annual electricity supplied to the grid	MWh/yr	55120.0	Preliminary Design Report
4	Electricity tariff (Inc. VAT)	RMB yuan/kWh	0.315	Preliminary Design Report; Hunan Province Price Bureau[7]
5	Valued-added tax	/	17%	Preliminary Design Report
6	Income tax	/	33%	Preliminary Design Report
7	Sale surtax	/	8%	Preliminary Design Report
8	Project lifetime	year	20	Preliminary Design Report
9	Operation & maintenance costs	10^4 RMB yuan	268.27	Financial Analysis in this PDD[8]
10	Expected CERs sale price	USD/t	10	
11	Exchange rate	USD/RMB yuan	1/7	

The IRRs of the project with/without CERs sale income are shown in Table 5.

Table 5 The financial parameters of Jintan Hydropower Project

Item	unit	Without CERs sale income	Benchmark	With CERs sale income
IRR	%	7.87	10	12.16

Without CERs sale income, the IRR of the project is only 7.87% which is lower than benchmark IRR 10%, so the project is not financially attractive, the project isn't attractive to investors; the IRR can be improved obviously and exceeds the benchmark with CERs sale income, so the registration of the project activity as a CDM project activity will improve the confidence of the project owner, CERs sale income will be very helpful to overcome the investment barrier.

Sub-step 2d. Sensitivity analysis
A sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the project, four parameters including total investment, electricity tariff, net electricity generation and annual O&M costs are selected as sensitive factors to check the financial attractiveness, the result of the sensitivity analysis is shown Table 6.

[7] The electricity tariff document (Xiangjiazhong [2004] No. 114) issued by Hunan Province Price Bureau on August 4, 2004.

[8] Please refer to IRR calculation sheet of the project for more details.

Table 6 Practical possibility assessment of critical factors

Variation range& assessment / Factor	Variation range to reach benchmark	Practical assessment of the critical factors
Total investment	-17.91%	When total investment of project decrease, the IRR of project goes up. The total investment of project is mainly subject to the industrial products' price indices, and according to the chart of "Ex-factory Price Indices of Industrial Products", which is published by the National Bureau of Statistics of China in 2006 (http://www.stats.gov.cn/tjsj/ndsj/2006/html/I0913C.HTM), the price indices increased 9.38% from 1998 to 2005. Thus the price of raw materials is apt to an increasing trend and will not decrease. And thus, as the recent published statistics, it is unlikely that the total investment of the project decreases 17.91%.
Electricity Tariff	+19.27%	When the tariff increase, the IRR of project goes up. This means that the IRR of the project would reach the benchmark of 10% only when the electricity tariff increases 19.27%. But it is impossible. According to the document form Hunan Price Bureau, the electricity tariff of Hunan Province has decreased from 0.348 RMB yuan[9] in 2000 to 0.327 RMB yuan[10] in 2002 and then 0.315 RMB yuan[11] in 2004 which indicated a decreasing trend. Thus, the increase of 19.27% of the electricity tariff shall not occur.
Electricity generation	+19.34%	When the annual operation hours increase, the IRR of project goes up. The variation of annual operation hours is mainly subject to the water resources of project site, and also is the outcome of the year's rainfall. It is impossible for the electricity generation of

[9] The electricity tariff (Xiangjiazhong [2000] No. 49) policy was issued by Hunan Price Bureau on March 6, 2000.

[10] The electricity tariff (Xiangjiazhong [2001] No. 327) policy was issued by Hunan Price Bureau on December 31, 2001.

[11] The electricity tariff (Xiangjiazhong [2004] No. 114) policy was issued by Hunan Price Bureau on August 4, 2004.

		project to increase 19.34%, because the expected electricity generation is calculated according to the hydrological data for 36 years in PDR and it will not change much. And thus, the increase of 19.34% of project's electricity generation shall not occur.
O&M costs	-70.06%	O&M cost: IRR of the project would achieve benchmark when the O &M cost decreases 70.06% which is impossible to occur in practice.

Note: The sensitivity analysis results of electricity tariff and net electricity generation are different since the net electricity generation has impact on costs. Please see IRR calculation excel file for details.

Table 6 shows that project IRRs are always lower than the benchmark (10%) within the reasonable variation scope of the total investment, electricity tariff, net electricity generation and O&M costs, thus the project activity is unlikely to be financially attractive.

Step 3. Barrier analysis

Skipped.

Step 4. Common practice analysis

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

The other activities similar to the proposed project activity are hydropower projects in the same region (Hunan Province), rely on a broadly similar technology, are of a similar scale(15[12]MW~50[13]MW), and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing.

The selected geographical area for the project, i.e. Hunan Province, is relatively large. Hunan Province is considerably larger than several countries. The common practice analysis is limited to the provincial level as the investment environment for each province differs (e.g. with regards to taxes, loan policy and electricity tariffs).

After 16th Party Congress in November 2002, the State Electricity Regulatory Commission (SERC) was established to improve the operation of the power industry. The former State Power Corporation (SPC) was broken into five power grid companies and 2 transmission companies. The most important impact after power industry restructure is the electricity tariff of power plants. Before the power industry restructure in year 2002[14], the hydropower plants are mainly developed by state-owned companies, provincial governments ensured that project entity of power plants can obtain sufficient return by providing guarantee electricity tariff[15]. Thus, the developers did not have financing difficulties. The national policy changed after 2002, the electricity tariff will be determined on the basis of average costs

[12] Referring to defination of small scale CDM project decided by CDM EB.

[13] Almanac of China's Water Power (2006), Volume 10, Page 141: Projects with capacity of 0.5MW~50MW are defined as small hydropower projects.

[14] Notice of the State Council on Printing and Distributing the Plans Regarding the Restructuring of the Power Industry(No.5 [2002] of the State Council).

[15] Ministry of Water Resources and Electric Power, State Economic Committee and State Price Bureau, Note on Implementation methods of Various Power Tariff (No. 101 Shuidiancaizi[1987]).

of power generators using the same advanced technology and built within the same period under the provincial power grid[16]. So, it is financially risky for some power plants with high costs or weak financial indicator.

The hydropower projects put into operation since 2002 are shown in Table 7 (Other CDM project activities are not included in the Table 7):

Table 7 Hydropower plants in operation since 2002 in Hunan (15~50MW)[17]

No.	The project name	Installed capacity (MW)	Operation time (year)	Annual utilization hours	Electricity Tariff (RMB yuan/kWh)
1	Ruoshui	15.0	2006	4333	0.327
2	Mulongtan	15.0	2003	4149	0.348
3	Yongxing II	20.0	2005	4420	0.348
4	Chengjiangkou	25.0	2006	3629	0.327
5	Yangmingshan II	25.0	2004	3300	0.348
6	Leizhong	40.5	2004	4490	0.348

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

There is an essential distinction between the proposed project and the hydropower plants with the installed capacity of 15~50MW completed since 2002 in Hunan Province (listed in Table 7).

In general, investors will develop the hydropower plants with good technical and economic indicators(such as annual utilization hours, etc.).

The annual utilization hours of Jintan project is 2901 hours[18]. This data is very low, because the distribution of rainfall in the project site in a year is considerably not even, 69.2% of the rainfall occurs from April to August, 47.0% of the rainfall occurs from May to July, especially. In order to utilize the water resources fully, the total installed capacity should be big appropriately, this causes a low annual utilization hours.

The annual utilization hours of the six projects in Table 7 are 14%~55% higher than that of the proposed project, and the electricity tariff of the six projects is higher than that of the project. So these six projects have excellent technical and economic indicators, they are financially attractive, it was easy for the developers to obtain loans from banks, there were not any financing difficulty. But the proposed project has poorer financial indicators and isn't financially attractive. Therefore, there is a severe financing difficulty for the proposed project. In order to improve the IRR and decrease the investment risk, the project owner held a meeting of the board of directors on May 10, 2005 and decided to apply for the

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[16] Notice of Relative Matters about Regulation of Electricity Tariff Management (No. 701 Jijiage [2001]).

[17] Investigation Report on Hydropower Plants with Installed Capacity of over 15MW Operational since 2002 in Hunan Province, Hunan Investigation, Design & Research Institute of Water Resources and Hydropower, March 2008.

[18] With request from project owner, Xiangxi Investigation, Design & Research Institute of Water Resources and Hydropower explained the data of annual utilization hours in PDR on April 20, 2008.

CDM support, and the construction of the project was started in July 01, 2005. So the incentives from the CDM have been seriously considered in the decision to proceed with the project activity.

It can be conclude from above analysis that the project activity is not common practice in Hunan Province.

The time schedule of the project is listed in Table 8 below:

Table 8 The project construction schedule

Date	Schedule
08/2004	Feasibility Study Report
11/2004	Preliminary Design Report was completed
23/11/2004	Preliminary Design Report was approved
02/2005	Supplement to Budget of Preliminary Design Report was completed[19]
29/03/2005	Supplement to Budget of Preliminary Design Report was approved
10/05/2005	The project owner decided to apply for CDM project[20]
15/05/2005	Intent Agreement of CDM Development Cooperation[21] was signed
20/06/2005	The tunnel construction agreement was signed[22]
01/07/2005	The tunnel construction was started[23]
28/10/2005	Agreement of the loan was signed due to CDM[24]
11/02/2006	The project owner signed Water-turbine Generator Units Purchase Agreement[25]

[19] In Feb. 2005, the project owner invited some hydro & power experts to visit the project worksite, the experts thought that the budget in the PDR was low according to the actual situation of the project, and proposed the project owner to adjust the budget. So the owner entrusted the designer (Xiangxi Investigation, Design & Research Institute of Water Resources and Hydropower) to made the Supplement to Budget of PDR.. Data sources for IRR calculation in PDD are from PDR except the total investment from the Supplement to Budget of PDR, both of the PDR and the Supplement to Budget of PDR have been approved by the local authority (Hunan Province Water Resources Department), so the data sources for IRR in PDD are reliable.

[20] The Meeting of the Board of Directors of Hunan Sangzhi Jinzang Hydropower Co., Ltd about Decision of Applying for CDM Support, dated on 10 May 2005.

[21] Intent Agreement of CDM Development Cooperation between Hunan Sangzhi Jinzang Hydropower Co., Ltd. and Hunan Science & Technology Information Institute, 15 May 2005.

[22] The Tunnel Construction Agreement between Sangzhi Jinzang Hydropower Co., Ltd. and Wenzhou 2nd Tunnel Project Co., Ltd., dated on 20 June 2005.

[23] Command on Starting Construction of the Tunnel Works of Jintan Hydropower Project, Hunan Jinhui Hydropower Surveillance Co., Ltd., dated on 20 June 2005.

[24] Agreement of the loan between Sangzhi Jinzang Hydropower Co., Ltd. and Zhangjiajie Branch of Industrial and Commercial Bank of China, 28 October 2005.

[25] Water-turbine and Generator Units Purchase Agreement of China Jintan Hydropower Project between Sangzhi Jinzang Hydropower Co., Ltd. and Hangzhou Electricity Generation Equipment Factory, 11 February 2006.

10/08/2006	The fore-bay construction agreement was signed[26]
10/08/2006	The powerhouse construction agreement was signed[27]
23/08/2006	Agreement of CDM Development Service was signed[28]
09/2008	The project will be put into operation

The relation of FSR, PDR and Supplement to Budget of PDR are as follows:
(1) FSR is a rough document about the implementation of the project, PDR is a more detailed and more accurate one, but FSR must be conducted and approved before PDR is conducted according to the stipulated project implementation procedures in China.
(2)In Feb. 2005, the project owner invited some hydro & power experts to visit the project worksite, the experts thought that the budget in the PDR was low according to the actual situation of the project, and proposed the project owner to adjust the budget. So the owner entrusted the designer (Xiangxi Investigation, Design & Research Institute of Water Resources and Hydropower) to made the Supplement to Budget of PDR.
(3) The IRR in PDR (=9.48%)and the IRR in PDD (=7.87%) is different only due to the different total investments. Data sources for IRR calculation in PDD are from PDR except the total investment from the Supplement to Budget of PDR, both of the PDR and the Supplement to Budget of PDR have been approved by the local authority (Hunan Province Water Resources Department), so the data sources for IRR in PDD are reliable.

The reasons why the project was validated two years later after the construction are as follows:
1. Hunan Science & Technology Information Institute (HSTII) paid attention to CDM in Feb. 2004 and started to study CDM in April 2004. Although the project owner signed the LOI of CDM development with HSTII in 15 May 2005, the PDD development progress was very slow due to the lack of qualified technical staff understanding CDM procedure and PDD development. In order to accelerate the PDD development progress, Hunan Province Science & Technology Department decided to establish Hunan CDM Project Service Center in July 2005 (HSTII, Report of Developing CDM Projects in Hunan Province, Xiangkexin[2005] No.15, 5 July 2005). The center was officially established on 9 November 2005. Then it took about half a year for the center to train technical staff to develop PDD. The development progress was improved after the project owner signed an official agreement about CDM development with the center in August 2006. Therefore, the lack of qualified and skilled technician of developing PDD is a main reason of the delay of CDM development.
2. The owner signed the ERPA with the CERs buyer in Sep. 2006, the PDD and related materials of the project were submitted to DNA of China for approval in April 2007, and the project was approved in 31 July 2007 by DNA of China in a CDM projects review meeting. Then the project was validated by DOE in Sep. 2007 according to the owner's requirement. To wait for the approval of DNA of China is another main reason of the delay of CDM development.

It can be found from above analysis that the project is additional. The CDM was considered seriously in the decision to proceed with the project activity and before the implementation of the project.

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[26] The Fore-bay Construction Agreement between Sangzhi Jinzang Hydropower Co., Ltd. and Loudi City Water Resources and Hydropower Construction Co., Ltd., 10 August 2006.

[27] The Powerhouse Construction Agreement between Sangzhi Jinzang Hydropower Co., Ltd. and Loudi City Construction Co., Ltd., August 10, 2006.

[28] Agreement of CDM Development Service between Hunan Sangzhi Jinzang Hydropower Co., Ltd., 23 Aug. 2006.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions
The project is a run-of-river hydropower plant without reservoir, according to the baseline methodology ACM0002, PE_y=0.

Baseline Emissions

According to baseline methodology ACM0002, the baseline emissions are the CO_2 emissions from the equivalent electricity generation in CCPG that are displaced by the project activity. So the baseline emissions by the project activity during a given year *y* is obtained as follow:

According to ACM0002, the project emission should be calculated as:

$$BE_y = EG_y \cdot EF_y \qquad (1)$$

Where:

EG_y is electricity supplied by the project activity to the grid in year *y*, in MWh;
EF_y is baseline emission factor in year y, in tCO_2e/MWh.

According to baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor by utilizing an ex-ante 3 years data vintage for the CCPG.

the baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor by utilizing an ex-ante 3 years data vintage for the CCPG. The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

Step 1. Calculating the Operating Margin emission factor （$EF_{OM,y}$）;
Step 2. Calculating the Build Margin emission factor （$EF_{BM,y}$）;
Step 3. Calculating the baseline emission factor （EF_y）.

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

According to baseline methodology ACM0002, there are four methods for calculating the $EF_{OM,y}$:

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

Method (c) should be the first methodological choice. However, this method requires the detailed dispatch data of the CCPG, which is confidential information and is not available to be obtained by public. Thus, method (c) is not applicable. Due to the same reasons, the method (b) is not applicable.

Method (a) can be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production. The only low-cost/must run resource in CCPG is hydropower plants. It can be found from Table 6 that installed capacity of hydropower plants constitute less than 50% of CCPG during year 2001 to 2005. Thus, method (a) is applicable to calculate $EF_{OM,y}$. And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation, therefore, method (d) is not applicable to calculate $EF_{OM,y}$.

Table 9 Electricity generation of hydropower plants in CCPG during year 2001～2005[12]

Year	2001	2002	2003	2004	2005
Electricity generation of hydros (%)	36.76	35.95	34.43	38.37	38.56

Due to the detailed data on the individual power plants connected to the power grid is not available, therefore information by type of generating source are used for OM calculation. According to baseline methodology ACM0002, tthe $EF_{OM,y}$ is calculated by utilizing an *ex-ante* 3 years data vintage for CCPG, the formula as follow:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (2)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant provinces *j* in year (s) *y*; *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provinces *j* and the percent oxidation of the fuel in year (s) *y*; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by province *j*.

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (3)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;
$OXID_i$ is the the oxidation factor of the fuel;
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

[12] *China Electric Power Yearbook 2002～2006*

There are net exports from the CCPG to other power grids, thus the imports are not taken into account.

$EF_{OM,y}$ is calculated according to the statistics information of recent 3 years (from 2003 to 2005), the data are the latest and available at the time of this PDD submission, the detailed calculations are shown in Table A2-Table A7 of Annex 3.

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

According to baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated by utilizing an *ex-ante* 3 years data vintage for CCPG, the formulae as follow:

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

Where ：

$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants *m.*

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total fuel-fired installed capacity, according to the approved deviation[29] by CDM EB, the $EF_{BM,y}$ will be calculated as:

1) Based on the most recent years energy balance of the CCPG, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions;

2) Based on the most advanced commercialized technologies which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the fuel-fired emission factor of the CCPG;

3) Calculating the $EF_{BM,y}$ through fuel-fired emission factor times the weighted-average of fuel-fired installed capacity which is more close to 20% in the new capacity additions.

Sub-Step 2a: Calculating the percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad \lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad \lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

(5)

Where:

[29] EB approved deviation for Methodologies AM0005 and AMS-I.D on 7 October 2005.

λ_{Gas}, λ_{Oil} and λ_{Coal} are respectively the percentages of CO_2 emissions from the gas-fired, oil-fired, coal-fired power plants in total fuel-fired CO_2 emissions;
$F_{i,j,y}$ is the amount of fuel *i* (tce) consumed by the province *j* in year *y*;
$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel *i*, taking into account the carbon content of the fuels used by the grid and the percent oxidation of the fuel in year *y*.

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

$$EF_{Thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gasl} \times EF_{gas,adv} \qquad (6)$$

Where:

$EF_{Thermal}$ is the fuel-fired emission factor;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas, which are applied by the most advanced commercialized technologies.

It can be found from Table A8 of Annex 3 that the sum of λ_{Oil} and λ_{Gas} account for only 0.52% of total fuel-fired CO_2 emissions, it is reasonable to replace $EF_{Thermal}$ with $EF_{Coal,Adv}$. As a conservative approach, the final $EF_{Thermal}$ is calculated as follow:

$$EF_{Thermal} = EF_{Coal,Adv} \cdot (1 - \lambda_{Oil} - \lambda_{Gas}) \qquad (7)$$

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

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

Where:

$EF_{BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year *y*;
CAP_{Total} is the new capacity additions;
$CAP_{Thermal}$ is the new fuel-fired capacity additions;
$EF_{Thermal}$ is fuel-fired emission factor.

$EF_{BM,y}$ is calculated according to the latest and available data at the time of this PDD submission, the detailed calculations are shown in Table A8-Table A11 of Annex 3.

Step 3: Calculating the baseline emission factor (EF_y)
According to baseline methodology ACM0002, 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 ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (9)$$

Where:

The weighs w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM}= w_{BM}= 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh.

Leakage

According to baseline methodology ACM0002, there is no need for the project to consider leakage (L_y).

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission and project activity emission. The final GHG emission reduction is calculated as follows:

$$ER_y\ (tCO_2e/yr) = BE_y - PE_y - L_y \qquad (10)$$

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

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3
Description:	The net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation rate of the fuel *i*
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	10^4 t, 10^7 m^3
Description:	The amount of fuel *i* (in a mass or volume unit) consumed by province *j* in year(s) *y*
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of	Data used are from Chinese authorities.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	*Electricity generation in CCPG*
Data unit:	MWh
Description:	The electricity generated by source *j* in year *y* of each province connected to CCPG.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	Internal power consumption rate of power plant
Data unit:	%
Description:	The internal power consumption rate of power plant in each province connected to CCPG in year *y*
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$EF_{CO2, i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Installed capacities of power source j in year y
Source of data used:	*China Electric Power Yearbook 2001-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Standard coal consumption of power generation*
Data unit:	t/MWh
Description:	The standard coal consumption of power generation of Chinese mainly sub-critical and super critical power plants.
Source of data used:	Conservative value
Value applied:	0.32
Justification of the choice of data or description of measurement methods and procedures actually applied :	The best available technologies in China are mainly sub-critical and super critical power plants, with the standard coal consumption of power generation of 0.327t/MWh and 0.323t/MWh respectively. It is conservative for standard coal to adopt the value 0.32t/MWh. It can be found from *China Electric Power Yearbook 2005* that the standard coal consumption of power generation is 0.371t/MWh in Central China Power Grid. Thus, the value 0.32t/MWh is very conservative to calculation BM.
Data / Parameter:	*Standard coal consumption of power generation*

B.6.3 Ex-ante calculation of emission reductions:

>>

Project Emissions

The proposed project is a run-of-river hydropower plant without submerged area, according to methodology ACM0002, $PE_y = 0$

Baseline Emissions

According to the formula (2)-(9) in section B.6.1, the results of EF_{OM} , EF_{BM} and EF_y are listed in following Table 10 , the detailed calculation is shown in Annex 3.

Table 10 Calculation result of baseline emission factor of CCPG

EF_{OM} (tCO_2e/MWh)	EF_{BM} (tCO_2e/MWh)	EF_y (tCO_2e/MWh)
1.28956	0.61277	0.95116

According to the formula (1) in section B.6.1, the baseline emissions (BE_y) of the project in a typical year are calculated as follow:

$$BE_y = EG_y \cdot EF_y == 55120 \text{ MWh} \times 0.95116 \text{ tCO}_2\text{e/MWh} = 52{,}428 \text{ tCO}_2\text{e}$$

Leakage

According to baseline methodology ACM0002, $L_y = 0$

Emission Reductions

According to formula (10) in section B.6.1, the annual emission reductions (ER_y) of the project in typical year is calculated as follow:

$$ER_y \text{ (tCO}_2\text{e/yr)} = 53{,}717-0-0 = 53{,}717 \text{ tCO}_2\text{e/yr}$$

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

>>

The summary of the ex-ante estimation of emission reductions are listed in Table 11 below:

Table 11 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)
01/11/2008-31/10/2009	0	52,428	0	52,428
01/11/2009-31/10/2010	0	52,428	0	52,428
01/11/2010-31/10/2011	0	52,428	0	52,428
01/11/2011-31/10/2012	0	52,428	0	52,428
01/11/2012-31/10/2013	0	52,428	0	52,428
01/11/2013-31/10/2014	0	52,428	0	52,428
01/11/2014-31/10/2015	0	52,428	0	52,428
Total (tonnes of CO2e)	0	366,996	0	366,996

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

B.7.1 Data and parameters monitored:

Data Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity delivered to CCPG
Source of data to be used:	Measured by the meter at the connection point to CCPG
Value of data applied for the purpose of calculating expected emission reductions in section B.5	55120
Description of measurement methods and procedures to be applied:	The net electricity is the difference of the generated electricity exported to power grid and electricity imported from power grid. The imported electricity and exported electricity are monitored through continuous measurement and monthly recording
QA/QC procedures to be applied:	Double check by receipt of sales.
Any comment:	

B.7.2 Description of the monitoring plan:

>>
An overall monitoring plan is made for the project activity. The project developer has compiled a monitoring and management manual, i.e. “The Monitoring and Management Manual for China Jintan Hydropower Project” submitted to DOE. The aim of the monitoring plan is to make sure that the data included in B.7.1 is monitored completely, consistently, reliably and precisely. The details are summarized as follows:

1. Monitoring subject
The main data monitored are the electricity exported to/imported from the grid by the project activity. The net electricity to the grid (=electricity exported to the grid－electricity imported from the grid) is used for the calculation of the emission reductions.

2. Monitoring management structure
In order to obtain reliable monitoring data, the project developer will establish a monitoring management structure prior to the starting of the crediting period. Clear responsibilities will be assigned to all staffs involved in the CDM project. A monitoring director will be appointed who has the overall responsibilities

for the monitoring of the project, other staffs will be responsible for the data recording, data collecting, data archiving and emission reductions calculation. The director will receive technical supports from the Hunan CDM Project Service Centre. The detailed structure is as follows:

Monitoring Director
Duty: Take charge of the implementation and management of the monitoring plan overall; check and supervise the activities such as recording, collecting and archiving of the monitoring data; be responsible for communicating with EB, DOE and Hunan CDM Project Service Centre.

Technical Department
Duty: Be responsible for operation & maintenance of monitoring equipment, recording and collecting of monitoring data.

Finance Department
Duty: Be responsible for calculation of emission reductions.

General Office
Duty: Be responsible for archiving of monitoring data.

3. Monitoring apparatus and installation:

The EG_y will be monitored by a main meter and a backup meter which will be installed in accordance with “Technology & Management Regulations for Power Metering Devices”(DL/T448-2000). The main meter and the backup meter will be installed at the connection point to the power grid and are owned by the project owner.

4. Data monitoring

(1) The data of electricity supplied to the grid and consumed by the project activity from the grid will be measured hourly and recorded monthly;
(2) The Power Grid Company provides the project owner with the net electricity generation data;
(3) The project owner provides the Power Grid Company with sales receipts and preserves the copies of the sales receipts;
(4) The project owner provides DOE with readings record of meters and copies of sales receipts.

5. Quality control

1) Calibration of meters

The calibration of meters conducted by qualified organization must comply with national standard and sectoral regulations, i.e. DL/T448-2000. The meters must be pasted with seal after calibration.

2) Emergency treatment

If the reading of main meter is beyond allowable error, the data should be determined by (1) The Backup Meter should be used for monitoring. (2) The project owner and power grid company shall jointly prepare a reasonable and conservative estimate of the correct reading if the Backup Meters are also beyond allowable errors.

After handling of the emergency, the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.

6. Data management

All monitoring data and records will be archived in electronic document and paper document. All the electronic and paper documents will be kept at least for 2 years after the end of the last crediting period.

7. Training program

The project developer and Hunan CDM Project Service Center will train all the related staffs before the project operation. The training contains CDM knowledge, operational regulations, quality control (QC), data monitoring requirements and data management regulations, etc.

More information can be obtained from "The Monitoring and Management Manual of China Jintan Hydropower Plant".

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

>>

Final Date of completion of the baseline study and monitoring methodology (DD/MM/YYYY)

15/12/2008

Name of person/entity determining baseline:

Haiwei Yuan
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Above mentioned individuals / entities who determined the baseline are not project participants

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:

>>

20/06/2005(Tunnel Construction Agreement was signed[30])

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

>>

20 years and 0 month

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:

>>

01/11/2008 or the day after registration whichever is later.

C.2.1.2. Length of the first crediting period:

>>

7 years

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

[30] The Tunnel Construction Agreement between Sangzhi Jinzang Hydropower Co., Ltd. and Wenzhou 2nd Tunnel Project Co., Ltd., dated on June 20, 2005.

SECTION D. Environmental impacts

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

>>

The project owner entrusted a third party, Sangzhi County Environmental Protection department to conduct the environmental impact assessment (EIA) on Jintan Hydropower Plant. The EIA report has been approved by the Zhangjiajie Environmental Protection Bureau in a document "Zhanghuanping [2006]56" in November 2006, the main approval is as follows:"During the Jintan Hydropower Plant construction period, there would be little waste water, waste gas and noise pollution, during the plant operation period, there would be some impact on the water quality. But on account of that the project scale is not large and the construction period is short, the negative effect of the project could be avoided by some protection methods. So the project is feasible at the angle of sustainable environmental protection."

According the PDR, only 3468 m^2 land will be covered due to the project activity. The project has no reservoir, and there is no inundation, so no families and villages will be affected due to the project activity.

The main comments of the EIA are as follows:

1. Waste Water Impacts

During the construction period, wastewater will mainly come from construction raw materials. Wastewater will have slight impact on water BOD. In general, wastewater will cause trifling contamination during the construction period. To avoid the impacts, wastewater from the power station will be treated by septic tanks and oil separator before discharged into the river. The minimum environmental flow is $0.27m^3/s$ according to the hydrological data from PDR and related calculating method.

2. Air Environment Impacts

During construction, the main impacts on the air quality will come from flying dust caused by cement mixture process and transportation, the main pollutant is TSP, SO_2, and $N0_X$. To avoid these impacts, the project owner will equip smoke elimination equipments on engineering machines, spray water regularly. Meanwhile, the machines will be examined and repaired regularly, In addition, workers will use masks for protection.

3. Noise Impacts

The noise impact will mainly come from construction machines and transportation. To avoid these impacts, the project owner will strengthen the construction management and control the operation time of construction machines of high noise. In addition, the workers will be protected by ear-muffs and helmets.

4. Rubbish Impacts

During construction, rubbish caused by workers' living will have impact on the sanitation. The rubbish should be collected at one place and dealed with together.

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:

>>

Both of the host Party and the project owners think that the proposed project will not have significant impacts on the environment. After the completion of the project construction, the project will be put into operation only after the inspection and acceptance of local environmental protection department.

SECTION E. Stakeholders' comments

>>

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

>>

For the purpose of letting the stakeholders realize the project situation and collecting their opinions and advices on the project, the project owner made an investigation in the form of questionnaire in May 2005. Project is located in Gucun Village, Baishi Town, the least distance between residential area and the project is 1 km, and the project is located in the valley, so families and villages will not been affected. Stakeholders of the project include the government and non-government parties, local people, social organizations in that region, etc., involving different occupation, different ages and different level of education with extensive representativeness. 54 questionnaires were distributed, and all questionnaires with reply were received.

Table 12 Collection of investigated stakeholders

Profession	Persons	Education degree	Persons
Public officials	5	Bachelor	3
Teachers	10	Junior college	8
businessman	3	Technical secondary school	14
Farmers	36	Senior high school	5
		Junior high school	19
		Primary school	5
Total	54	Total	54

E.2. Summary of the comments received:

>>

The result of the questionnaires shows that, 98% of informants agreed with the development of the project, they considered the project would ease local electric power shortage, add local job opportunities and promote local economic development. The stakeholders' comments are as follows:

1. Most of informants were concerned with the environmental problem, water & soil erosion and vegetation destruction problem during the project construction. They requested project owner to take care of the environment kindly, and reduce destruction to vegetation and soil as possible.
2. Part of informants worried about the compensation for their land acquisition.
3. Informants hoped the project can be completed as soon as possible so as to bring economic benefit and social benefit for the local people.

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

>>

The project owner has taken the stakeholders' comments into full account and will take the following measures:

1. During the construction, the project owner has promised to take the environmental protection measures according to the requirement of EIA, after the project is completed, the project owner will recover the local vegetation, and protect local water resources, prevent soil from erosion.
2. The related stakeholders will be compensated for their land acquisition according to national policies and laws strictly, the rights and interests of local residents will be safeguarded.
3. The project owner has promised to complete the project construction as soon as possible so as to promote the local social and economic sustainable development.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project owner

Organization:	Hunan Sangzhi Jinzang Hydropower Co., Ltd.
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Salutation:	Mr
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CERs Purchaser

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from UNFCCC Annex I for the project.

Annex 3

BASELINE INFORMATION

The installed capacity, fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>. Furthermore, the data are compiled by Chinese DNA, for more information, please refer to following link:
http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A1 below.

Table A1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908 kJ/kg	25.8	100%
Cleaned Coal	26344 kJ/kg	25.8	100%
Other Washed Coal	8363 kJ/kg	25.8	100%
Coke	28435 kJ/kg	25.8	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Natural Gas	38931 kJ/m^3	15.3	100%
Coke Oven Gas	16726 kJ/m^3	12.1	100%
Other Gas	5227 kJ/m^3	12.1	100%
LPG	50179 kJ/kg	17.2	100%
Refinery Dry Gas	46055 kJ/kg	15.7	100%

Data Source:

The net calorific values are quoted from <China Energy Statistical Yearbook 2006>, Page 287.

The emission factors and oxidation factors are quoted from <Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories >, Table 1.4, Page 1.24, Chapter 1, Volume 2.

Step 1: Calculating the Operating Margin emission factor ($EF_{OM,y}$)

Table A2 Simple OM Emission Factors Calculation of CCPG for Year 2003

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44 /12/10000 (for 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 (for volume unit)
Raw Coal	10^4 t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100	20908	273971539.89
Cleaned Coal	10^4 t							0	25.8	100	26344	0
Other Washed Coal	10^4 t	2.03	39.63			106.12		147.78	25.8	100	8363	1169146.40
Coke	10^4 t				1.22			1.22	29.2	100	28435	37142.18
Coke Oven Gas	10^8 m^3			0.93				0.93	12.1	100	16726	69013.15
Other Gas	10^8 m^3							0	12.1	100	5227	0
Crude Oil	10^4 t		0.5	0.24			1.2	1.94	20	100	41816	59490.23
Diesel Oil	10^4 t	0.52	2.54	0.69	1.21	0.77		5.73	20.2	100	42652	181015.94
Fuel Oil	10^4 t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157229.00
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	1.76	6.53		0.66			8.95	15.7	100	46055	237285.34
Natural Gas	10^8 m^3					0.04	2.2	2.24	15.3	100	38931	489222.52
											Total	**276371084.63**

Data Source: <China Energy Statistical Yearbook 2004>

Table A3 Fuel-fired Electricity Generation of CCPG for Year 2003

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	271.65	27165000	6.43	25418291
Henan	955.18	95518000	7.68	88182218
Hubei	395.32	39532000	3.81	38025831
Hunan	295.01	29501000	4.58	28149854
Chongqing	163.41	16341000	8.97	14875212
Sichuan	327.82	32782000	4.41	31336314
Total				225987719

Data Source: <China Electric Power Yearbook 2004>

According to Table A2, the total CO_2 emissions of CCPG is **276371084.63** tCO_2e in year 2003. According to Table A3, the total supplied electricity of CCPG is 225987719.2 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2003}$ is 1.2229 tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of CCPG for Year 2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J* 44/12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J	K=G*H*I*J*4 4/12 /1000 (for volume unit)
Raw Coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.29
Cleaned Coal	10^4 t		2.34					2.34	25.8	100	26344	58316.13
Other Washed Coal	10^4 t	48.93	104.22			89.72		242.87	25.8	100	8363	1921441.23
Coke	10^4 t		109.61					109.61	29.2	100	28435	3337011.41
Coke Oven Gas	10^8 m^3			1.68		0.34		2.02	12.1	100	16726	149899.53
Other Gas	10^8 m^3					2.61		2.61	12.1	100	5227	60527.09
Crude Oil	10^4 t		0.86	0.22				1.08	20	100	41816	33118.27
Gasoline	10^4 t		0.06			0.01		0.07	20.2	100	43070	2089.33
Diesel Oil	10^4 t	0.02	3.86	1.7	1.72	1.14		8.44	21.1	100	42652	266627.32
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	17.2	100	41816	464893.14
LPG	10^4 t							0	15.7	100	50179	0
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	15.3	100	46055	153506.38
Natural Gas	10^8 m^3						2.27	2.27	25.8	100	38931	495774.61
											Total	**346035809.73**

Data Source: <China Energy Statistical Yearbook 2005>

Table A5 Fuel-fired Electricity Generation of CCPG for Year 2004

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	301.27	30127000	7.04	28006059
Henan	1093.52	109352000	8.19	100396071
Hubei	430.34	43034000	6.58	40202363
Hunan	371.86	37186000	7.47	34408206
Chongqing	165.2	16520000	11.06	14692888
Sichuan	346.27	34627000	9.41	31368599
Total				249074186

Data Source: <China Electric Power Yearbook 2005>

According to Table A4, the total CO_2 emissions of CCPG is 346035809.73 tCO_2e in year 2004. According to Table A5, the total supplied electricity of CCPG is 249074186 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2004}$ is 1.3893 tCO_2e/MWh.

Table A6 Simple OM Emission Factors Calculation of CCPG for Year 2005

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
									(tC/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J*44 /12/10000 (for 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 (for volume unit)
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614496.76
Cleaned Coal	10^4 t	0.02	0					0.02	25.8	100	26344	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	25.8	100	8363	1804669.00
Coke	10^4 t		25.95		105			130.95	29.2	100	28435	3986695.05
Coke Oven Gas	10^8 m^3			1.15		0.36		1.51	12.1	100	16726	112053.61
Other Gas	10^8 m^3		10.2			3.12		13.32	12.1	100	5227	308896.88
Crude Oil	10^4 t		0.82	0.36				1.18	20	100	41816	36184.78
Gasoline			0.02			0.02		0.04	18.9	100	43070	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	20.2	100	42652	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959.09
LPG	10^4 t							0	17.2	100	50179	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	15.7	100	46055	176572.11
Natural Gas	10^8 m^3						3	3	15.3	100	38931	655208.73
											Total	**360283226.12**

Data Source: <China Energy Statistical Yearbook 2006>

Table A7 Fuel-fired Electricity Generation of CCPG for Year 2005

Province	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Jiangxi	305.61	30561000	6.48	28580647.2
Henan	1311.3	131130000	7.32	121531284
Hubei	476.15	47615000	2.51	46419863.5
Hunan	403.08	40308000	5	38292600
Chongqing	186.69	18669000	8.05	17166145.5
Sichuan	365.42	36542000	4.27	34981656.6
Total				286972196.8

Data Source: <China Electric Power Yearbook 2006>

According to Table A6, the total CO_2 emissions of CCPG is 360283226.12 tCO_2e in year 2005. According to Table A7, the total supplied electricity of CCPG is 286972196.8 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2005}$ is 1.2555 tCO_2e/MWh.

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2003-2005, as follow:

$$EF_{OM} = 1.28956\ tCO_2e/MWh$$

Step 2: Calculating the Build Margin emission factor ($EF_{BM,y}$)
Sub-Step 2a: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table A8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Jiangxi	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**	**Average Low Calorific Value**	**Emission Factor (tC/TJ)**	**Oxidation**	**CO_2 Emission (tCO_2e)**
Fuel	Unit	A	B	C	D	E	F	G=A+…+F	H	I	J	K=G*H*I*J*44 /12/100
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	20908 kJ/kg	25.8	100%	352614496.76
Cleaned Coal	10^4 t	0.02	0					0.02	26344 kJ/kg	25.8	100%	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	8363 kJ/kg	25.8	100%	1804669.00
Coke	10^4 t		25.95		105			130.95	28435 kJ/kg	29.2	100%	3986695.05
Subtotal												**358406359.24**
Crude Oil	10^4 t		0.82	0.36				1.18	41816 kJ/kg	20	100%	36184.78
Gasoline	10^4 t		0.02			0.02		0.04	43070 kJ/kg	18.9	100%	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	42652 kJ/kg	20.2	100%	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	41816 kJ/kg	21.1	100%	286959.09
Subtotal												**624135.55**
Natural Gas	10^7 m^3						30	30	38931 kJ/m^3	15.3	100%	655208.73
Coke Oven Gas	10^7 m^3			11.5		3.6		15.1	16726 kJ/m^3	12.1	100%	112053.61
Other Gas	10^7 m^3		102			31.2		133.2	5227 kJ/m^3	12.1	100%	308896.88
LPG	10^4 t							0	50179 kJ/kg	17.2	100%	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	46055 kJ/kg	15.7	100%	176572.11
Subtotal												**1252731.33**
Total												**360283226.12**

Data Source: <China Energy Statistical Yearbook 2006>

According to Table A8 and formula (5) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal} = 99.48\%,\quad \lambda_{Oil} = 0.17\%,\quad \lambda_{Gas} = 0.35\%$$

Due to the sum of λ_{Oil} and λ_{Gas} account for only 0.52% of total fuel-fired CO_2 emissions, it is reasonable to replace $EF_{Thermal}$ with $EF_{Coal,\,Adv}$. As a conservative approach, the final $EF_{Thermal}$ is calculated as follow:

$$EF_{Thermal} = EF_{Coal,\,Adv} \cdot (1 - \lambda_{Oil} - \lambda_{Gas})$$

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

The best available technologies in China are mainly sub-critical and super critical power plants, with the standard coal consumption of power generation of 327g/kWh and 323g/kWh respectively. It is conservative for standard coal to adopt the value 320g/kWh. It can be found from <China Electric Power Yearbook 2005> that the standard coal consumption of power generation is 371kg/kWh in Central China Power Grid. Thus, the value 320g/kWh is very conservative to calculation BM.

Parameters used for calculating coal-fired plant emission factor are shown in Table A9 below:

Table A9 Parameters used for calculating coal-fired plant emission factor

Parameter	Unit	Value	Comment
NCV of standard coal	TJ/t coal	0.02927	The data is derived from General Code Comprehensive Energy Consumption Calculation (GB2589-81)
Coal consumption of power generation	t/MWh	0.32	Conservative value
Emission factor of coal	tC/TJ	25.8	The data is derived from IPCC2006
Oxidation factor of coal	/	100%	The data is derived from IPCC2006

The $EF_{Thermal}$ is 0.88145 tCO_2e/MWh

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table A10 Installed Capacities of CCPG

Installed Capacity	**Unit**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Fuel-fired	MW	39864.6	42569.2	43303.2	46893.5	53744.7	60167.3
Hydro	MW	28637.8	30397	31034.7	36557	34642	38405.1
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	24
Total	MW	**68502.4**	**72966.2**	**74337.9**	**83450.5**	**88386.7**	**98596.4**

Data Source: <China Electric Power Yearbook 2001-2006>

Table A11 Newly Added Installed Capacity from Year 2000-2005

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**F-C**
	A	**B**	**C**	**D**	**E**	**F**	
Fuel-fired (MW)	39864.6	42569.2	43303.2	46893.5	53744.7	60167.3	16864.1
Hydro (MW)	28637.8	30397	31034.7	36557	34642	38405.1	7370.4
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	24
Total （MW）	68502.4	72966.2	74337.9	83450.5	88386.7	98596.4	24258.5
Percentage of newly installed capacity to 2005	30.51%	25.98%	24.59%	15.34%	10.33%	0.00%	
Percentage of newly added fuel-fired plants		69.52%					

It can be concluded from Table A13 that capacity additions from year 2002 to 2005 is closer to 20% of the total additions and it is obvious the capacity additions during year 2002 to 2005 are larger than the capacity of five plants, so year 2002 and 2005 are chosen to calculate the BM emission factor of CCPG.

According to Table A11 and formula (8) in section B.6.1, the EF_{BM} is calculated as:

$$EF_{BM} = 0.61277 \text{ tCO}_2\text{e/MWh}$$

Step 3: Calculating the baseline emission factor (EF_y)

According to formula (9) in section B.6.1, the baseline emission factor of CCPG is calculated as:

$$EF_y = 0.95116 \text{ tCO}_2\text{e/MWh}$$

Annex 4

MONITORING INFORMATION

No additional information.