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

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / Crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
Title of the project activity: China Shaibeitan Hydropower Project
Document version: 6
Date of completion: 19/12/2008

Version history:

Version number	Date	Reason
Version 1	17/12/2006	Draft Project Design Document (PDD)
Version 2	20/07/2007	Revised PDD for GSP
Version 3	02/12/2007	Revised PDD according to comments from NDRC
Version 4	22/04/2008	Revised PDD according to draft validation report from DOE
Version 5	03/08/2008	Revised PDD according to further clarification request from DOE.
Version 6	19/12/2008	Revised to address the issues raised in the request for review

A.2. Description of the project activity:

>>
China Shaibeitan Hydropower Project (hereinafter referred to as "the project") is a newly-built hydropower station. The project is located in the upstream of Baishui River (a branch of Xiangjiang River) in Shaibeitan Town, Qiyang County, Yongzhou City, Hunan Province, the People's Republic of China. The total installed capacity is 35 MW with annual operation time of 3,345 hours. The surface area at the full reservoir level is 3.9 km^2 , thus the power density of the project is 9.0W/m^2. The electricity is delivered to the Central China Power Grid (CCPG) which mainly consists of fuel-fired power plants. When the project is completed, it can produce total electricity of 117,080 MWh and supply net electricity of 109,000 MWh to CCPG annually[1].

The electricity generated by the project can displace part of the electricity generated by CCPG. When the project is put into operation, the expected annual GHG emission reductions are 93,139 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 200 job opportunities during the construction period, and more than 30 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 construction.

[1] Hunan Qiyang Shaibeitan Hydropower Project Preliminary Design Report (PDR, September 2003), Hunan 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 in July 17, 2002 (Grade A, No.180105)). The PDR is approved by Water Resources Bureau of Hunan Province on 20 February 2004.

A.3. Project participants:

>>

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Peoples' Republic of China (Host)	Qiyang Yangguang Hydroelectric Co., Ltd	No
Netherlands	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.		

For detailed information, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>

The People's Republic of China (host)

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

>>

Hunan Province

A.4.1.3. City/Town/Community etc:

>>

Shaibeitan Town, Qiyang County, Yongzhou City

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

>>

The project is located in Shaibeitan Town, Qiyang County, Yongzhou City, Hunan Province, which is about 60km away from the Qiyang County and 80 km away from the Yongzhou City, and the dam's geographical coordinates are eastern longitude of 112°09′40″, and northern latitude of 26°10′14″, the powerhouse's geographical coordinates are eastern longitude of 112°08′51″, and northern latitude of 26°12′50″. The location of the project activity is shown in Fig. 1.

Fig. 1 Geographical position of the project

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

>>

The project falls into:

Sectoral Scope 1: Energy industries(renewable sources)

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

>>

The project is a newly-built hydropower station. The main buildings consist of a dam, a powerhouse and a switch station. There are 2 water-turbine generator units with a single-unit capacity of 17.5 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 8 km. The technical parameters of generators and turbines are shown in Table 1:

Table 1 Technical parameters on main constructions and facilities of the project

Parameters		Unit	Value
Hydraulic Turbine	Model	/	HL190-LJ-142
	Quantity	set	2
	Rated capacity	MW	18.23
	Rated rotation	r/min	600
	Rated water head	m	122
	Rated flow	m^3/s	16.5
Hydraulic Generator	Model	/	SF17.5-10/2600
	Quantity	set	2
	Rated Capacity	MW	17.5
	Rated Voltage	kV	10.5

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:

>>

The first crediting period of the project is 7 years from January 1, 2009 to December 31, 2015. The amounts of annual and total emission reductions are listed in Table 2:

Table 2 Estimated amounts of emission reductions over the chosen crediting period

Year	Annual estimation of emission reductions in tonnes of CO_2e
2009	93,139
2010	93,139
2011	93,139
2012	93,139
2013	93,139
2014	93,139
2015	93,139

Total estimated reductions (tonnes of CO_2e)	651,973
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	93,139

A.4.5. Public funding of the project activity:

>>

No public funding from parties included in Annex I is available to the project activity.

SECTION B. Application of a baseline and monitoring methodology:

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

>>

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

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

Tool for the demonstration and assessment of additionality (Version 05).

Reference: Please click following link for more information about the methodology and reference: 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:

>>

The project is a grid-connected renewable power generation project activity which meets all the applicable criteria stated in the methodology ACM0002:

1. The project is a newly-built hydropower station by using water resources for power generation, its power density is $9.0W/m^2$ which is greater than $4W/m^2$;
2. The project activity doesn't involve switching from fossil fuels to renewable energy at the site of the project activity;
3. The geographic and system boundaries for CCPG which the project is connected to can be clearly identified and information on the characteristics of the grid is available.

Therefore, the methodology ACM0002 is applicable to the project activity.

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

>>

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	Yes	The project power density is less than $10W/m^2$, CH_4 emissions have to be 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:

>>
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 supply to CCPG;
Scenario 3 Other renewable energy power plants with equivalent annual power generation;
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 6.55% 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 supply 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 35MW. 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].
Therefore, the scenario 2 does not comply with current mandatory applicable legislation and regulations in China, it is not feasible baseline scenario.

---

[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.

Scenario 3 Other renewable energy power plants with equivalent annual power generation
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 intensive for generating the equivalent annual output. The region where the proposed project is located is poor in terms of wind resources 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 of similar size 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.
.

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):

>>
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 includes:
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 supply to CCPG;
Alternative 3 Other renewable energy power plants with equivalent annual power generation;
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 35MW, but 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[6], so the alternative is not consistent with the current laws and regulation, it is not realistic and credible alternative.

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

[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.

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

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 8% which is quoted from *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project*. The *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project* is applicable to newly investment and retrofit power plants. Thus, the benchmark analysis is applicable to the project. The benchmark of 8% used for the project is quoted from the Preliminary Design Report. This benchmark is selected in line with the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project*, which is applicable to newly built power plants as well as retrofit power plants. Another commonly used guidance for benchmark selection for small hydro projects is *Economic Evaluation Code for Small Hydropower Projects* (SL 16-95). It states that the benchmark is 10% for small scale hydropower projects with installed capacity below 25 MW and for small scale hydropower projects with installed capacity below 50 MW in the rural region. This specific project has the installed capacity above 25 MW and it is not located in the rural region. Thus this guidance is not applicable to the Shaibeitan project.

Thus, the option III is used in this PDD for investment analysis.

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

According to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project,* the financial benchmark internal rate of return (after tax) of total investment for Chinese power industry is 8%, which is used widely in hydropower projects in China.

Sub-step 2c. Calculation and comparison of financial indicators
The main assumptions for the investment analysis are shown in Table 4.

Table 4 Main assumptions for investment analysis and calculation

No.	Main Parameter	Unit	Value	Notes
1	Installed capacity	10,000 kW	3.50	Preliminary Design Report

2	Total investment	10^4 RMB yuan	28382.09	Preliminary Design Report
3	Net electricity generation	MWh/yr	109,000.00	Preliminary Design Report
4	Electricity tariff (VAT Incl.)	RMB yuan/kWh	0.315	Hunan Province Price Bureau[7]
5	Value-added Tax	/	17%	Proof document from Taxation Bureau of Qiyang County[8]
6	Urban Construction & Maintenance Tax	/	5%	Preliminary Design Report
7	Additional Education Fees	/	3%	Preliminary Design Report
8	Income tax	/	33%	Preliminary Design Report
9	Project lifetime	year	30	Preliminary Design Report
10	Average O&M costs	10^4 RMB yuan	437.70	Preliminary Design Report

Note: The PDR was received in Sep., 2003. The project owner was aware of VAT for the proposed project is 17% other than 6% from local taxation department. Then the local taxation department provided a explanation document which indicated that the actual VAT should be 17% for the project on 18 June 2004. Later, Hunan Province Price Bureau issued a document "Notice on Adjusting Electricity Tariff of Power Stations in Hunan Provincial Power Grid Issued by Hunan Province Price Bureau" which stipulated that the electricity tariff should be 0.315 RMB yuan/kWh for the project on 4 August 2004. The project owner asked for the design institute to re-assess the related data in PDR in September 2004, and the design institute confirmed that the data were still valid except the VAT and the electricity tariff [21]. So the data adopted in PDD are from PDR except VAT and the electricity tariff.

The analysis of parameters in above table are as follows:

1. Total investment

The total investment of the project is derived from PDR of Shaibeitan Hydropower Project. According to investment statement from China Construction Bank Yongzhou Branch on 22 July 2008, the actual fixed assets investment (interests during construction period is not included) spent on the project is 287 million RMB up to July 2008 in accordance with actual payments made already. The final investment will keep increasing since the project is still under construction now. Thus the estimated total investment for the project in PDR is credible. The unexpected increased investment is due to inflation and delayed construction period.

2. Net electricity generation

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

[8] Certificate of VAT of China Shaibeitan Hydropower Project, Baishui Branch of Qiyang National Taxation Bureau, June 18, 2004.

According to PDR, the data is calculated through 36 years of water flow data (1967-2002) measured by the third party Jindong Hydrology Station. The project is a newly built power plant with reservoir thus the power generation is stable and will not fluctuate too much through the whole year.

3. Electricity tariff

The data is derived from <Notice of the Electricity Tariff of Power Grid of Hunan Province> (Xiangjiachong [2004] No.114), which is issued by Hunan Price Bureau on 4 August 4 2004 (Xiangjiachong (2004) No.114) before the investment decision of the project.

The project is still under construction, thus the Power Purchase Agreement and electricity sales receipts are not available. However, according to Notice of the Hunan Yongzhou Price Bureau in November 2008, the electricity tariff for the project will be 0.316 RMB/kWh. The increasing rate of electricity tariff from 2004 to 2008 is only 0.32%.

The tariff will not fluctuate too much and is credible and reasonable throughout the investment period. The analysis is as below:

(1) It is common practice to adopt the fixed electricity tariff and fixed costs when conducting the investment analysis in Feasibility Study Report (FSR) or PDR in China. According to *Economic Assessment Method and Parameters for Construction Projects (Version 3)*, the fixed price should be used in the investment analysis. According to Interim Rules on *Economic Assessment of Electrical Engineering Retrofit Project* published by China Electric Power Press in September 2002, the price used for investment analysis should be based on the current price system. The *Economic Assessment of Electrical Engineering Retrofit Project* is also the benchmark reference for the project.

Thus it is reasonable to adopt fixed electricity tariff and costs to conduct investment analysis since *Economic Assessment of Electrical Engineering Retrofit Project* is chosen as the benchmark for the project.

(2) In China, the electricity tariff is strictly controlled by the central government. The electricity tariff will not be significantly changed without permission by the central government. In order to ensure the stability of the price for the whole country, the central government has very strict control for the basic price such as the tariff and commodity price. It is impossible for power generation enterprises to forecast the electricity tariff variation in the future. The adjustment of electricity tariff needs to be realized by negotiation of several government departments or even needs to be approved by the CPC Central Committee, which could not be forecasted or controlled by one specific power generation enterprise. So electricity tariff used for financial analysis of projects could not be forecasted. Thus only fixed electricity tariff derived from relevant electricity guiding price could be adopted.

According to the *Notification of Electric Power Tariff Reform by the Office of National Council* (Guobanfa (2003) No.62)[9] issued on 9 July 2003, the related policies for the electricity tariff management in China are as follows:

Item 33: The electricity tariff is controlled and managed by the price responsible department of government. For crucial price decision, it is required to consult power supervision department, power electric association and related marketing entities for opinions. The power electric supervision and

[9] http://www.chinabaike.com/law/zy/xz/bgt/1336813_3.html

management department recommends the electricity tariff adjustment methods to price responsible department of government in accordance with situation of market.

Item 34: The principles of electricity tariff management, the electricity transmission tariff and capacity tariff of power electric market should be decided and issued by price responsible department of State Council.

Item 35: The price responsible department of government and power electric supervision department should supervise and check the implementation of electricity tariff for participants in power electric market.

(3) In Hunan Province, the electricity generated by utilization of renewable resource got a higher tariff in the past several years, but it was decreased because of the competition principle for electricity tariff delivered to the grid. It can be indicated that: according to the document form Hunan Price Bureau, the electricity tariff has decreased from 0.348 RMB￥/kWh[10] in 2000 to 0.327 RMB￥/kWh[11] in 2002 and then 0.315 RMB￥/kWh in 2004[12] which indicated a decreasing trend. And from 2006, the electricity tariff of similar power plants in locality is stable at 0.316 RMB￥/kWh[13]. The increasing rate of electricity tariff from 2004 to 2008 is 0.32%, which can be ignored comparing the electricity decreasing trend from 2000 until now and compared to the **minimum** increase of salary costs of 12.4% between 2005 and 2007 (see below).

However, it can be found that the increasing rate of electricity tariff from 2004 to 2008 is 0.32%, then we'd like to assess the impact on the IRR calculation of applying the realistic and reasonable tariff and O&M increments in CONSERVATIVE approach below:

(1) We take 0.32% as annual increased rate for electricity tariff although 0.32% is actually increased rate for electricity tariff from 2004 until now.
(2) The increase of O&M costs is ignored due to it leads to a higher IRR.
(3) The increased investment for the project is ignored due to it leads to a higher IRR.

It can be found that the IRR result (Please see attached separate IRR excel spreadsheets) of applying the realistic and reasonable tariff is 6.81%. The project IRR is still far below the benchmark (8%).

4. VAT

According to *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* published by National Water Resource Ministry, the VAT of the project is fixed by 17%. The data is also

[10] Hunan Price Bureau , Notice of the Electricity Price of Power Grid of Hunan Province, March 6, 2000 (Xiangjiachong (2000) No.49)

[11] Hunan Price Bureau , Notice of the Electricity Price of Power Plants of Hunan Province, December 31, 2001 (Xiangjiachong (2001) No.327)

[12] Hunan Price Bureau , Notice of the Electricity Price of Power Grid of Hunan Province, August 4, 2004 (Xiangjiachong (2004) No.114)

[13] Hunan Price Bureau , Notice of the Electricity Price of Power Grid of Hunan Province, July 28, 2006 (Xiangjiachong (2006) No.111)

consistent with national taxation regulation. The document provided by local taxation bureau before investment decision can be used as cross-check. So the data is credible and reasonable during the investment period.

5. Income tax

The value is derived from Corporate Income tax Temporary Terms of People's Republic of China published on 23/12/1993 which is valid until end of year 2007.

6. City maintenance & construction tax

According to *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* published by National Water Resource Ministry, the city maintenance & construction tax is 5%. The data is also consistent with national taxation regulation.

7. Education surtax

According to *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* published by National Water Resource Ministry, the education surtax is 3%. The data is also consistent with national taxation regulation.

8. O&M costs

The O & M costs include salary, repair fee, water resource fee, reservoir region maintenance fee, material fee and other costs. All these parameters are derived from PDR of the project. The cross check of these parameters are as follows:

The repair fee is 1% according to PDR; the data is also the default value indicated in *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* published which was published by National Water Resource Ministry.

The water resource fee rate is 0.001RMB/kWh, the rate can be cross checked by *The Notice to Confirm the Water Resource Fee* (Xiangjiafei[2003] No.128)[14] published by Hunan Price Bureau and Hunan Finance Bureau.

The materials fee is 5 RMB yuan/KW, which is also the default value indicated in *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* published which was published by National Water Resource Ministry.

The reservoir region maintenance fee is 0.001RMB/kWh, the rate can be cross checked by *Reservoir Region Maintenance Fee for Hydropower Plants* (Diancaizi (1981) No.56)[15] issued by Ministry of Finance and Ministry of Power Electric Industry.

The other costs fee is 24 RMB/kW, which is derived from *Provisional Regulation of Financial Assessment for Hydroelectric Construction Project* issued by National Water Resource Ministry.

---

[14] http://www.hnwr.gov.cn/news/html/2007/06/20070626155052-1.htm

[15] http://www.hbym.gov.cn/Article/policy/200611/3572.html

Salary: According to the notices published by the Statistical Information of Hunan, the average laborage in Yongzhou City is 19.705 thousand RMB in 2007 with the increase rate of 12.4%[16], 14%[17] and 20.6%[18], respectively from 2005 to 2007, and which shows an increasing trend. The above analysis indicates that the salary standard for the workers is reasonable and credible.

Therefore, the O & M costs show a stable increasing tendency through historical data. In other words, a general price index increase (called inflation) affects all relevant cash flows of a baseline and project scenario and is included in the so-called discount rate of a nominal IRR analysis, by definition. The project's cash outflows are faced by a bigger inflation than the cash inflows and thus, if at all, the electricity tariff would have to be adjusted downwards over the assessment period, in a nominal IRR analysis. Thus, even if the grid tariff is not fixed, it is highly unlikely that the additionality of the project is affected.

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

Table 5 Comparison of financial indicators with or without CERs revenue

Item	Unit	Without CERs revenue	Benchmark	With CERs revenue (10$/t$CO_2$e)
IRR	/	6.55%	8%	9.00%

According to Table 5, when the CERs sale revenue are not taken into account, the IRR is 6.55% which is lower than the benchmark. Therefore, the proposed project is not financially attractive to investors; on the contrary, the IRR can be improved obviously and exceeds the benchmark IRR with CERs sale revenue, so the registration of the project as a CDM project activity will improve the confidence of the project owner and the bank, the incentives from the CDM will be very important to overcome the financial 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.

Table 6 Practical possibility assessment of critical factors

[16] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2005, March 27, 2006

http://www.hntj.gov.cn/fxbg/2006fxbg/2006tjxx/200603270064.htm

[17] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2006, March 21, 2007

http://www.hntj.gov.cn/fxbg/2007fxbg/2007tjxx/200703210067.htm

[18] Statistical Information of Hunan, the Statistical Information of the laborage of each city in Hunan Province in 2007, March 27, 2008

http://www.hntj.gov.cn/fxbg/2008fxbg/2008tjxx/200803260040.htm

Variation range & assessment / Factor	Variation range to reach benchmark	Practical assessment of the critical factors
Total investment	-15.4%	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 15.4%.
Electricity Tariff	+17.2%	When the tariff increase, the IRR of project goes up. That means that the IRR of the project would reach the benchmark of 8% only when the electricity tariff increases 17.2%. 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[19] in 2000 to 0.327 RMB yuan[20] in 2002 and then 0.315 RMB yuan[21] in 2004 which indicated a decreasing trend. And thus, the increase of 17.2% of the electricity tariff shall not occur.
Electricity generation	+17.3%	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 project to increase 17.3%, because the expected electricity generation is calculated according to the hydrological data for 36 years in PDR and it will not change much.

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

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

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

		And thus, the increase of 17.3% of project's electricity generation shall not occur.
O&M costs	/	The project IRR is only 7.83% when O&M costs are 0. And thus, the O&M costs have little impact on project IRR.

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 (8%) 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 (hydropower plants), are of a similar scale(15MW~50MW), and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing.

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). The selected geographical area for the project, i.e. Hunan Province, is relatively large. Hunan Province is considerably larger than several countries. The policies and regulations in Chinese provinces are different with each other.

According to *Classification & Design Safety Standard of Hydropower Projects* (DL5180-2003), hydropower plants with capacity below 50 MW are classified as small size projects. According to EB guidelines, the hydropower plants below 15 MW do not have to conduct common practice. Thus the similar scale is defined between 15~50 MW.

The significant reform to Chinese electric power sector was taken place in 2002. The reform involved establishing State Grid Corporation of China and China Southern Power Grid Corporation[22]. The former State Power Corporation was restructured and separated into 5 national power generation companies[23]. Before the power industry restructure in year 2002[24], the hydropower plants were mainly developed by

---

[22] Notice of the State Council on Printing and Distributing the Plans Regarding the Restructuring of the Power Industry(Guofa [2002] No.5), issued by State Council on 10 February 2002

http://www.china5e.com/laws/index2.htm?id=200608080001

[23] Approval from State Development Planning Commission about Power Generation Asset Restructuring and Division Scheme of State Power Corporation, Guodianban (2002) No.952, 26 December 2002

http://www.365dq.com/Research/Info_View.asp?ContentID=1793

[24] Notice of the State Council on Printing and Distributing the Plans Regarding the Restructuring of the Power Industry (Guofa [2002] No.5), issued by State Council, 10 February 2002

the state owned enterprises, provincial governments ensured that project entity of power plants can obtain sufficient return by providing guarantee electricity tariff. Power plants were constructed with the national or the local governmental funds, or the government provide the loan guarantee for the companies, the developers didn't have financing difficulties. Thus the electricity tariff for each power plant was determined with the principle of full-cost recovery[25].However, the national policy changed after 2002, the electricity tariff will be determined on the basis of average costs of power generation using the same advanced technology and built within the same period under the provincial power grids. Thus projects operated after 2002 are considered as similar projects to the proposed project since they were operated under a same policy scheme.

The other activities currently operational after 2002 in Hunan Province are listed in Table below, other CDM project activities are not included in the table according to additionality tool.

Table 7 Hydropower plants in operation since 2002 in Hunan (15~50MW)[26]

No.	The project name	Installed capacity (MW)	Operation time (year)	Investment per kWh (RMB yuan/kWh)	Essential distinction with Shaibeitan	IRR[27]	Type of the project owner
1	Ruoshui	15.0	2006	1.85	No reservoir construction required	Above 10%	Private company
2	Mulongtan	15.0	2003	1.75	Reservoir construction invested by government	Above 10%	State owned enterprise
3	Yongxing II	20.0	2005	1.85	No reservoir construction required	Above 10%	State owned enterprise
4	Chengjiangkou	25.0	2006	1.96	No reservoir construction required	Above 10%	Private company
5	Yangmingshan II	25.0	2004	1.21	No reservoir construction required	Above 10%	State owned enterprise
6	Ouyanghai Expanded Project	30.0	2006	1.62[28]	No reservoir construction required	Above 10%	State owned enterprise
7	Leizhong	40.5	2004	1.80	No reservoir construction	Above 10%	State owned enterprise

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

http://www.scicpa.org.cn/html/hyfw/default.asp?id=46&vid=4795

[26] Investigation Report on Hydropower Plants with Installed Capacity of over 15MW in Operation since 2002 in Hunan Province, Hunan Hydro & Power Design Institute, March 2008.

[27] The exact IRRs are not disclosed as it is confidential information. The evidence Investigation Report on Hydropower Plants with Installed Capacity of over 15MW in Operation since 2002 in Hunan Province was verified by DOE.

[28] http://www.shp.com.cn/news/info/2007/8/6/1410011621.html.

					required		

All the data and information described below are derived from *Investigation Report on Hydropower Plants with Installed Capacity above 15 MW Operational since 2002 in Hunan Province* unless otherwise stated expressly.

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

In general, investors will develop the hydropower plants with good technical and economic indicators, the hydropower plants in above table were developed earlier with excellent natural conditions such as high water head and low construction costs, so these plants had excellent technical and economic indicators, the investment per unit power generation (equal to total investment divided by power generation) of these projects is 1.21~1.96 RMB yuan/kWh which is 19%~50% less than that of the proposed project (2.42 RMB yuan/kWh). The IRR for all these projects are above 10%. Thus these projects listed in Table above were financially attractive and had no investment risks. But the proposed project has poorer financial indicators and is not financially attractive; it would be very difficult for the developer of the proposed project to obtain a bank's loan without CDM support.

The detailed description of the distinctions of the identified similar projects:

1. Ruoshui hydropower plant: There is a Baiyun reservoir with multi-year pondage capacity in the upriver of the project. Ruoshui project leads to few submergence of lands due to Baiyun reservoir thus the investment for Ruoshui project is much less than Shaibeitan project. Furthermore, the annual operation period of the project is much higher than Shaibeitan project.

2. Mulongtan hydropower plant: The reservoir of the project is invested by local government, and part of investment is included in the city flooding engineering. The investment of the project is much lower than Shaibeitan project while the annual operation period of the project is much higher than Shaibeitan project. Furthermore, Mulongtan project is owned by state-owned enterprise while Shaibeitan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets can be used as mortgage in bank.

3. Yongxing II hydropower plant: There is a Dongjiang reservoir with multi-year pondage capacity in the upriver of the project. Yongxing II project leads to few submergence of lands due to Dongjiang reservoir thus the investment for Yongxing II project is much less than Shaibeitan project. Furthermore, the annual operation period of the project is much higher than Shaibeitan project. Yongxing II project is owned by state-owned enterprise while Shaibeitan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets can be used as mortgage in bank.

4. Chengjiangkou hydropower plant: There is a Dongjiang reservoir with multi-year pondage capacity in the upriver of the project. Chengjiangkou project leads to few submergence of lands due to Dongjiang reservoir thus the investment for Chengjiangkou project is much less than Shaibeitan project. Furthermore, the annual operation period of the project is much higher than Shaibeitan project.

5. Yangmingshan II hydropower plant: The annual operation period (3300 hours) for the project is a little less than Shaibeitan project (3345 hours). However, due to few submergence of lands of Yangmingshan II project, the investment for the project is nearly half of Shaibeitan project since Yangmingshan II was constructed much earlier than Shaibeitan. Furthermore, Yangmingshan II project is owned by state-owned enterprise while Shaibeitan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets can be used as mortgage in bank.

6. Ouyanghai expanded project: The project is an installed capacity expansion project. There is no submergence of lands and resettlers involved for the project thus the investment for the project is much less than Shaibeitan project. Furthermore, Ouyanghai expanded project is owned by state-owned enterprise while Shaibeitan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets can be used as mortgage in bank.

7. Leizhong hydropower plant: There is a Dongjiang reservoir with multi-year pondage capacity in the upriver of the project. Leizhong project leads to few submergence of lands due to Dongjiang reservoir thus the investment for Leizhong project is much less than Shaibeitan project. Furthermore, the annual operation period of the project is much higher than Shaibeitan project. Furthermore, Leizhong project is owned by state-owned enterprise while Shaibeitan project is owned by private company. The financing difficulty for private company is much higher than state-owned enterprise since state-owned enterprise has more assets can be used as mortgage in bank.

In conclusion, the submergences of above 7 similar projects are much less than Shaibeitan project thus the investment for these 7 similar projects are much less than Shaibeitan project. Most of above projects are using the big reservoir in upriver or the existing reservoir. These 7 similar projects were constructed earlier than Shaibeitan project. There is a reservoir with annual pondage capacity involved in the construction of Shaibeitan project thus the reservoir causes the high investment due to submergence of lands and resettlers.

It can be concluded 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(dd/mm/yyyy)	Schedule
09/2003	Preliminary Design Report was completed
01/2004	EIA was completed[29]
20/02/2004	Preliminary Design Report was approved
20/02/2004	EIA was approved
18/06/2004	Explanation document of VAT of China Shaibeitan Hydropower Project[30]
04/08/2004	Document of Hunan Province Price Bureau(Electricity tariff of 0.315 RMB ¥ /kWh which is applicable for China Shaibeitan Hydropower Project)[31]

[29] Hunan Qiyang Shaibeitan Hydropower Project Environmental Impact Assessment, Hunan Investigation, Design & Research Institute of Water Resources and Hydropower, January 2004.

[30] Evidence of VAT of China Shaibeitan Hydropower Project, Baishui Branch of National Taxation Bureau of Qiyang, June 18, 2004. The project owners consulted to Baishui Branch of National Taxation Bureau of Qiyang for VAT of Shaibeitan project, and received this evidence by Baishui Branch of National Taxation Bureau of Qiyang.

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

10/09/2004	The re-assessment of the data in PDR[32]
02/11/2004	Decision of the project owner to apply for CDM support[33]
10/11/2004	The project owner entrusted Hunan Science & Technology Information Institute to take charge of the application for CDM support[34]
26/12/2004	Intention agreement of the loan was signed due to CDM.[35]
08/01/2005	The tunnel construction agreement was signed[36]
13/01/2005	The powerhouse construction agreement was signed[37]
31/01/2005	The dam construction agreement was signed[38]
16/03/2005	The project owner decided to establish a CDM working group and try their best to make the project registered[39]
14/04/2005	The dam construction was started[40]
22/04/2005	The tunnel construction was started[41]

[32] With request from project owner, Hunan Investigation, Design & Research Institute of Water Resources and Hydropower Plant re-assessed the data in PDR on September 10, 2004, which was to explian the data in PDR except VAT and electricity tariff were valid and applicable for the project.

[33] Eighth Meeting Minutes of the first board of directors of Qiyang Yangguang Hydroelectric Co., Ltd. about decision of applying for CDM support, November 2, 2004.

[34] Letter of Intention of Development Cooperation of Shaibeitan CDM Project between Qiyang Yangguang Hydroelectric Co., Ltd. and Hunan Science & Technology Information Institute, November 10, 2004.

[35] Intention agreement of the loan between Qiyang Yangguang Hydroelectric Co., Ltd. and Yongzhou Branch of China Construction Bank, December 26, 2004.

[36] The Tunnel Construction Agreement between Qiyang Yangguang Hydroelectric Co., Ltd. and Yongzhou Construction of Water Resources and Hydropower Co., Ltd., dated on January 8, 2005.

[37] The Powerhouse Construction Agreement between Qiyang Yangguang Hydroelectric Co., Ltd. and Hunan Provincial Construction Engineering Co., Ltd., dated on January 13, 2005.

[38] The dam construction agreement between Qiyang Yangguang Hydroelectric Co., Ltd. and Sixth Enginerring Co., Ltd. of Gezhouba Group, January 31, 2005.

[39] Twelfth Meeting Minutes of the first board of directors of Qiyang Yangguang Hydroelectric Co., Ltd. about accelerating the application for CDM project, March16, 2005.

[40] Starting Construction Order of the Dam Issued by Engineering Supervision Department, April 14, 2005.

[41] Starting Construction Order of Tunnel Issued by Engineering Supervision Department, April 22, 2005.

26/05/2005	The powerhouse construction was started[42]
05/07/2005	HNSTI submitted the application to establish CDM center[43]
29/08/2005	The project owner signed Water-turbine Generator Units Purchase Agreement[44]
09/11/2005	Establishment of Hunan Province CDM Project Service Center (HNCDM)[45].
23/06/2006	Letter of Intent (LoI) of Emission Reductions Purchase was signed with Carbon Asset Management Sweden AB.
March 2007	Emission Reductions Purchase Agreement (ERPA) negotiation with HNCDM.
28/05/2007	CDM application to National Development & Reform Commission (NDRC).
28/06/2007	ERPA was signed with Carbon Asset Management Sweden AB.
26/07/2007	The project PDD was published for validation.
01/10/2007	Draft validation report (DVR) was completed.
March 2008	Hard copy of Chinese Letter of Approval (LoA) for CDM was issued.
15/05/2008	Hard copy of Netherlands LoA for CDM was issued.
04/08/2008	Final validation report (FVR) was completed.
01/04/2009	Expected operation date of the 1st generator.

The project PDR was approved on 20 February 2004 by Water Resources Bureau of Hunan Province. Due to the changed VAT and electricity tariff, the financial indicator of the project was decreased below the benchmark. Then the project owner decided to implement CDM application to overcome the financial barrier and lower investment risks in the board meeting on 2 November 2004.

On 10 November 2004, the project owner signed the LoI of CDM Project Development for CDM development and application with Hunan Science & Technology Information Research Institute (HNSTI), which is a public service unit belonged to Science & Technology Bureau of Hunan Province. Science & Technology Bureau is one of two CDM administration authority in China, another authority is Development & Reform Commission.

---

[42] Starting Construction Order of Powerhouse Issued by Engineering Supervision Department, May 26, 2005.

[43] Xianigkexin [2005] No.15

[44] Water-turbine and Generator Units Purchase Agreement of China Shaibeitan Hydropower Project between Qiyang Yangguang Hydroelectric Co., Ltd and Nanning Electricity Generation Equipment Factory, August 29, 2005.

[45] http://www.most.gov.cn/dfkjgznew/200512/t20051208_26678.htm

On 26 December 2004, the Intention agreement of bank loan was signed between China Construction Bank Yongzhou Branch due to CDM since CDM can improve the financial indicators for the project.

The tunnel construction agreement was signed on 8 January 2005, which is marked as the project starting date.

From the milestones and key events above, it can be concluded that CDM incentives were essential for project owner to go ahead with the implementation of the project activity.

a. Reasons for the delay in the CDM development

The CDM development of the project was entrusted to HNSTI, including PDD development, buyer search and so on. The responsible department for CDM in HNSTI was Science Policy & Strategy Research Department. However, the focus of job duty of Science Policy & Strategy Research Department is on soft science research and CDM research rather than CDM development. The Science Policy & Strategy Research Department lacked of English professionals and PDD writers. The job responsibility regarding CDM for Science Policy & Strategy Research Department was to visit the project sites and identify projects. Due to the huge pressure from project owners and urgent demand of special CDM development team, the HNSTI submitted the "Application Regarding Organizing Hunan Province CDM Project Service Center (HNCDM)" to Science & Technology Bureau of Hunan Province on 5 July 2005 and the application was approved by the Head officer of Science & Technology Bureau of Hunan Province on 20 July 2005[46]. The HNCDM was officially established on 9 November 2005[47].

The HNCDM were mainly depended on professors from universities to develop PDD at early stage due to it took a little long time to recruit capable people for PDD development. The HNCDM sent first batch of PINs to Ministry of Science & Technology and Tsinghua University for buyer seeking at the end of 2005 and then sent first 4 PDDs to them for assessing. During 2005 and first half year of 2006, the staffs from HNSTI and HNCDM attended many CDM Training Courses held in China. One of the training programs is the "Sino-Canada CDM cooperation program", which started from October 2005 and concluded in April 2006, the capacity building program systematically trained the invited developers of HNCDM to own the capacity of developing CDM projects[48].

On 23 June 2006, the project owner signed the LoI of Emission Reductions Purchase with Carbon Asset Management Sweden AB after efforts from HNCDM.

However, due to the project involves large of resettlers, it took long time for negotiation between project owner and buyer. Due to time is limited, it is hard to find all the written communication about ERPA negotiation. We present email regarding CERs price negotiation in March 2007 to prove continuing and real actions were taken to secure the CDM status for the project activity in parallel with its implementation during this period.

Finally, the project owner and buyer made the agreement after several rounds of negotiations. The project was submitted to NDRC for CDM application on 28 May 2007 and ERPA was signed on 28 June 2007

---

[46] Xiangkexin [2005] No.15

[47] http://www.most.gov.cn/dfkjgznew/200512/t20051208_26678.htm

[48] http://www.most.gov.cn/dfkjgznew/200604/t20060410_30365.htm

between project owner and Carbon Asset Management Sweden AB. The NDRC LoA was finally received on March 2008 since there are some mistakes in CDM application materials. The re-submission of the materials caused some delay in whole progress.

On 27 July 2007, the project PDD was published for validation. After that, the main communication is between project owner, PDD developer and DOE.

The project is still under construction, the 1st generator of the project is expected to be operational in the end of March 2009 at earliest. The delay of the construction is due to following reasons[49]:

1. The flood disaster destroyed the weir for dam construction on 14 June 2006, the construction was delayed for half a year.

2. The water introduction tunnel was collapsed due to geological problems. The construction was delayed for 3 months.

3. The snow disaster happened in January 2008 caused collapse of 5 sets of 15 km long 10 kV electricity transmission lines used for power supply during construction period. The construction was delayed for 4 months.

4. The financing was delayed due to increased price of raw materials.

5. The generators and turbines manufacture were delayed by manufacturer.

The delay of CDM development will not cause lost of CERs. The given explanation on delay of PDD development is suitable and not unusual for the host country environment. It can be found from UNFCCC validation webpage, there are totally only around 80 projects submitted for validation and 68 projects approved by NDRC[50] until end of June 2006, by when the project signed LoI of Emission Reductions Purchase with Carbon Asset Management Sweden AB. The figure shows the PDD development is a bottleneck at that time. Therefore, it can be concluded that continuing and real actions were taken to secure the CDM status for the project activity in parallel with its implementation.

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, which was before the starting date of the project.

B.6. Emission reductions:

>>

B.6.1. Explanation of methodological choices:

>>

Project Emissions

According to the baseline methodology ACM0002, for new hydro electric power projects with reservoirs, if the power density of project is greater than $4W/m^2$, and less than or equal to $10W/m^2$, estimated project emissions are calculated as follows:

---

[49] The explanation of construction delay of Shaibeitan Hydropower Plant, 1 August 2008

[50] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1024

$$PE_y = \frac{EF_{Res} * TEG_y}{1000} \quad (1)$$

Where,
PE_y is emissions from reservoir expressed as tCO_2e/year
EF_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e/MWh
TEG_y is total electricity produced by the hydro electric power project in year y, in MWh
Notes: it is conservative to use TEGy instead of EGy to calculate the PEy.

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:

$$BE_y = EG_y \cdot EF_y \quad (2)$$

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.

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 normal data for hydroelectricity production. It can be found from Table 6 that the low-cost/must run resources 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 Constitution of low-cost/must run resources in CCPG during year 2001 ~ 2005[51]

Year	2001	2002	2003	2004	2005
Percentage (%)	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, the $EF_{OM,y}$ is calculated by utilizing an *ex-ante* 3 years data vintage for CCPG, the formula is as follows:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (3)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *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 power sources *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 power sources *j*. The data is not available in *China Electric Power Yearbook*, so the $GEN_{j,y}$ is calculated as follow:

$$GEN_{j,y} = \text{Electricity generation of power plants in CCPG} \times (1 - \text{Internal use rate of power plants}) \qquad (4)$$

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (5)$$

Where:

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

According to the deviation approach[52] agreed by the 22nd CDM EB meeting for OM and BM calculation for Chinese power grids, if the detailed data at the power plants level of the grids, such as power

[51] China Electric Power Yearbook 2002~2006.

[52] http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ.

generation quantity, internal use rate of power plants, fuel types, fuel consumption and fuel emission factors, etc., are not publicly available for the $EF_{OM,y}$ calculation, then as an alternative, the statistical data on collected power generation quantity, the internal use rate of power plants and fuel consumption which publicly available by the fuel types *i* and by province *j* covered by the power grid can be used. So, the average power generation efficiencies (gce/kWh) and average emission factors of fuel *i* can be used. The fuel *i* based on collected power generation and the related fuel consumption data are publicly available in *China Electric Power Yearbook* and *China Energy Statistical Yearbook*. Thus, the data quoted from these two kinds of yearbooks are used for $EF_{OM,y}$ calculation.

There are 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:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (6)$$

Where ：

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plants *m* in year (s) *y*;
$COEF_{i,m,y}$ 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 plants *m* and the percent oxidation of the fuel in year (s) *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plants *m*. It equals to power generation minus power plants self power consumption.

ACM0002 provides two following options to calculate BM:

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

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

Option 1) is chosen by project participants to calculate $EF_{BM,y}$ for this project, and can not be changed during the crediting period.

For the sample group *m*, it includes two options:

1) The five power plants that have been built most recently, or

2) The power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The project participants should use from these two options that sample group that comprises the larger annual generation.

Because of the same reasons as the data unavailability at the power plant level in China, the 22nd CDM EB meeting agreed the following deviation[53] approaches for $EF_{BM,y}$ calculation:

1) Use the efficiency level of the best technologies commercially available in the provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{BM,y}$.

2) Use capacity additions during last several years for estimating the $EF_{BM,y}$, i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

3) Use installed capacity to replace annual power generation to estimate weights.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total thermal installed capacity, 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 CO_2 emissions of thermal power plants;

2) Based on the best technologies commercially available which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the emission factor of thermal power plants in CCPG. This approach is more conservative as it assumes all recently built plants have the fuel efficiency as that of the most advanced commercialized technologies;

3) Calculating the $EF_{BM,y}$ through emission factor of thermal power plants times the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

The above calculation approach has been used by several recently registered China projects. The BM emission factor in this PDD is calculated as following sub-steps.

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

$$\lambda_{coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

Where:

[53] http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ.

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 CO_2 emissions from total thermal power plants;
$F_{i,j,y}$ is the amount of fuel *i* (tce) consumed by the power sources 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 ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{Coal} \times EF_{coal,adv} + \lambda_{Oil} \times EF_{oil,adv} + \lambda_{Gas} \times EF_{gas,adv} \quad (8)$$

Where:

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

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

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (9)$$

Where:

$EF_{BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year *y*;
CAP_{Total} is the installed capacity of all recently built power plants;
$CAP_{Thermal}$ is the newly installed capacity of recently built thermal power plants;
$EF_{Thermal}$ is the emission factor of thermal power plants.

$EF_{BM,y}$ 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 ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (10)$$

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.

The EF_y is fixed during the first crediting period and will be updated at the renewal of second crediting period.

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 emissions, project emissions and emissions due to leakage. The final GHG emission reduction is calculated as follows:

$$ER_y \text{ (tCO}_2\text{e/yr)} = BE_y - PE_y - L_y \quad (11)$$

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 measurement methods and procedures actually	Data used are from Chinese authorities.

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:	*Standard coal consumption of power generation*
Data unit:	tce/MWh
Description:	The standard fuel consumption of power generation of most advanced commercialized technologies available in Chinese power plants.
Source of data used:	For coal, it is a conservative data.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The most advanced commercialized technologies for coal-fired power plants in China are mainly sub-critical and super critical power plants, with the standard coal consumption of power generation of 0.327 tce/MWh and 0.323 tce/MWh respectively. It is conservative for standard coal to adopt the value 0.32 tce/MWh. It can be found from *China Electric Power Yearbook 2006* that the lowest standard coal consumption of power generation is 0.342 tce/MWh in CCPG. Thus, the value 0.32 tce/MWh is very conservative to calculation BM.
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:	

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

>>

Project Emissions

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

$$PE_y = \frac{EF_{Res} * TEG_y}{1000} = \frac{90\text{Kg } CO_2\text{e /MWh} * 117{,}080 \text{ MWh}}{1000} = 10{,}537 \text{ t}CO_2 \text{ e /yr}$$

Baseline Emissions

According to the formula (2)-(11) in section B.6.1, the values of EF_{OM} , EF_{BM} and EF_y are listed in following Table 10, the detailed calculation is shown in Annex 3.

Table 10 Calculating 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 (2) in section B.6.1, the baseline emissions (BE_y) of the project in a typical year are calculated as follow:

$$BE_y = EG_y * EF_y = 109{,}000 \text{ MWh} \times 0.95116 \text{ t}CO_2\text{e /MWh} = 103{,}676 \text{ t}CO_2 \text{ e /yr}$$

Leakage
According to the baseline methodology ACM0002, $L_y = 0$

Emission Reductions
According to the formula (11) in section B.6.1, the emission reductions (ER_y) of the project in a typical year are calculated as follow:

$$ER_y\ (tCO_2e/yr) = 103{,}676 - 10{,}537 - 0 = 93{,}139\ t\ CO_2\ e/yr$$

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

>>
The estimated project emission reductions in the first crediting period are listed in Table 11:

Table 11 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)
2009	10,537	103,676	0	93,139
2010	10,537	103,676	0	93,139
2011	10,537	103,676	0	93,139
2012	10,537	103,676	0	93,139
2013	10,537	103,676	0	93,139
2014	10,537	103,676	0	93,139
2015	10,537	103,676	0	93,139
Total (tonnes of CO_2e)	73,759	725,732	0	651,973

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

>>

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	*TEG_y*
Data unit:	MWh
Description:	Electricity produced by the hydro electric power project
Source of data to be used:	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	117,080
Description of measurement methods and procedures to be	The exported electricity is monitored continuously through meters and will be recorded monthly. The meters are installed at exit of two generators separately. All the electronic and paper monitoring documents will be archived during the

applied:	crediting period and two years after.
QA/QC procedures to be applied:	The calibration of meters conducted by qualified organization must comply with national standard and sectoral regulations.
Any comment:	Used for Project Emissions calculation.

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net generated electricity delivered to CCPG
Source of data to be used:	Electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	109,000
Description of measurement methods and procedures to be applied:	The net generated 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 continuously through bidirectional main meter and will be recorded monthly. All the electronic and paper monitoring documents will be archived during the crediting period and two years after.
QA/QC procedures to be applied:	Net power supply data from power grid company and sales receipts will be used for double check of data. The calibration of meters conducted by qualified organization must comply with national standard and sectoral regulations.
Any comment:	Used for emission reductions calculation.

Data / Parameter:	*Surface Area*
Data unit:	km^2
Description:	Surface area at the full reservoir level
Source of data to be used:	*Environmental Impact Assessment Report on Shaibeitan Hydropower Project.* The data has been measured based on the forecast water level and the topographical reservoir map, once, at the start of the project.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.9
Description of measurement methods and procedures to be applied:	The data measured by Huan Investigation, Design & Research Institute of Water Resources and Hydropower once at the start of the project activity is reliable and creditable.
QA/QC procedures to be applied:	Official data is used for calculation, which is credible and authoritative.
Any comment:	Uncertainty level of the data is low.

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 Shaibeitan 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 and total electricity produced by the project activity. The total electricity and net electricity (=electricity exported to the grid - electricity imported from the grid) to the grid are 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:

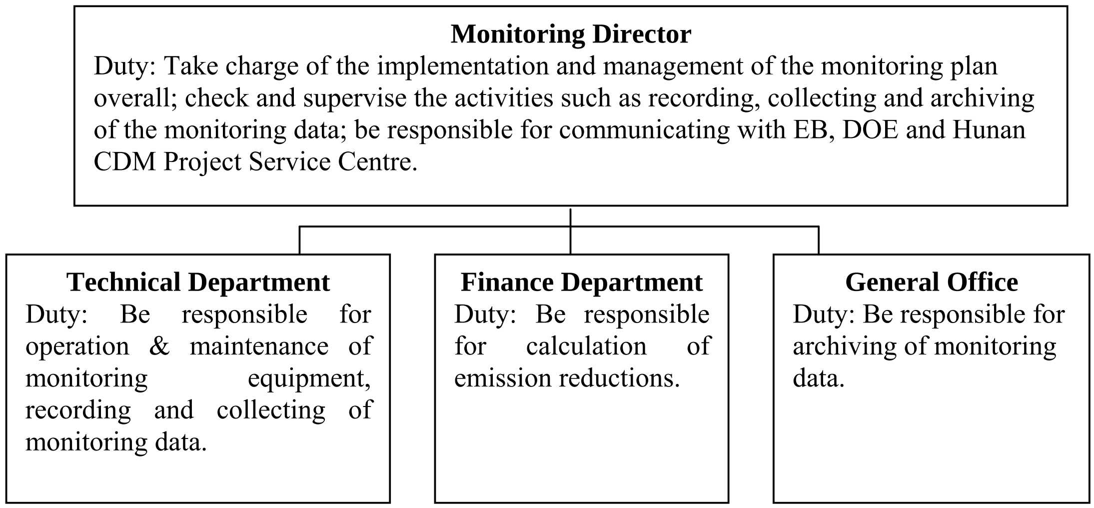

Fig.2 Operational and management structure

3. Monitoring apparatus and installation:

The meters will be installed in accordance with "Technology & Management Regulations for Power Metering Devices"(DL/T448-2000). The TEG_y will be monitored by meters installed at exit of generators, EG_y will be monitored by Master Meter.

4. Data monitoring

(1) The data of total electricity produced by the project activity and electricity exported to power grid as well as electricity imported from power grid will be measured continuously 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. Calibration of meters

The calibration and the accuracy of meters must comply with national standard and sectoral regulations, i.e. DL/T448-2000.

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 Shaibeitan 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 application of the baseline and monitoring methodology: 22/04/2008

Name of the responsible person/entity: Mr. Yuan Haiwei
Unit: Hunan CDM project service centre
Address: No. 59, Bayi Road, Changsha City, Hunan Province, the People’s Republic of China
Zip code: 410001
Tel: +86-731-4586955-809
E-mail: hwyuan06@126.com
None of the person referred above is the project participant.

SECTION C. Duration of the project activity / Crediting period

C.1 . Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
08/01/2005 (Tunnel construction agreement was signed, which is the earliest starting date of the project)

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

>>
30 years

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

C.2.1. Renewable crediting period

>>

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

>>
01/01/2009 or the date 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:

SECTION D. Environmental impacts

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

>>
The project owner entrusted a third party-the Hunan Investigation, Design & Research Institute of Water Resources and Hydropower to assess the project's environmental impact. The conclusion of the EIA report is: the project is a hydropower project, thus the project activity will not pollute the environment. The positive impacts will occur after the completion of the construction, and the positive impacts will be significant in a long-term; while the negative impacts will mainly occur during the construction period and will be slight in a short-term. Most of the negative impacts could be minimized or remedied through the appropriate measures. Therefore, as the above conclusion, the project is feasible at the angle of environmental protection.

The EIA report has been approved by the Hunan Environmental Protection Bureau in a document "Xianghuanping [2004]No. 018" on February 20, 2004, the approval is as follows: The project will improve the regional economical development and mitigate the shortage of electricity in Qiyang County. And it has no big adverse impacts on the environment after taking the measures stated in the EIA report, and thus the project construction is approved.

The forecasting and assessment of the main adverse impacts and relevant protection measures to be taken are shown in Table 12:

Table 12 Forecasting & assessment of impacts on environment and measures for environmental Protection

Impact items	Assessment and Views on environmental impacts	Measures for environmental protection
Water environment	The amount of waste water from the construction and living sewage will be less, which has less impact on the whole water quality; the change of the hydrological condition won't cause obvious adverse impacts on the whole water quality after storing water; the water quality can meet the requirement of water function division in the local area as a whole.	The desilting basins and sedimentation basins will be used to deal with waste water from the construction, and the living sewage will be used as fertilizer by the local peasants. The living sewage and wastewater from the factory should be discharged by related standards during the operation of the project. The minimum environmental flow is 2 m^3/s listed in EIA Report.
ecological environment	There are no rare animals and plants in the neighboring area of the project, the construction and inundation won't have big impacts on the terrestrial vegetation , and will only reduce some small animals' habitat to a certain extent, this impact is limited.	To make green by planting trees in the construction area, the ecological environment construction will be carried out in the resettlement sites; the administering laws and propaganda for the wild animals' protection will be strengthened to improve the consciousness of the local people and workers to protect the wild animals.

Inundation and resettlement	The inundation and resettlement will result in some impacts on the local agriculture and environment, there are 592 resettlers and 3.0 km^2 land inundated. The district has a certain environmental capacity which can basically meet the need for resettlement.	The investment on agriculture will be increased by the local government to raise the grains output in order to improve the environmental capacity for the resettlement; it will be prohibited to cultivate the hillsides fields with a gradient of over 25 degree; the favorable policies will be made for the people resettled through 2nd and 3rd industries so as to ensure that the resettlers have enough employment opportunities.
Air quality	The construction will produce some waste gas and powder, but this won' affect the air quality; the air pollution will only affect the neighboring inhabitants and workers possibly in the partial area.	The mechanic equipments of the project contractors should be equipped with corresponding device of eliminating smoke and dust to ensure that the discharged tail gas conforms to the indicators of the environmental protection; the dust will be reduced through sprinkling water in the construction area, the individual protection measures such as wearing masks will be taken by the influenced workers.
Sound environment	The noise produced by the construction and transportation will have some impacts on the neighboring inhabitants and workers.	By using the construction technologies and equipments with small noise, reinforcing the maintenance of the equipments to lower the operation noise. The measures of lowering the vibration and noise should be taken for the mechanical equipments with big vibration. The construction at night should be avoided.
Solid garbage	The solid garbage mainly includes the earth and stone caused by the construction and living rubbish.	The earth and stone caused by the construction will be piled up in the stipulated location, and plant trees and grasses immediately after construction of the project. Sanitary facilities such as temporary toilets and rubbish barrels will be put in the construction area, these sanitary facilities should be often cleaned and disinfected, and the public sanitation department will be entrusted to treat the daily living rubbish.
Electromagnetic radiation	The electromagnetic radiation will affect people's health.	The security distance to prevent from electromagnetic radiation of the transformers station is 3 meters.
Transboundary impacts	According to EIA, there is no transboundary impact.	-

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 host Party and the project owner both regard that the proposed project will not bring significant impacts on the environment.

SECTION E. Stakeholders' comments

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

>>

In order to consult the stakeholders' opinions about the project, the project owner entrusted local government, i.e. Resettlement Coordination Office of Shaibeitan Hydropower Plant to posted bills around places the resettlers located, People's Government of Qiyang County and Village Commission of Shaibeitan Village to collect the stakeholders' opinions in April 2006. The project owner held a meeting[54] about the construction of Shaibeitan Hydropower Project with stakeholders on April 27 2006. There were totally 100 copies of questionnaires were distributed during the stakeholder meeting. The consulted stakeholders included the government officials, local villagers, resettlers development etc. The summary of stakeholders' comments collected from the interviews is listed in E.2.

E.2. Summary of the comments received:

>>

Table 13 Summary of the results of the questionnaires

Question	Answer	Percentages (%)
1．Do you know about Shaibeitan project?	Yes	100
	No	0
2．Do you agree with the construction of the project?	Yes	100
	No	0
	Don't know	0
3. How about the impact caused by the project on the water quality of Baishui River?	Positive	50
	Negative	0
	Irrelevant	50
4. How about the impact caused by the project on the local ecological environment?	Positive	62
	Negative	0
	Irrelevant	38
5. How about the impact caused by the project on the local surrounding area?	Positive	55
	Negative	0
	Irrelevant	45
6. Do you think whether the project will be helpful to the	Yes	96

54 Meeting Minute of Colloquia with Stakeholders, dated on Apr. 27, 2006.

local economic development?	No	0
	Irrelevant	4

The comments of the stakeholders in the colloquia are as follows:
1. The comments confirm that the project will mitigate the power lack of the area, increase the local employment, the tax revenue of the local government and promote the local development.
2. Some resettlers suggest they should be resettled according to the national policies and be ensured that their living standard isn't lower than ever before.
3. Very few people think that there is a small impact on the environment, and the impact will mainly occur during the construction perid in the form of dust and low noise.
4. The properly disposal of the waste water, waste solid, dust and noise are required. And soil & water conservation and protection of the ecological environment should be implemented properly.
5. Hope that the power plant will be completed as soon as possible so as to obtain the good economic and social benefits. They expect that the project plays a greater role to promote local economic growth and improve the income level of the local residents.
6. Hope that the construction of project will not .affect local safety.

E.3. Report on how due account was taken of any comments received:
>>
On the whole, the local government and residents expressed their support for the development of the project. According to the comments received, owners will take appropriate measures to decrease the adverse impacts. The measures are listed below:

1. All resettlers will be resettled according to the national policies and be ensured that their living standard isn't lower than ever before.

2. Dust from the construction is controlled by sprinkling.

3. In order to decrease the noise, the construction time will be adjusted if possible. The construction equipments are equipped with shock absorption apparatus or silencers. The workers will take personal protection measures before going into these zones, such as wearing earplugs and so on.

4. Some measures such as placing ash-bin, cleaning periodically and epidemic prevention should be taken.

5. Soil & water conservation and ecological protection measures will be taken according to EIA Report.

6. During the construction and operation phase of the project, the surrounding environment and the interests of the local residents will be fully considered and protected. After the completion of the project, the surrounding vegetation will be recovered.

7. The project owner has promised to accelerate the project construction and make more contribution to the local economic development.

8. Workers will be managed strictly to ensure local safety, and the government officer promises to local villagers that they will improve local safety environment.

Above measurements are supervised by local government.

.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY
PROJECT OWNER

Organization:	Qiyang Yangguang Hydroelectric Co., Ltd
Street/P.O.Box:	Xiaojindong Town, Qiyang County
Building:	/
City:	Yongzhou City
State/Region:	Hunan Province
Postfix/ZIP:	426100
Country:	People's Republic of China
Telephone:	+86-746-3878557
FAX:	+86-746-3878557
E-Mail:	qiyangyangguang@126.com
URL:	/
Represented by:	Xiaoping Zhou
Title:	President
Salutation:	Mr.
Last Name:	Xiaoping
Middle Name:	/
First Name:	Zhou
Department:	Qiyang Yangguang Hydroelectric Co., Ltd
Mobile:	+86-13515789788
Direct FAX:	+86-746-3878557
Direct tel:	+86-746-3878557
Personal E-Mail:	qiyangyangguang@126.com

PURCHASER

Organization:	Carbon Asset Management Sweden AB
Street/P.O.Box:	Drottninggatan 92-94
Building:	/
City:	Stockholm
State/Region:	/
Postfix/ZIP:	111 36
Country:	Sweden
Telephone:	+46 8 506 885 00
FAX:	+46 8 34 60 80
E-Mail:	co2@tricorona.se
URL:	www.tricorona.se
Represented by:	Niels Von Zweigbergk
Title:	President & CEO
Salutation:	Mr.
Last Name:	Zweigbergk
Middle Name:	Von
First Name:	Niels
Department:	/
Mobile:	+46 708 59 35 00
Direct FAX:	+46 8 34 60 80
Direct tel:	+46 8 506 263 96
Personal E-Mail:	nvz@tricorona.se

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from parties included in Annex I is available to the project activity.

Annex 3

BASELINE INFORMATION

The installed capacity, power generation, internal power use rate of power plant and fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>
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	29.2	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Kerosine	43070 kJ/kg	19.6	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Other Oil	38369 kJ/kg	20.0	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 1.3 and Table 1.4, Page 1.21-1.24, 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)
									(tCO_2/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	2072.4 4	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	Internal Power Consumption Rate	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)
									(tCO_2/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	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	18.9	100	43070	2089.33
Diesel Oil	10^4 t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42652	266627.32
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464893.14
LPG	10^4 t							0	17.2	100	50179	0
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	15.7	100	46055	153506.38
Natural Gas	10^8 m^3						2.27	2.27	15.3	100	38931	495774.6057
											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	Internal Power Consumption Rate	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	Internal Power Consumption Rate	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 (tCO_2/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 (6) 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:

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

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 most advanced commercialized technologies for coal-fired power plants in China are mainly sub-critical and super critical power plants, with the standard coal consumption of power generation of 0.327 tce/MWh and 0.323 tce/MWh respectively. It is conservative for standard coal to adopt the value 0.32 tce/MWh. It can be found from *China Electric Power Yearbook 2006* that the lowest standard coal consumption of power generation is 0.342 tce/MWh in CCPG. Thus, the value 0.32 tce/MWh is very conservative to calculation BM.

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

Table A9 Parameters used for calculating fuel-fired 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

Parameter	Unit	Value	Com
NCV of standard coal	TJ/t	0.02927	The data is derived from Genera

	coal		Consumption Calculation (GB2
Coal consumption of power generation	t/MWh	0.32	Conserva
Emission factor of coal	tC/TJ	25.8	The data is deriv
Oxidation factor of coal	/	100%	The data is derive

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	0
Wind & Others (MW)	0	0	0	0	0	24	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 A11 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:

$$EF_y = 0.95116\ tCO_2e/MWh$$

The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

Annex 4

MONITORING PLAN

No additional information.