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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title of document: Wuxi Hydropower Project, Qiyang County, Hunan Province
Version of document: Version 01
The date of the document: 23/05/2008

A.2. Description of the project activity:

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The proposed project is designed to construct a 100MW (25MW×4) run-of-river hydropower station on the upper-middle stream of Xiangjiang River in Qiyang County, Yongzhou City, Hunan Province, P. R. China. With annual operation duration of 3,955h, the proposed project is expected to generate an annual output of 395.51 GWh and supply on-grid electricity of 368.22 GWh annually. The proposed project mainly consists of a concrete gate dam, a daily regulated reservoir, a power house, 2 earth dams, 2 main transformers and 3 sets of transmission lines which will be finally connected to Central China Power Grid (CCPG).

Thermal power is the major power source of CCPG. The electricity generated by the proposed project will displace the equivalent amount of electricity in CCPG. Therefore the proposed project can be identified as a substitution for thermal power of CCPG, resulting into GHGs emission reduction of 358,830 tCO_2e annually when all the generation units are put into operation. The proposed project provides a combination of environmental and socio-economic benefits. The specific sustainable development benefits of this proposed project are described as follows:

- To supply clean and reliable power to local area and further to alleviate local power shortage;
- To create new job opportunities: a maximum labor force of 1,840 are needed in the construction phase, and 36 permanent positions are provided in the operation phase;
- To mitigate other air pollutant resulting from the combustion of fossil fuels;
- To improve the living standard of local residents.

In terms of the environmental and socio-economic benefits, the proposed project is in constancy with China's harnessing zero-emission renewable energy resources, contributing a lot to the country and local region.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host Party)	Hunan Wuxi Hydropower Development Co. Ltd.	No
Japan	Mitsubishi Corporation	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Hunan Province

A.4.1.3. City/Town/Community etc:

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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):

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The proposed project is located on the upper-middle stream of Xiangjiang River, in Qiyang County, Yongzhou City, Hunan Province, P. R. China. With the geographical coordinate of 26°34'N, 110°50'E, it is about 2.5 km from Qiyang County centre. The location of the proposed project is illustrated in the Figures 1~3 as below:

Figure 1: The location of Hunan province

Figure 2: The location of Yongzhou City

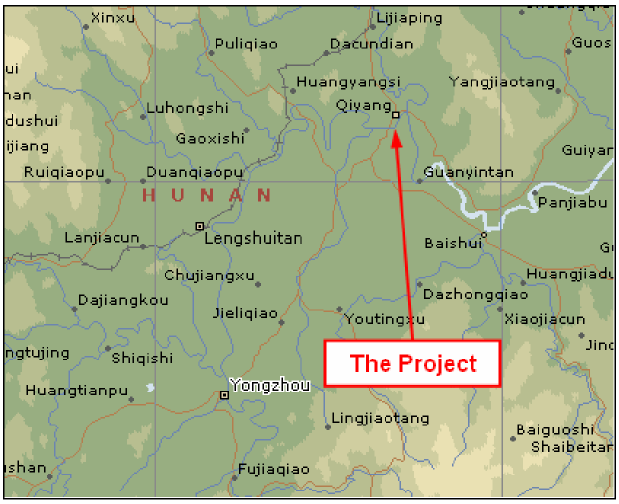

Figure 3: The location of the proposed project

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

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The proposed project falls into:
Sectoral Scope Number: 1. Energy Industry (renewable sources)

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

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The proposed project is a run-of-river hydropower plant, which mainly consists of a concrete gate dam, a daily regulated reservoir, a power house, two earth dams, two main transformers and three sets of transmission lines:

- A concrete gate dam with a maximum height of 28 m, consisting of 13 overflow sluices with the size of 20×12.5 m, providing the maximum net water head of 13.5 m;
- A daily regulated reservoir with storage capacity of 160.9 million m^3 with flooded surface area of 9.07 km^2 , resulting in a power density at 11.02 W/m^2
- A riverbed 100MW power house consisting of 4 sets of turbine-generator units with the installed capacity of 25MW each;
- 2 earth dams connecting with the left and right banks, respectively, with total length of 949.4 m;
- 2 sets of 110 kV double coil main transformers with the rated voltage of 63,000KVA each;
- 3 sets of 110kV transmission lines, one set connected to Qiyang Baotashan 110kV Substation, another connected to Qiyang 220kV Substation, the rest for spare use. The project will be finally connected to CCPG.

The generation units will be put into operation in sequence starting from Dec., 2008, and the annual on-grid power supply of the whole project are shown as follows[1]:

Unit	Commissioning time	In the first crediting period (01/12/2008~30/11/2009)		In the subsequent crediting period	
		Anticipated output (MWh)	Anticipated on-grid power supply (MWh)	Anticipated output (MWh)	Anticipated on-grid power supply (MWh)
1st Unit	Dec. 2008	98,878	92,055	98,878	92,055
2nd Unit	Feb. 2009	82,398	76,712	98,878	92,055
3rd Unit	Apr. 2009	65,918	61,370	98,878	92,055
4th Unit	Jun. 2009	49,439	46,027	98,878	92,055
Total		296,633	276,165	395,512	368,220

[1] The crediting period is estimated to be started from 01/12/2008. In order to explicitly and transparently calculate the ERs of the Project, the timeframe of the anticipation of annual on-grid power supply here is set in accordance with the crediting period.

The technical parameters of the key components of the proposed project are list in the table 1below:

Table 1: The key components of the proposed project

Equipment	Quantity	Model	Producer
Turbine	4	GZTF07B-WP-580	Tianjin Tianfa Heavy Hydro-power Machinery Co.,Ltd
Generator	4	SFWG25-64/6450	Tianjin Tianfa Heavy Hydro-power Machinery Co.,Ltd

All the equipments are produced domestically. Thus, the project involves no technology transfer.

The technology to be employed are safe and sound, and The Project operators are all skillful.

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

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The project chooses 7×3-year renewable crediting period, the annual emission reductions are 358,830 tCO_2e, resulting in a total GHGs mitigation of 2,422,103 tCO_2e throughout the first 7-year crediting period specified as follows:

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
01/12/2008~30/11/2009	269,123
01/12/2009~30/11/2010	358,830
01/12/2010~30/11/2011	358,830
01/12/2011~30/11/2012	358,830
01/12/2012~30/11/2013	358,830
01/12/2013~30/11/2014	358,830
01/12/2014~30/11/2015	358,830
Total estimated reductions (tonnes of CO_2e)	2,422,103
Total number of crediting years	7 years
Annual average over the crediting period ofestimated reductions (tonnes of CO_2e)	358,830

A.4.5. Public funding of the project activity:

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No public funding from the Annex I countries is involved in the proposed project.

SECTION B. Application of a baseline and monitoring methodology:

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

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The Project applies Approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002/Version 07, Sectoral Scope 01, EB36); Tool to calculate the emission factor for an electricity system (Version 01) and Tool for the demonstration and assessment of additionality (Version 04).
For more information please refer to the website below:

http://cdm.unfccc.int/methodologies/DB/T978BR87OSXVDVGWPU6WDBZ2DZP7UL/view.html

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

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The Project is a grid-connected renewable power generation activity and meets all the applicability conditions stated in the methodology ACM0002 as follows:

- The proposed project is a run-of-river hydropower project with reservoirs having power density at 11.02 W/m^2, greater than the threshold of 4 W/m^2;
- The project activity does not involving switching from fossil fuel to renewable energy at the project site;
- The geographic and system boundary of Central China Power Grid (CCPG) can be clearly identified and the information on the characteristic of CCPG is publicly available.

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

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The project boundary for the proposed project includes the project power plant and Central China Power Grid (CCPG) to which the Project is connected to. CCPG includes Henan Grid, Hubei Grid, Hunan Grid, Jiangxi Grid, Chongqing Grid and Sichuan Grid, within which there is clearly defined spatial and geographical extent of the power plants and transmission system, all electricity can be dispatched without significant transmission constraints. Moreover, geographical boundary of the CCPG is also clearly defined as a regional grid according to the "Explain of confirming baseline emission factors of regional power gird in China" issued by China's DNA. Also, the geographic boundary of CCPG is clear. Therefore, CCPG is considered as the grid boundary for the proposed project for determining the build margin (BM) and operating margin (OM) emission factors. The structure of CCPG is shown in Figure 4 below:

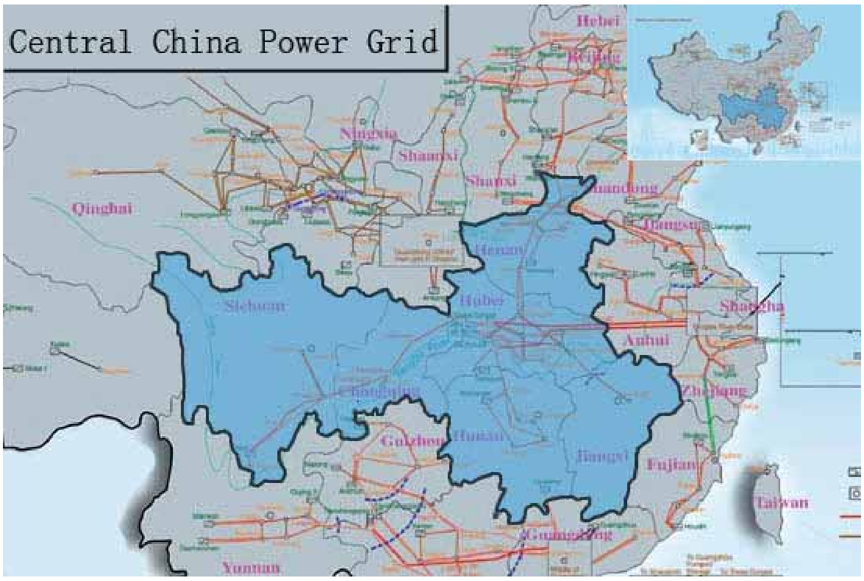

Figure 4: The Structure of Central China Power Grid

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below:

	Source	Gas	Included	Justification/Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	Emission from reservoir of the proposed project (inside the project boundary)	CO_2	No	Minor emission source.
		CH_4	No	As the power density of the Project is 11.02 W/m^2, greater than 10W/m^2, according to ACM0002, the project emission from reservoir needn't taken into account.
		N_2O	No	Minor emission source.

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

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In the absence of the proposed project, the possible alternatives which comprise the baseline scenario would be as follows:

1. Construction of a new coal-fired power plant with equivalent output connected to CCPG;

2. Construction of a new power plant using other renewable power sources with equivalent output connected to CCPG;

3. The propose project not undertaken as CDM project activity;

4. Provision of equivalent amount of annual power output by the grid (CCPG) with which the Project is connected;

For Alternative 1, according to current laws and regulations, construction of coal-fired power plants with installed capacity below 135 MW, if without special permission, are strictly prohibited in large layered grids[2]. Therefore, alternative 1) is not in compliance with current regulation requirements and is not credible and realistic.

For Alternative 2, the proposed project is located in Hunan Province, where it is provided with other renewable energy resources such as wind power, solar power and biomass. However, considering the financial feasibility of those alternatives, all of them are less attractive comparing with the proposed project. The generation cost for small-scale hydropower project in China is similar with conventional thermal power plants. Whereas, the generation costs of wind power and solar power are around RMB 0.4~0.6 yuan/kWh, and RMB 3.5 yuan/kWh[3], respectively, about 1.5 and 10 times of thermal power. The generation cost for biomass power generation project is also higher as much as 1.5 times more than the thermal power plants[4]. Therefore, alternative 2 is not financial attractive, and is not a feasible baseline scenario;

For Alternative 3, according to the Investment Analysis in B.5, without the injection of CERs sales revenue from CDM, the proposed project is not financially attractive. Thus, Alternative 3 is not a credible baseline scenario either.

For Alternative 4, "Provision of equivalent amount of annual power output by the grid with which the Project is connected" complies with current laws and regulations and is financially feasible. Therefore, alternative 4 is the only credible and feasible baseline scenario for the proposed project.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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The following steps are used to demonstrate the additionality of the Project according to the last version of *Tool for the demonstration and assessment of additionality (version 4)* issued by EB.

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

The step is to define realistic and credible alternatives to the project activities that can be (part of) the baseline scenario through the following sub-steps:

Sub-step 1a: Define alternatives to the project activities:

The available alternatives that would supply equivalent amount of electricity in the absence of the proposed CDM project activity are to include:

1) Construction of a new coal-fired power plant with equivalent output connected to CCPG;

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[2] Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

[3] www.cnpower.org/biz/gting/200706/15920.html

[4] http://www.cei.gov.cn/loadpage.aspx?Page=ShowDoc&CategoryAlias=zonghe/ggmflm_zh&ProductAlias=zhuanjshj&BlockAlias=zjzjsd&filename=/doc/zjzjsd/200803242713.xml

2) Construction of a new power plant using other renewable power sources with equivalent output connected to CCPG; as analyzed in B.4 demonstrated above, since development costs of other renewable power plants are higher than hydroelectric ones, this option is not considered to be a feasible alternative;

3) The proposed project not undertaken as CDM project activity; and

4) Provision of equivalent amount of annual power output by the grid (CCPG) with which the Project is connected.

Sub-step 1b: Consistency with mandatory laws and regulations:
According to Chinese regulation rules, coal-fired power plants with a capacity of 135 MW or less, if without special permission, are prohibited in large layered grids, such as provincial grids[5]. Thus, construction of a new coal-fired power plant with limited installed capacity 100 MW cannot comply with the regulations. Furthermore, if generating the same annual output of 395.51 GWh, the installed capacity of a coal-fired power plant should be much lower than that of a run-of-river power plant. Therefore, alternative 1) is not feasible, and should be eliminated from further consideration.

Step 2: Investment Analysis

The objective of this step is to determine whether the proposed project activity is less economically or financially attractive than other alternatives without the revenue from the sale of CERs.

Sub-step 2a: Determine appropriate analysis method

Three analysis methods demonstrated in *Tool for the demonstration and assessment of additionality (version 4)* are available to conduct the investment analysis:

Option I: Simply cost analysis;
Option II: Investment comparison analysis; and
Option III: Benchmark analysis.

The simple cost analysis (Option I) is not appropriate since the proposed project will receive revenue not only from the CDM but also from electricity sales. Neither is the investment comparison analysis (Option II) because the alternative is “Provision of equivalent amount of annual power output by the grid (CCPG) with which the Project is connected” rather than a similar investment project alternative to the Project. Therefore, the proposed project will apply benchmark analysis (option III) since the data on the total investment IRR of Chinese power industry is available.

Sub-step 2b: Benchmark Analysis Method (Option III)

According to Interim rules on Economic Assessment of Electric Engineering Retrofit Projects, the benchmark IRR on total investment (after tax) of hydropower project is at 8 %, which are widely used for the power project investment evaluation in China. This benchmark will be used for the financial appraisal of the proposed project.

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

1) Critical techno-economic parameters and assumptions

[5] Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

The critical techno-economic parameters and assumptions of the Project for calculation of IRR are presented below:

Parameters	Unit	Value	Data source
Installed Capacity	MW	100	Approved FSR
Annual Electricity Generation	MWh	395,510	Approved FSR
Annual On-grid Power Generation	MWh	368,220	Approved FSR
Total Investment	million yuan	909.795	Approved FSR
Project Lifetime	years	34	Approved FSR
Construction Period	years	4	Approved FSR
Operation & Maintenance Period	years	30	Approved FSR
Prospective bus-bar tariff (VAT included)	yuan/kWh	0.301[6]	
VAT tax	%	17%	Approved FSR
Income Tax Rate	%	25%[7]	
Depreciation Rate	%	3.33%	Approved FSR

2) Calculation and comparison of FIRR of the Project activity and the financial benchmark

In accordance with Option III, if the Project activity has a less favourable indicator than the benchmark, then the Project cannot be considered to be financially attractive.

Based on the date above, the IRR without CDM sales revenue are shown in the following table. It is clear that without CDM sales revenue, the IRR of the Project is only 6.74%, lower than the benchmark of 8%. Therefore, the proposed project is not financially attractive.

However, the extra income from CDM will improve the economic competitiveness of the Project if it is registered as a CDM project activity. The IRR (including expected CDM revenue) will be increased to 9.43% which is higher than the benchmark of 8%, making the Project financially feasible.

	Project IRR
Without CDM revenue	6.74%
With CDM revenue	9.43%

Sub-step 2d. Sensitivity analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding financial attractiveness is robust to reasonable variations in the critical assumptions.

[6] Notification on the Adjustment of the Bus Bar-tariff in Central China Power Grid issued by National Development and Reform Commission, dated on 11/07/2006 with document no. of (2006)1233.

[7] Originally, the income tax rate in the FSR of the project is 33%. The FSR was completed in April 2005. At that time, the income tax rate applicable to enterprises in China was established as 33% in accordance with the *Provisional Regulations of the People's Republic of China on Enterprise Income Tax,* promulgated by the State Council on December 13, 1993.

On Mar. 16, 2007, the *Enterprise Income Tax Law of the People's Republic of China* has been adopted by the Fifth Session of the Tenth National People's Congress and is hereby promulgated for effect as of January 1, 2008. This regulation prescribes 25% as income tax rate for enterprises and meanwhile abolishes the *Provisional Regulations of the People's Republic of China on Enterprise Income Tax*

The following key parameters have been selected as sensitive indicators to test the financial attractiveness for the Project.

(1) Annual output;
(2) Total investment; and
(3) Annual O&M cost

Provided that the annual output, total investment and annual O&M cost change with fluctuation range of –10% ~ +10%, the impacts of these indicators on IRR of total investment are analysed. The results are shown in Table 2 and Figure 5.

Table2 Sensitivity analysis of the Project (without CDM)

Range / Parameter	-10.00%	-7.50%	-5.00%	-2.50%	0	2.50%	5.00%	7.50%	10.00%
Annual output	5.66%	5.93%	6.20%	6.47%	6.74%	7.00%	7.26%	7.51%	7.77%
Total Investment	7.81%	7.52%	7.25%	6.99%	6.74%	6.49%	6.26%	6.04%	5.82%
Annual O&M Cost	6.95%	6.90%	6.85%	6.79%	6.74%	6.68%	6.63%	6.57%	6.51%

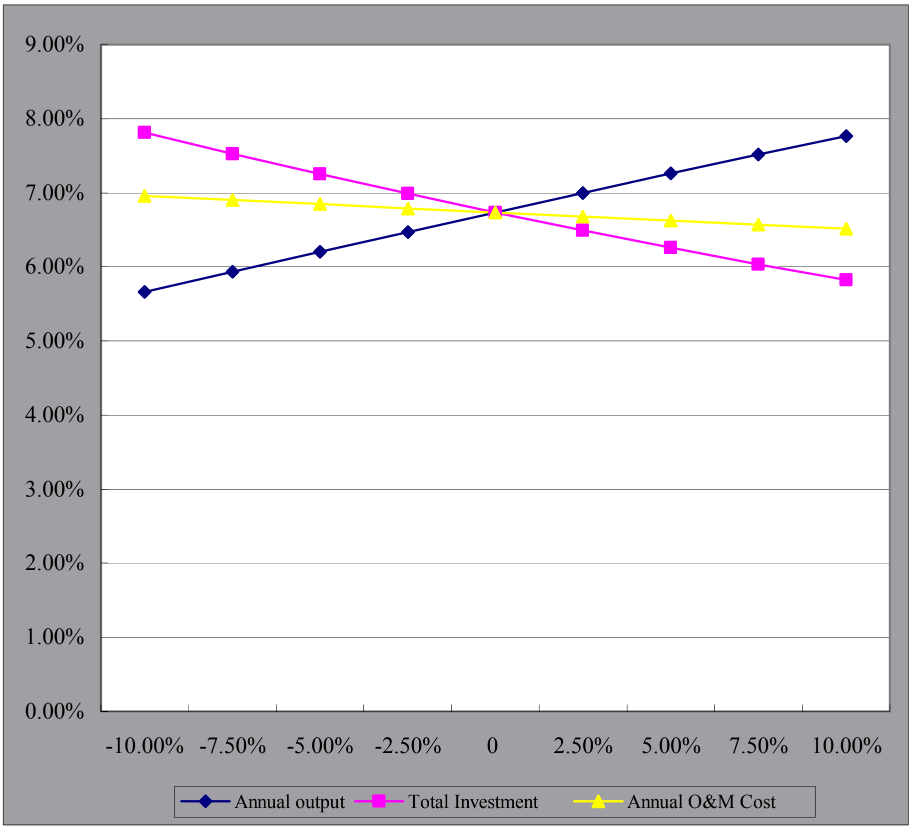

Figure 5: Sensitivity analysis of the Project (without CDM)

Table 2 and Figure 5 show that within a realistic range of critical assumptions of the three parameters, the IRR of total investment of the proposed project is still lower than the benchmark. Therefore, the sensitivity analysis strongly and consistently supports the conclusion that the proposed project activity is unlikely to be financially attractive.

In conclusion, the Project is not financially competitive. Without CDM support, the proposed project would unlikely occur.

Step 4: Common Practice Analysis

Common practice analysis is a credibility check to complement the investment analysis. The common practice analysis is identified and discussed through the following sub-steps:

Sub-step 4a: Analyze other activities similar to the proposed project activity
All hydropower projects under construction or existing in Hunan Province with similar installed capacity (between 50 MW and 150 MW) under similar investment environment after 2002 when China started the electric sector reform are identified in the following table:

No.	Title	Installed Capacity (MW)	Commission Year
1	Jinweizhou Project	65.7	2003
2	Zhuzhu Hangdian Project	140	2006
3	Zaoshi Hydropower Plant	120	2007
4	Anjiang Hydropower Plant	150	Under construction

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

However, the existence of the above projects will not bring any negative impact on the additionality of the Project:

- Jinweizhou Project not only obtained some Hunan Provincial Government's favourable policies[8], but also a bank loan with low interests from Austrian government[9], lowering the construction cost and operation and maintenance cost of the project, and further improving the financial competitiveness;

- Zhuzhou Hangdian Project is included in the Major Construction Program of the Tenth Five-year Plan of Hunan Province, which implies preferential policies such as fees remission, tax exemptions and etc.. In addition, the project was also provided with financial aid from the World Bank[10], making the projects more financially attractive than other similar projects under the same investment climate.

- Zaoshi Hydropower Plant and Anjiang Hydropower Plant are selected to be the key construction project in China's Tenth Five-year Plan[11] and the key construction project in Hunan Province[12], respectively. Both of them can enjoy the favour policy issued by local governments. They are much easier to access finance and have stronger capacity to control the risks.

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[8] http://www.shp.com.cn/news/info/2002/7/22/17401657.html

[9] http://people.rednet.cn/PeopleShow.asp?ID=108923

[10] http://www.zzx.gov.cn/ReadNews.asp?NewsID=560

[11] http://www.cnhpd.com/TradeNews/ViewTradeInfo.aspx?InfoId=672

[12] http://www.hjs.gov.cn/xzwz/fgj/zdxm/200801/4326.html

Compared with the projects analysed above, the Project does not get any favourable policy supports regarding to fees remission or tax exemptions. The benefit return of the Project is so poor that cannot prove its financial feasibility, which has already been demonstrated in Step 2 before, and it is difficult for the project owner to raise investment without CDM incentives.

Therefore, it can be concluded that the existence of these project activities does not contradict the claim that the proposed project activity is financially unattractive.

From all these steps included in this section B.5., it can be concluded that the Project is additional, not (part of) the baseline scenario. Without CDM support, the Project would unlikely occur.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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1. Project emissions (PE_y)

The project activity is the installation of a new hydropower plant that results in a reservoir. In accordance with ACM0002 (Version 7), the power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad (1)$$

Where:

PD	=Power density of the project activity, in W/m^2.
Cap_{PJ}	=Installed capacity of the hydro power plant after the implementation of the project activity (W).
Cap_{BL}	=Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydropower plants, this value is zero.
A_{PJ}	=Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).
A_{BL}	= Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new hydropower plants, this value is zero.

Since the created surface area of the reservoir at the flooded water level is identified to be 9.07 km^2, the power density of the project is calculated to be 11.02 W/m^2 (100 MW/9.07 km^2), which is greater than the threshold of 10 W/m^2. In accordance with methodology ACM002, for hydropower project with power density larger than 10W/m^2, the project emission is zero, so:

PEy = 0.

2. Baseline emission (BE_y)

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants within CCPG that are displaced due to the Project activity, calculated as follows:

$$BE_y = (EG_y - EG_{baseline}) \bullet EF_{grid,CM,y} \qquad (2)$$

Where:

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

EG_y = Electricity supplied by the Project activity to the grid (MWh).
$EG_{baseline}$ = Baseline electricity supplied to the gird in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

As the Project activity is the installation of a new hydropower plant, formula (2) above is transformed to:

$$BE_y = EG_y \bullet EF_{grid,CM,y} \qquad (3)$$

Where:

$$EG_y = EG_{out,y} - EG_{in,y}$$

where:
EG_y = Electricity supplied by the Project activity to the grid (MWh).
$EG^{out,y}$ = Electricity supplied by the Project activity to CCPG
$EG^{in,y}$ = Electricity purchased from CCPG by the Project for the plant operation

The Combined margin CO_2 emission factor ($EF_{grid,CM,y}$) is calculated by applying the following six steps in accordance with the "Tool to calculate the emission factor for an electricity system".

Step 1. Identify the relevant electric power system

As the electric power system of the Project activity has been identified in section B.3 above, this step can be skipped.

Step 2. Select an operating margin (OM) method

There are four options to calculate the operating margin

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

For the Project activity, because the dispatch data of the Grid (including the CCPG) in China is not available to the public, options (b) and (c) can't be adopted. Furthermore, since low-cost/must-run power sources constitute 34.41%, 42.90%, 34.43%, 37.89% and 38.60%, less than 50% of the CCPG from 2001~2005, option (a) (simple OM) is the only reasonable and feasible method among the four options.

This PDD chooses ex-ante method to calculate the OM emission factor of CCPG by using the latest 3 years data vintage.

Step 3. Calculate the OM emission factor according to the selected method

The Simple OM emission factor ($EF_{OM,\ simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

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

Option C is only feasibly and selected to calculate OM emission factor of CCPG due to the following reasons:

- The necessary data for option A and option B are not available such as data of fuel consumption and net electricity generation of each power plant/unit serving the system;
- The low-cost/must-run power sources in CCPG only refer to hydropower and wind power; and
- The quantity of electricity supplied to CCPG by different sources is available.

According option C, the simple OM emission factor is calculated based on the net electricity supplied to CCPG by all power plants serving the CCPG, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of CCPG, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (4)$$

Where:

$EF_{grid,OMsimple,y}$:	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$:	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
$EF_{CO2,i,y}$:	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
EG_y :	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh);
i :	All fossil fuel types combusted in power sources in the project electricity system in year *y*;
y :	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

This PDD calculates the Operating Margin (OM) emission factors of CCPG in 2003, 2004 and 2005, respectively based on the latest published statistic data by China. Then, the OM emission factor of CCPG is calculated as the weighted average of the three years.

Step 4. Identify the cohort of power units to be included in the build margin (BM)

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

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[13].

Because it is very difficult to obtain the data of five most recently built power plants as these data are considered as confidential business information in China, 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 is selected as as the sample group *m*. The power plants which are CDM projects are not included in sample group m.

However, even for those built most recently power plants that comprise 20% of the system generation, it is also difficult to obtain the specific data regarding to fuel consumption and electricity generation additions by each power sources as confidential reason. Considering this situation, the following clarifications are given by EB for deviation in use of methodology AM0005 and AMS-I.D by several project activities in China when estimating *BM* emission coefficient:

1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity;
2) Use of weights estimated using installed capacity in place of annual electricity generation; and
3) It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption.

Thus, the most recent built power plants are calculated as the difference of total installed power capacities in the year 2005 and 2002, respectively, which accounted for 24.60% of the total capacity in 2005 (see Table B3 in Annex 3). So the calculation by using the data in the years 2005 and 2002 satisfies the requirements.

In terms of vintage of data, ex-ante method is employed in this PDD to calculate the BM emission factor for the first crediting period based on the most recent data available in CCPG from 2003~2005.

Step 5. Calculate the BM emission factor

According to “Tool to calculate the emission factor for an electricity system”and the clarifications by EB, the main steps for BM calculation are as following:

Sub-step 1: Calculation of weights of CO_2 emissions by coal-fired, oil-fired and gas-fired plants in total CO_2 emissions of CCPG.

$$\lambda_{coal} = \frac{\sum_{ieCOAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (5)$$

[13] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.

$$\lambda_{oil} = \frac{\sum_{ieOIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

$$\lambda_{Gas} = \frac{\sum_{ieGAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

Where:

$F_{i,j,y}$: is the total amount of fuel *i* (in a mass or volume unit) consumed by Province j in CCPG for power generation in year y;

$COEF_{i,j\,y}$: is the total amount the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the oxidation rate of the fuel in year(s) y.

This PDD employs the CO_2 emission weights by coal-fired, oil-fired and gas-fired plants of total CO_2 emission of CCPG in 2005 As result, the λ_{coal}, λ_{oil} and λ_{gas} are calculated as 99.46%, 0.17% and 0.37%, respectively.

Sub-step 2: Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of CCPG.

The $EF_{thermal\ power}$ is calculated as a weighted emission factor as the following formula:

$$EFThermal = \lambda Coal \times EF\ Coal, Adv + \lambda Oil \times EF\ oil, Adv + \lambda Gas \times EFGas, Adv \quad (8)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,\ Adv}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Table B2 Annex 3).

According to the data issued by China DNA, the efficiency levels of domestic sub-critical 600 MW coal power unit and the 200 MW combined cycle power unit are taken as the efficiency levels of the best technology for coal-fired power plants, and oil and gas fired power plants commercially available in China, which are at 35.82% and 47.67%, respectively.

Sub-step 3: Calculation of Build Margin (BM) emission factor of CCPG.

Finally, weighted average build margin emission factor (EF_BM,y) are calculated by multiplying the $EF_{thermal\ power}$ with the weight of new capacity addition by thermal power of total capacity addition in CCPG.

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

Where:

CAP_{Total} : the total capacity addition of CCPG between 2003~2005

$CAP_{Therma:}$ the capacity addition by thermal power of CCPG between 2003~2005.

The method of OM and BM calculation above refer to official website:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf issued by China DNA.

Step 6. Calculate the combined margin (CM) emissions factor

The final step is to calculate the weighted average baseline emission factor of the Project as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \qquad (10)$$

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
w_{OM} : Weighting of operating margin emissions factor (%); and
w_{BM} : Weighting of build margin emissions factor (%).

For the Project, 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 3 and 5 above.

3. Leakage (LE_y)

According to ACM0002 (Ver. 07), leakage needs not be considered.

4. Emission reductions (ERy)

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad (11)$$

Where:

ER_y = Emission reductions in year *y* (t CO_{2e}/yr).
BE_y = Baseline emissions in year *y* (t CO_{2e}/yr).
PE_y = Project emissions in year *y* (t CO_2/yr).
LE_y = Leakage emissions in year *y* (t CO_2/yr).

Since the leakage emission (LE_y) and the project emission (PEy) of the Project are zero. The emission reduction (ERy) is equal to the baseline emission (BE_y):

$$ER_y = BE_y \qquad (12)$$

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

Data / Parameter:	$F_{i,j,\ 2003\sim2005}$
Data unit:	Ton or m^3
Description:	The total amount of fuel *i* (in a mass or volume unit) consumed by Province j in CCPG for power generation in year 2003, 2004 and 2005.
Source of data used:	China Electric Power Yearbook (2004~2006)

Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the "Tool to calculate the emission factor for an electricity system".
Any comment:	For OM and BM calculation.

Data / Parameter:	$EG_{2003\sim2005}$
Data unit:	MWh
Description:	The electricity output (MWh) supplied to the grid by the Province *j* in CCPG in year 2003, 2004 and 2005.
Source of data used:	China Electric Power Yearbook (2004~2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the "Tool to calculate the emission factor for an electricity system".
Any comment:	For OM calculation.

Data / Parameter:	NCV_i
Data unit:	kJ/Kg or kJ/m^3
Description:	net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
Source of data used:	China Energy Statistical Yearbook 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to "Tool to calculate the emission factor for an electricity system", the national value is used.
Any comment:	For OM and BM calculation.

Data / Parameter:	$EF_{co2,\ I}$
Data unit:	tC/Tj
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	Table1.3 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the national value is unavailable, IPCC default is used.
Any comment:	For OM and BM calculation.

Data / Parameter:	Installed Capacity $_{j\ 2002,\ 2003,\ 2005}$
Data unit:	MW
Description:	The installed capacity of Province j in CCPG in year 2002, 2003 and 2005.

Source of data used:	China Electric Power Yearbook (2003, 2004 and 2006)
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with "Tool to calculate the emission factor for an electricity system".
Any comment:	For BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	
Description:	The oxidation factor of the fuel.
Source of data used:	Table1.4 Default CO_2 Emission Factor For Combustion, Page 1.23, Page 1.24 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is based on IPCC default value because the national specific value is unavailable.
Any comment:	

Data / Parameter:	$\eta_{Adv,i}$
Data unit:	%
Description:	The efficiency level of the best technology for each fuel type commercially available in China.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with "Tool to calculate the emission factor for an electricity system".
Any comment:	For BM calculation.

Data / Parameter:	λ_i
Data unit:	%
Description:	The proportion of emission from different fuel i power plant to the total emissions of CCPG.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
Value applied:	See table A8 in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with "Tool to calculate the emission factor for an electricity system".
Any comment:	For BM calculation.

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

1. $EF_{OM,simple}$ of CCPG

According to the OM calculation of China DNA, the Simple OM emission factor of CCPG is at is 1.2899 tCO_{2e}/MWh (see details in Annex 3).

2. EF_{BM} of CCPG

According to BM calculation of China DNA, based on the formula (6) and (7) in B.6.1, the $EF_{thermal\ powe}$ of CCPG is at 0.9482 tCO2/MWh（See Annex 3）.

The new capacity addition of thermal power in CCPG accounts for 69.52% of total capacity addition between 2002~2005. Thus, based on formula (8) above, the build margin emission factor is calculated as 0.6592 tCO_{2e}/MWh (see details in Annex 3).

3. $EF_{grid,CM}$ of CCPG

According to equation 9, the baseline combine emission factor = (1.2899+0.6592)/2=0.9745 (tCO_{2e}/MWh).

4. Emission reduction (ER_y) by the Project activity

According to equations 12, the annual emission reductions generated from the Project are calculated as follows:

For the first crediting year (01/12/2008~30/11/2009):

$ERy= BE_y = EF_{grid,CM,y} \times EG_y = EF_{grid,CM,y} \times (EG_{out} - EG_{in}) = 0.9745 \times 276,165 = 269,123\ tCO_{2e}$

For the subsequent crediting years:

$ERy= BE_y = EF_{grid,CM,y} \times EG_y = EF_{grid,CM,y} \times (EG_{out} - EG_{in}) = 0.9745 \times 368,220 = 358,830\ tCO_{2e}$

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
01/12/2008~30/11/2009	0	269,123	0	269,123
01/12/2009~30/11/2010	0	358,830	0	358,830
01/12/2010~30/11/2011	0	358,830	0	358,830
01/12/2011~30/11/2012	0	358,830	0	358,830
01/12/2012~30/11/2013	0	358,830	0	358,830
01/12/2013~30/11/2014	0	358,830	0	358,830
01/12/2014~30/11/2015	0	358,830	0	358,830
Total (tonnes of CO_2e)	0	2,422,103	0	2,422,103

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$EG_{out,y}$
Data unit:	MWh
Description:	Electricity
Source of data :	Annual on-grid electricity supplied to CCPG by the proposed project.
Measurement procedures (if any)	-
Monitoring frequency:	Hourly measurement and monthly recording.
QA/QC procedures to be applied:	Electricity supplied by the project activity to CCPG. Double check by receipt of sales.
Any comment:	-

Data / Parameter:	$EG_{in,y}$
Data unit:	MWh
Description:	Net electricity CCPG purchased from CCPG by the Project for the plant operation in year *y*
Source of data	Project activity site.
Measurement procedures (if any)	-

Monitoring frequency:	Hourly measurement and monthly recording.
QA/QC procedures to be applied:	Electricity purchased by the project activity from CCPG. Double check by receipt of sales.
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site.
Measurement procedures (if any)	Measured from maps
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the proposed project.
Source of data	Project site.
Measurement procedures (if any)	Determined in accordance with the nameplates supplied by the manufacturer.
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2. Description of the monitoring plan:

>>

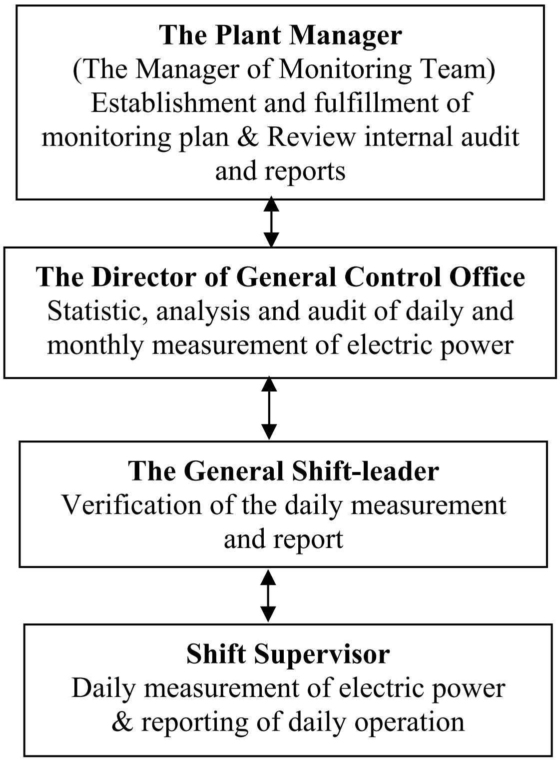
The project owner is the user of this monitoring plan and will be responsible for it. The project owner must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the bquanshen dfaleng uyers of the Certified Emissions Reductions (CERs).

Emission reductions will be achieved through avoided power generation of fossil fuel plant due to the power generated by the proposed project. The grid-connected output is therefore defined as the key data to monitor.

Operational and Management Structure for Monitoring

The project owner has assigned a Monitoring Team to carry out the whole monitoring process as the Figure 6 below.

Figure 6 Monitoring and Management Structure



The Plant Manager will establish the monitoring plan, and hold the overall responsibility for the whole process:

The first step is the measurement of the daily electrical energy supplied to the grid and reporting of daily operation, which will be conducted by **Shift Supervisor**.

The second step is the verification of the daily measurement and report, which will be carried out by **The General Shift-leader**;

The third step is the statistic, analysis and audit of the daily and monthly measurement. Besides execution of quality control (QC) and quality assurance (QA) procedures mentioned above, **The Director of General Control Office** who is acting as a monitoring officer will collect the required supporting documents such as reading cards supplied by the Grid company and sales receipt provided to the Grid company, and prepare monitoring reports of the project activity including operating periods, power generation, power delivered to the grid, equipment defects, and etc.;

The final step is the review of the internal audit and monitoring reports, which will be carried out by **The Plant Manager.**

Monitoring Plan

The approved monitoring methodology ACM0002 is used for developing the monitoring plan.

Monitoring tasks must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is monitored and reported.

I. Monitoring of EGy

1. Responsibility

Overall responsibility for daily monitoring and reporting lies with the project owner. A monitoring team mentioned above will be established by the project owner to carry out the monitoring work.

2. Installation of meters

Meters will be installed for the proposed project. The net on-grid electricity will be monitored by the main Meter installed in the substation. The meter can measure the bi-directional electricity flows, which include the electricity supplied to the gird by the project ($EG_{out,y}$) and electricity purchased from the gird by the project for plant operation ($EG_{in,y}$). A backup Meter is installed in the same measurement point as the main Meter in substation for crosscheck. It also has the same model and function with the main Meter. When the main Meter is out of order, the readings from the backup Meter will be used for reference.

In addition, project owner will install meters on generator site to monitor the electricity generation (TEG_y). Another meter will be installed at the project site to measure the auxiliary comsumption of the electricity by the Project. Data from all the meters can be used to cross check the data measured by the main meter.

The metering equipment will be properly configured and checked annually according to the requirement from technical administrative code of electric energy metering (DL/T448-2000).

3. Reporting

The specific steps for data collection and reporting are listed below:

- Firstly, to read and verify the readings of the meters at the project site daily and to prepare the monthly data report by **Shift Supervisor**;
- Secondly, to collect the reading cards from the Grid and check the recorded readings with those from the meters at the project site, and to determine the accurate net on-gird power supply with the Grid by **The General Shift-leader**;
- Thirdly, to provide CCPG with sales receipts and to preserve the corresponding copies; and by **The Director of General Control Office**;
- Fourthly, to prepare and review the monitoring report internally and to provide DOE with reading cards and copies of sales receipts and other relevant documentations for verification by **The Plant Manager.**

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the grid-connected electricity generated by the Project shall be determined by reading the backup meter, unless a test by either party reveals it is inaccurate:

- If the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the Project owner and grid company shall jointly prepare an estimate of the correct reading; and
- If the Project owner and the grid company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

4. Calibration
All the meters shall be inspected and sealed on behalf of the parities concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representative. And all the meters shall be calibrated specified as follows:

- The metering equipment are calibrated and checked annually for accuracy;
- All the meters installed shall be tested by a third party within 10 days after:
  (a) Detection of a difference larger than the allowable error in the readings of both meters;
  (b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

Calibration is carried out by qualified parties with the records being supplied to the project owner, and these records will be preserved and maintained both by the project owner and the appointed parties. And the calibration shall ensure sufficient accuracy so that any error resulting from such equipment shall not exceed the allowable error of full-scale rating.

II. Monitoring of Cap_{PJ} and A_{PJ}

Installed capacity of the hydro power plant after the implementation of the project activity will be monitored by checking the rated capacity on the nameplate of the generator..

Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full is monitored by calculations based on relevant maps supplied by qualified parties.

Data management system
All data collected as part of monitoring will be archived electronically. All information will be stored by the technology department of the project owner and all the material will have a physical copy for backup. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results will be indexed. And all data including calibration records is kept until 2 years after the end of the total credit time of the CDM project.

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)

>>
The baseline study and monitoring plan of the proposed project were completed on 26/05/2008 by the Beijing Changjiang River International Holding.

Ms. Kai MEI, mabery@126.com , Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

Ms. Lisa Tu, Tuli0424@yahoo.com.cn, Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

The entity and the persons listed above are not considered as project participants.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
17/11/2005

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:

>>
01/12/2008

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

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

>>

Entrusted by the owner of the proposed project, Hunan Hydroelectric Investigation and Design Institute conducted the Environment Impact Assessment in August, 2003. The environment impact assessment report was approved by the Environmental Protection Bureau of Hunan Province on September 16th, 2003.

The impacts of the proposed project were identified and the corresponding mitigation measures are illustrated as below:

Wastewater

The wastewater is mainly rising from sand-rock washing, concrete mixing, machine-vehicle washing and the working personnel. According to Integrated Wastewater Discharge Standard (GB8978-1996) grade I, Some prevention-cure measures will be adopted in order to protect the Xiangjiang River from being polluted. As to the waste water caused by sand-rock washing and concrete mixing, it will be disposed in the sedimentation tank with flocculate. And the oil wastewater from machine-vehicle washing will be treated in the oil-water separating tank. As for the domestic sewage, it will be disposed in the septic tank and then used as manure.

Air pollution

During the construction period, the air pollutant are mainly composed of the exhaust gases from the vehicle and the dust caused by the foundation excavation, tunnel excavation, construction road excavation, sand-rock processing, concrete mixing, running of vehicles etc. In compliance with the Ambient Air Quality Standard (GB3095-96) grade II, corresponding mitigation measures will be taken, such as watering, strengthen the management of large scale construction machines and vehicles, install the machine with de-dust device, cover the conveyance with textile, clear the trunk road regularly etc.

Noise

The noise is mainly produced by the construction machines and vehicles in the construction phase. According to the Noise Limits for Construction Site (GB12523-90) and the Standard of Noise at Boundary of Industrial Enterprises (GB12348-90) grade III, some alleviation methods will be adopted to protect the local residents and the working personnel, for example, control the operation duration of high-noise equipments, arrange the time schedule reasonably, equip the heavy transport vehicles with mufflers, protect the workers with earplugs, soundproof helmets etc.

Solid wastes

The solid wastes generated by the construction will be collected and then transported to the designated dumping sites and the domestic wastes will be collected at the waste sites and then carried to Qiyang Domestic Wastes Disposal Site for integrated disposal.

Soil erosion

Because of excavation and the earth-rock exploitation that disturbed the original landforms, soil erosion will easily happen if without properly protective measures. In order to restore the water and soil and protect local ecosystem, some effective project measures will be taken including build some retaining walls, protecting slopes, carry out some afforestation project, build some green belt around the power house, backfill the earth and rock generated by excavation etc.

Impact on the ecosystem

There are only some scattered woods around the project site. No rare protected vegetation or ancient trees and rare wild animals are identified.

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:

>>

Due to the mitigation measures described above, the construction of the proposed project will not result in significant environmental impacts.

SECTION E. Stakeholders' comments

>>

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

>>

In order to better understand the attitudes of local stakeholders towards the proposed project, the project owner conducted an investigation by the way of distributing questionnaires (see table below) to local stakeholders in and around the project site, including the representatives of local residents, technicians of construction entities, civil servants of local government etc.

Questionnaire for the Public on the Impact Assessment of Wuxi Hydropower Project, Qiyang county, Hunan Province

<table>
<tr><td>Name</td><td></td><td>Gender</td><td colspan="2"></td><td colspan="2">Age</td><td colspan="2"></td></tr>
<tr><td>Occupation</td><td colspan="2"></td><td colspan="3">Education Level</td><td colspan="3"></td></tr>
<tr><td colspan="9">Project description:</td></tr>
<tr><td colspan="9">Wuxi Hydropower Project, Qiyang County, Hunan Province is a 100 MW (25MW×4) run-of-river hydropower station developed by Hunan Wuxi Hydropower Development Co. Ltd. It is located on the upper-middle stream of Xiangjiang River, in Qiyang County, Yongzhou City, Hunan Province, P. R. China. The proposed project mainly consists of a concrete gate dam, a daily regulated reservoir, a 100MW powerhouse, 2 main transformers and 3 sets of transmission lines. With annual operation duration of 3,955h, the proposed project is expected to generate annual output of 395.51GWh and supply on-grid electricity of 368.22GWh annually, which will be connected to Central China Power Grid.

In order to get fully understanding of comments hold by the public, we're distributing these questionnaires to you and begging your opinions and suggestions. Thanks a lot!</td></tr>
<tr><td colspan="3">1. Are you familiar with the proposed project?</td><td colspan="3">A. Yes</td><td colspan="3">B. No</td></tr>
<tr><td colspan="3">2. Do you support the construction of the proposed project?</td><td colspan="2">A. Yes</td><td colspan="2">B. No</td><td colspan="2">C. No idea</td></tr>
<tr><td colspan="3">3. Do you think that the proposed project will accelerate local economic development?</td><td colspan="2">A. Yes</td><td colspan="2">B. No</td><td colspan="2">C. No idea</td></tr>
<tr><td colspan="3">4. Do you think that the proposed project will improve the local employment?</td><td colspan="2">A. Yes</td><td colspan="2">B. No</td><td colspan="2">C. No idea</td></tr>
<tr><td colspan="3">5. How do you think of the impact of the proposed project on the local environment?</td><td>A. Positive</td><td colspan="2">B. Negative</td><td colspan="2">C. No impact</td><td>D. No idea</td></tr>
<tr><td colspan="3">6. How do you think of the impact of the proposed project on the local ecosystem?</td><td>A. Positive</td><td colspan="2">B. Negative</td><td colspan="2">C. No impact</td><td>D. No idea</td></tr>
<tr><td colspan="3">7. Do you think that the proposed project will improve local residents' living standard?</td><td colspan="2">A. Yes</td><td colspan="2">B. No</td><td colspan="2">C. No idea</td></tr>
<tr><td colspan="9">What other positive or negative impacts do you think the proposed project will bring?</td></tr>
<tr><td colspan="9">What other problems are you concerned about? Please write down your suggestions, if any:</td></tr>
</table>

E.2. Summary of the comments received:

>>

50 questionnaires were distributed and all of them were returned. The components of the respondents are listed in the following table:

Total No.	Gender		Age			Occupation			
50	Male	Female	≤30	31~45	≥46	Peasant	Worker	Civil servant	Water Conservancy Worker
	32	18	16	24	10	12	20	13	5
	64%	36%	32%	48%	20%	24%	40%	26%	10%

The results of the investigation are summarized as follows:

- All of the respondents are familiar with the proposed project;
- All of the respondents support the construction of the proposed project;
- 94% of the respondents believe that the proposed project will accelerate the local economic development and the rest have no idea;
- 96% of the respondents consider that the proposed project will improve the local employment and the rest have no idea;
- 90% of the respondents hold that the proposed project will cause positive impact on local environment, 6% consider that there will be no impact and the rest have no idea;
- 86% of the respondents think that the proposed project will bring positive impact on local ecosystem, 8% consider that there will be no impact and the rest have no idea;
- All of the respondents believe that the proposed project will improve their living standard.

All of the local stakeholders strongly support the implementation of the proposed project. They deeply believe that the project will bring multiple benefits to the local region such as acceleration of local economic development, creation of more job opportunities, improvement of local living standard and etc.

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

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According to the response of the investigation and the comments received, there is no need to modify the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project.

Annex 3
BASELINE INFORMATION

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Please refer to the following official websites issued by DNA for the procedure of OM and BM calculation of CCPG:
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Table A1 Simple OM of the Central China Power Grid in 2003

Table A1-1. Basic data of the Central China Power Grid in 2003			
Province	Electricity generation and supply by thermal power plants		
	Electricity generation （MWh）	Power self-consumption rate (%)	Power supply to the Grid (MWh)
Jiangxi	27,165,000	6.43%	25,418,291
Henan	95,518,000	7.68%	88,182,218
Hubei	39,532,000	3.81%	38,025,831
Hunan	29,501,000	4.58%	28,149,854
Chongqing	16,341,000	8.97%	14,875,212.30
Sichuan	32,782,000	4.41%	31,336,313.80
Sum		—	225,987,719
Electricity Import (MWh)	0	Total power supply (MWh)	225,987,719

Data source: China Electric Power Yearbook 2003

Table A1-2 Calculation of simple OM emission factor of the Central China Power Grid in 2003

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$	NCV	OXIDi	Emission
	Jiangxi (10^4t) (10^8m^3)	Henan (10^4t) (10^8m^3)	Hubei (10^4t) (10^8m^3)	Hunan (10^4t) (10^8m^3)	Chongqing (10^4t) (10^8m^3)	Sichuan (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)		(tCO_2/Tj)	(Kj/Kg) (Kj/m^3)		(tCO_2e)
	A	**B**	**C**	**D**	**E**	F	**G=A+B+C+D+E +F**	**H**	**I=H*44/12**	**J**	**K**	**L=G*I*J*K*10^{-2}**
Raw coal	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.80	94.60	20908.00	1.00	273971539.89
Clean coal							0.00	25.80	94.60	26344.00	1.00	0.00
Other washed coal	2.03	39.63			106.12		147.78	25.80	94.60	8363.00	1.00	1169146.40
Coke				1.22			1.22	25.80	94.60	28435.00	1.00	32817.40
Coke oven gas			9.30				9.30	12.10	44.37	16726.00	1.00	69013.15
Other gas							0.00	12.10	44.37	5227.00	1.00	0.00
Crude oil		0.50	0.24			1.20	1.94	20.00	73.33	41816.00	1.00	59490.23
Gasoline							0.00	18.90	69.30	43070.00	1.00	0.00
Diesel	0.52	2.54	0.69	1.21	0.77		5.73	20.20	74.07	42652.00	1.00	181015.94
Fuel oil	0.42	0.25	2.17	0.54	0.28	1.20	4.86	21.10	77.37	41816.00	1.00	157229.00
Natural gas					0.40	22.00	22.40	15.30	56.10	38931.00	1.00	489222.52
LPG							0.00	17.20	63.07	50179.00	1.00	0.00
Refinery gas	1.76	6.53		0.66			8.95	18.20	66.73	46055.00	1.00	275069.63
Other petroleum products*							0.00	20.00	73.33	38369.00	1.00	0.00
Other energy(renewable energy or waste heating)		11.04			16.20		27.24	0.00	0.00	0.00	0.00	0.00
Total emission of the CCPG (tCO2e)	276,404,544.15											
Fossil power generation of the CCPG(MWh)	225,987,719.20											
OM emission factor of the CCPG(tCO2e/MWh)	1.2231											

Data source: China Energy Statistical Yearbook 2004;

2006 IPCC Guidelines for National Greenhouse Gas Inventories

Table A2 Simple OM of the Central China Power Grid in 2004

Table A2-1. Basic data of the Central China Power Grid in 2004

Province	Electricity generation and supply by thermal power plants		
	Electricity generation (MWh)	Power self-consumption rate (%)	Power supply to the Grid (MWh)
Jiangxi	30,127,000	7.04%	28,006,059
Henan	109,352,000	8.19%	100,396,071
Hubei	43,034,000	6.58%	40,202,363
Hunan	37,186,000	7.47%	34,408,206
Chongqing	16,520,000	11.06%	14,692,888.00
Sichuan	34,627,000	9.41%	31,368,599.30
Sum	270,846,000	—	249,074,186
Electricity Import (MWh)	0	Total power supply (MWh)	225,987,719

Data source: China Electric Power Yearbook 2005

Table A2-2 Calculation of simple OM emission factor of the Central China Power Grid in 2004

	Fi							Carbon Emission Factors (tC/Tj) H	$EF_{CO2,i}$ (tCO_2/Tj) I=H*44/12	NCV (Kj/Kg) (Kj/m^3) J	OXIDi K	Emission (tCO_2e) $L=G*I*J*K*10^{-2}$
	Jiangxi (10^4t) (10^8m^3) A	Henan (10^4t) (10^8m^3) B	Hubei (10^4t) (10^8m^3) C	Hunan (10^4t) (10^8m^3) D	Chongqing (10^4t) (10^8m^3) E	Sichuan (10^4t) (10^8m^3) F	Total (10^4t) (10^8m^3) G=A+B+C+D+E +F					
Raw coal	1863.80	6948.50	2510.50	2197.90	875.50	2747.90	17144.10	25.80	94.60	20908.00	1.00	339092605.29
Clean coal		2.34					2.34	25.80	94.60	26344.00	1.00	58316.13
Other washed coal	48.93	104.22			89.72		242.87	25.80	94.60	8363.00	1.00	1921441.23
Coke		109.61					109.61	25.80	94.60	28435.00	1.00	2948455.29
Coke oven gas			16.80		3.40		20.20	12.10	44.37	16726.00	1.00	149899.53
Other gas					26.10		26.10	12.10	44.37	5227.00	1.00	60527.09
Crude oil		0.86	0.22				1.08	20.00	73.33	41816.00	1.00	33118.27
Gasoline		0.06			0.01		0.07	18.90	69.30	43070.00	1.00	2089.33
Diesel	0.02	3.86	1.70	1.72	1.14		8.44	20.20	74.07	42652.00	1.00	266627.32
Fuel oil	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.10	77.37	41816.00	1.00	464893.14
Natural gas						22.70	22.70	15.30	56.10	38931.00	1.00	495774.61
LPG							0.00	17.20	63.07	50179.00	1.00	0.00
Refinery gas	3.52	2.27					5.79	18.20	66.73	46055.00	1.00	177950.07
Other petroleum products*							0.00	20.00	73.33	38369.00	1.00	0.00
Other energy(renewable energy or waste heating)		16.92		15.20	20.95		53.07	0.00	0.00	0.00	0.00	0.00
Total emission of the CCPG (tCO2e)	345,671,697.30											
Fossil power generation of the CCPG(MWh)	249,074,186.30											
OM emission factor of the CCPG(tCO2e/MWh)	1.3878											

Data source: China Energy Statistical Yearbook 2005;
2006 IPCC Guidelines for National Greenhouse Gas Inventories

Table A3 Simple OM of the Central China Power Grid in 2005

Table A3-1. Basic data of the Central China Power Grid in 2005			
Province	Electricity generation and supply by thermal power plants		
	Electricity generation (MWh)	Power self-consumption rate (%)	Power supply to the Grid (MWh)
Jiangxi	30,000,000	6.48%	28,056,000
Henan	131,590,000	7.32%	121,957,612
Hubei	47,700,000	2.51%	46,502,730
Hunan	39,900,000	5.00%	37,905,000
Chongqing	17,584,000	8.05%	16,168,488.00
Sichuan	37,202,000	4.27%	35,613,474.60
Sum	303,976,000	—	286,203,305
Electricity Import (MWh)	0	Total power supply (MWh)	225,987,719

Data source: China Electric Power Yearbook 2006

Table A3-2 Calculation of simple OM emission factor of the Central China Power Grid in 2005

	Fi							Carbon Emission Factors (tC/Tj) H	$EF_{CO2,i}$ (tCO_2/Tj) I=H*44/12	NCV (Kj/Kg) (Kj/m^3) J	OXIDi K	Emission (tCO_2e) $L=G*I*J*K*10^{-2}$
	Jiangxi (10^4t) (10^8m^3) A	Henan (10^4t) (10^8m^3) B	Hubei (10^4t) (10^8m^3) C	Hunan (10^4t) (10^8m^3) D	Chongqing (10^4t) (10^8m^3) E	Sichuan (10^4t) (10^8m^3) F	Total (10^4t) (10^8m^3) G=A+B+C+D+E +F					
Raw coal	1869.29	7638.87	2732.15	1712.27	875.40	2999.77	17827.75	25.80	94.60	20908.00	1.00	352614496.76
Clean coal	0.02						0.02	25.80	94.60	26344.00	1.00	498.43
Other washed coal		138.12			89.99		228.11	25.80	94.60	8363.00	1.00	1804669.00
Coke		25.95		105.00			130.95	25.80	94.60	28435.00	1.00	3522490.83
Coke oven gas			11.50		3.60		15.10	12.10	44.37	16726.00	1.00	112053.61
Other gas		102.00			31.20		133.20	12.10	44.37	5227.00	1.00	308896.88
Crude oil		0.82	0.36				1.18	20.00	73.33	41816.00	1.00	36184.78
Gasoline		0.02			0.02		0.04	18.90	69.30	43070.00	1.00	1193.90
Diesel	1.30	3.03	2.39	1.39	1.38		9.49	20.20	74.07	42652.00	1.00	299797.78
Fuel oil	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.10	77.37	41816.00	1.00	286959.09
LPG							0.00	17.20	63.07	50179.00	1.00	0.00
Refinery gas	0.71	3.41	1.76	0.78			6.66	18.20	66.73	46055.00	1.00	204688.68
Natural gas						30.00	30.00	15.30	56.10	38931.00	1.00	655208.73
Other petroleum products*							0.00	20.00	73.33	38369.00	1.00	0.00
Other coking				1.50			1.50	25.80	94.60	28435.00	1.00	40349.27
Other energy(renewable energy or waste heating)		2.88		1.74	32.80		37.42	0.00	0.00	0.00	0.00	0.00
Total emission of the CCPG (tCO2e)	359,887,487.74											
Fossil power generation of the CCPG(MWh)	286,203,304.60											
OM emission factor of the CCPG (tCO2e/MWh)	1.2575											

Data source: China Energy Statistical Yearbook 2006;
2006 IPCC Guidelines for National Greenhouse Gas Inventories

Table A4 Simple OM emission factor of CCPG

Year	Annual CO_2 Emission (tCO_2)	Annual Electricity Supply (MWh)
2003	276,404,544	225,987,719
2004	345,671,697	249,074,186
2005	359,887,488	286,203,305
Sum	981,963,729	761,265,210
EF_OM（tCO_2/MWh）		1.2899

Table B1 Installed Capacity of the Central China Power Grid

Table B1-1 Installed Capacity of the CCPG in 2002

Province	Installed capacity（MW）				
	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Jiangxi	2,197.40	5,128.80			7,326.20
Henan	2,438.00	15,904.50			18,342.50
Hubei	7,213.90	8,147.80			15,361.70
Hunan	6,135.30	4,975.60			11,110.90
Chongqing	1,195.50	3,004.50			4,200.00
Sichuan	11,854.60	6,142.00			17,996.60
Sum	31,034.70	43,303.20	0	0	74,337.90
Share	41.75%	58.25%	0.00%	0.00%	100.00%

Data source: China Electric Power Yearbook 2003

Table B1-2 Installed Capacity of the CCPG in 2003

Provicne	Installed capacity（MW）				
	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Jiangxi	2,307.40	5,407.80			7,715.20
Henan	2,438.00	17,635.50			20,073.50
Hubei	7,337.20	8,173.30			15,510.50
Hunan	6,603.10	6,446.70			13,049.80
Chongqing	12,341.50	6,104.00			18,445.50
Sichuan	1,329.80	3,126.20			4,456.00
Sum	32,357.00	46,893.50	0	0	79,250.50
Share	40.83%	59.17%	0.00%	0.00%	100.00%

Data source: China Electric Power Yearbook 2004

Table B1-3 Installed Capacity of the CCPG in 2005

Provicne	Installed capacity（MW）				
	Hydro power	Fuel-fired power	Nuclear power	Other	Total
Jiangxi	3,019.00	5,906.00			8,925.00
Henan	2,539.90	26,267.80			28,807.70
Hubei	8,088.90	9,526.30			17,615.20
Hunan	7,905.10	7,211.60			15,116.70
Chongqing	1,892.70	3,759.50		24	5,676.20
Sichuan	14,959.60	7,496.00			22,455.60
Sum	38,405.20	60,167.20	0	24	98,596.40
Share	38.95%	61.02%	0.00%	0.04%	100.01%

Data source: China Electric Power Yearbook 2006

Table B2 Emission factor of thermal power in CCPG

	Carbon Emission Factors (tC/Tj)[1] A	EF_{CO2} (tCO2/Tj) B=A*44/12	OXIDi C	Power Supply Efficiency of The Best Power Technology (%) D	Emission Factor of Best Techonology (tCO2e/MWh) E=3.6/D/1000*B*C	The mix of thermal power capacity of CCPG in 2004 H	EF thermal power (tCO2e/MWh) I
Standard Coal	25.8	94.6	1	35.82%	0.9508	99.46%	0.9482
Fuel Oil/diesel	21.1	77.37	1	47.67%	0.5843	0.17%	
Natrual Gas	15.3	56.1	1	47.67%	0.4237	0.37%	

Table B3 Weighted Average Build Margin Emission Factor

	Installed Capacity 2002 (MW)	Installed Capacity 2003 (MW)	Installed Capacity 2005 (MW)	New Capacity Additions (MW)	Split of Electricity generation from New Capacity	Emission Factor of Newly Bulit Thermal Power Plants (tCO2e/MWh)	Weighted Average Build Margin Emission Factor *EF_BM,y* (tCO2e/MWh)
	A1	A2	B	C	D	E	F
Source				C=B-A1	D=C/Total C	Table B2	F=E*D
Hydro Power Plant	31,034.70	32,357.00	38,405.20	7,370.50	30.38%	0.000	0.000
Thermal Power Plant	43,303.20	46,893.50	60,167.20	16,864.00	69.52%	0.9482	0.6592
Nuclear Power	0.00	0.00	0.00	0.00	0.00%	0.000	0.000
Others	0.00	0.00	24.00	24.00	0.10%	0.000	0.000
Total	74,337.90	79,250.50	98,596.40	24,258.50	100.00%		0.6592
Percentage of the Installed Capacity of 2005	75.40%	80.38%	—	24.60%			

Table C EF_CM of the China Central Power Grid

EF_OM (tCO2e/MWh)	EF_BM (tCO2e/MWh)	EF (tCO2e/MWh)
1.2899	0.6592	0.9745

Annex 4

MONITORING PLAN

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See Section B.7.2.