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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
25MW Liangwan Hydropower Development Project
Version 05
08/08/2008

A.2. Description of the project activity:

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The 25MW Liangwan Hydropower Development Project (hereafter refers to "project activity") developed by Hechi Liangwan Electric Power Development Co., Ltd. (hereafter referred to "Project Entity") is a run-of-river hydropower project on the border of Fengshan County and Bama County in Hechi City, Guangxi Zhuang Autonomous Region, P.R.China. The installed capacity of the project activity is 25MW, consisting of two 8.5MW turbine generators and one 8MW turbine generator, and its lifetime is 25 years. The surface area at the normal water level is 0.8 km^2 and the power density is 31.25W/m^2. The expected annual electricity generated by the project activity is 96,100MWh, which will be connected to South China Power Grid via the Bama 220kV transformer substation.

The purpose of the project activity is to utilize hydrological resources to generate zero emission energy to South China Power Grid (SCPG), which is predominantly coal-fired generation. The net electricity generated by the project activity (84,770MWh) will displace the equivalent amount of electricity supplied by thermal power plant of South China Power Grid, thereby reducing GHGs emissions. The expected annual GHGs emission reductions are 71,046 tonnes CO_{2e}.

As a renewable energy project, the project activity will promote sustainable economic and industrial growth in the long run, help conserving natural resources, and consequently contribute to the coming of a cleaner and healthier environment.

As illustrated below, the project activity will generate multiple benefits:

- The electricity generated by the project activity will displace the equivalent amount of electricity supplied from South China Power Grid, thereby reducing the emission of CO_2, SO_2 and NO_x from burning of fossil fuels at thermal power plants supplying power to the grid.
- The project activity will satisfy increasing electricity demand of Fengshan County and Bama County, bring in related economic benefits for the local community and lead to sustainable economic and industrial growth in the region.
- The project activity will contribute to conservation of natural resources, such as coal, diesel and gas, and so on, by utilizing renewable sources of energy.
- The project activity will provide some positions for the professionals, workers and residents in the 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)	Hechi Liangwan Electric Power Development Co., Ltd.	No
Luxembourg(registered country)/ Netherlands(Annex-I Approval country)	MGM Carbon Portfolio, S.a.r.l	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.		

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For detailed information on participants in the project activities, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:
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A.4.1.1. Host Party(ies):
>>
People's Republic of China

A.4.1.2. Region/State/Province etc.:
>>
Guangxi Zhuang Autonomous Region

A.4.1.3. City/Town/Community etc:
>>
Hechi City, Fengshan County Paoli Village and Bama County Baime Village

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 Liangwan Hydropower Station lies on the border of Fengshan County and Bama County in Hechi City, Guangxi Zhuang Autonomous Region, China. The diversion dam will be built in Paoli Village, Fengshan County, at a distance of 32km from Fengshan county seat. The factory building will be situated in Baime Village, Bama County, at a distance of 9.5km from the diversion dam, 50km from Fengshan county seat and 35km from Bama county seat. Its geographical coordinates are north latitude 24°01′ and east longitude 107°02′. The position of the project activity is shown in Fig. A 4-1.

Fig. A 4-1 The position of project

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

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As per the scope of the project activity defined in the 'list of sectoral scopes and approved baseline and monitoring methodologies', the project activity falls under Scope Number 1-Energy Industries (renewable/non-renewable sources).

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

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The project activity uses well established hydro power generation technology for electricity generation and transmission. The project is a run-of-river hydropower project with a total installed capacity of 25MW (2×8.5MW+8MW) and a designed operation life of 25 years. The project activity includes a dam with 116.5m length (axial line), a newly built tunnel with 10253.5m length, a power generation plant, 110kV line with 34km length from the power generation plant to the Bama 220kV transformer substation, and so on.

The project activity involves construction of a dam with 116.5m length (axial line) to form a reservoir in the current river course. The reservoir capacity is 0.75 million m^3 under the normal impounded level (408m). The surface area at the normal water level is 0.8 km^2, and the power density is 31.25W/m^2.

From the reservoir, the water will be led through a newly built tunnel with 10253.5m length to the power generation plant. The two sets of water-turbine generators with unit capacity 8.5MW and one set of water-turbine generator with unit capacity 8MW will be installed in the power generation plant. The total installed capacity of water-turbine generator sets is 25MW. The three sets of HLA194-LJ-115 mixed-flow water turbines will be proposed in the project activity, whose main parameters are as following: rated head 105m, maximum head 110m, minimum head 100m, rated output 8.5MW, rated speed 600r/min, rated efficiency 92%, rated flux 9.3m^3/s(two sets) and 9.0m^3/s(one set). The two sets of SF8500-10/2600 generator and one set of SF8000-10/2600 generator will be selected in the project activity, whose main parameters are as following: standard power 8.5MW(SF8500-10/2600) and 8.0MW(SF8000-10/2600), rated voltage 10.5kV, rated current flow 974A, rated power factor 0.80, rated speed 600r/min.

The project activity also involves the construction of the 110kV line with 34km length from the power generation plant to the Bama 220kV transformer substation where the electricity generated by the project activity will be supplied to South China Power Grid.

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

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The proposed project activity uses the renewable crediting period (7×3 years), and the estimated emission reductions during the first crediting period are provided in the following table. The total estimated emission reductions during the first crediting period are 497,322 tCO_{2e}.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2008.11-12	11,841
2009	71,046
2010	71,046
2011	71,046
2012	71,046
2013	71,046
2014	71,046
2015.1-10	59,205
Total estimated reductions (tonnes of CO_2e)	497,322
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	71,046

A.4.5. Public funding of the project activity:

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No public funding from any Annex I parties are involved in 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:

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The applied methodology is the approved consolidated methodology ACM0002 (Version 06) "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

The applied monitoring methodology is the approved consolidated monitoring methodology ACM0002 (Version 06) "Consolidated monitoring methodology for zero emissions grid-connected electricity generation from renewable sources"

This methodology also refers to the latest version (version 04) of the "Tool for the demonstration and assessment of additionality"

For more information regarding the proposals and their consideration by the Executive Board please refer to http://cdm.unfccc.int/methodologies/PAmethodologies/index.html.

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

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The proposed project activity meets all applicability conditions of the methodology ACM0002 as follows:

- The proposed project activity is a run-of-river water diversion small hydro power project, and the electricity generated by the project activity will be connected to South China Power Grid, so it is a grid-connected electricity generation project from renewable sources.
- The installed capacity is 25MW, and the surface area at the normal water level is 0.8 km^2. Therefore, the power density is 31.25W/m^2. According to Thresholds and Criteria for the Eligibility of Hydroelectric Power Plants with Reservoirs as CDM Project Activities published by UNFCCC Executive Board, the project activity can use current approved methodologies and the project emissions from the reservoir may be neglected.
- The project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.
- The geographic and system boundaries for South China Power Grid can be clearly identified and information and data on the characteristics of the grid is available.

Thus the project activity satisfies the applicability conditions specified in ACM0002/Version06, the said methodology is applicable to the project activity.

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

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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 latest rules on project boundary in ACM0002/Version 06 are the following:

1. Use the delineation of grid boundaries as provided by the DNA of the host country if available; or
2. Use, where DNA guidance is not available, the following definition of boundary:

In large countries with layered dispatch system (e.g. state/provincial/regional/national) the regional grid definition should be used.

According to above requirements, South China Power Grid is selected as the project boundary.

The South China Power Grid includes Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid, and Guizhou Power Grid.

The following table illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

	Source	Gas	Included?	Justification/Explanation
Baseline	All power plants connected to the South China Power Grid	CO_2	Included	Main emission source. This is conservative.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	The project activity facilities	CO_2	Excluded	The power density is 31.25W/m^2. According to Thresholds and Criteria for the Eligibility of Hydroelectric Power Plants with Reservoirs as CDM Project Activities published by UNFCCC Executive Board, the project activity emissions from the reservoir may be neglected.
		CH_4	Excluded	
		N_2O	Excluded	

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

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As specified by ACM0002, the possible alternative baseline scenarios to the proposed project activity are as follows:

Baseline scenario 1-The proposed project activity not undertaken as a CDM project activity

This scenario is in compliance with current laws and regulations of China. However, according to the investment analysis in section B.5, the proposed project activity without CDM revenues is economically unattractive to the investors because the total investment's internal rate of return (IRR) is lower than the financial benchmark IRR (10%).Therefore, alternative baseline scenario 1- the proposed project activity not undertaken as CDM project activity can not be the realistic and credible scenario to the proposed project activity. (Investment analysis are shown in Section B.5)

Baseline scenario 2- Continued operation of the existing power plants in South China Power Grid and the addition of new generation sources to meet increased electricity demand

Alternative 2 does not involve initial investment and has no associated risks for the project participant. As for this baseline scenario, under the current relevant laws and regulations in China's power market, the existing capacity and newly added capacity building of South China Power Grid meet the requirements of the national laws and regulations, and are economically viable. Therefore, the continued operation of the existing power plants in South China Power Grid and the addition of new generation sources to meet increased electricity demand is an economically viable baseline scenario.

Baseline scenario 3- New fossil fuel (coal/gas/diesel) based power station

The project entity can generate equivalent amount of power using fossil fuel based captive power plant. However, as per Chinese power regulations, coal based power plants of less than 135MW and gas or diesel based power plant of less than 100MW are prohibited[1]. As the installed capacity is only 25MW which is less than 100MW and 135MW, the construction and operation one fossil fuel based captive power plant does not comply with the legal and regulatory requirements. Therefore this scenario can be excluded from the baseline scenario.

Scenario 4-Construction of a power station utilizing other renewable resources such as wind power, solar power or biomass

Because the project area is poor in wind energy resources (The average annual wind speed in the previous years is 1.8m/s, which is not viable for wind power project) [2], it is not feasible to construct wind power plant with the same amount of annual power generation. Biomass power generation needs plenty of biomass material, which is short in the mountainous area with limited farm land where the project activity located[3,4]. Therefore, it is not feasible to construct biomass power plant with the same amount of annual power generation. Furthermore, power generation based on other renewable energy, such as solar electrical energy generation, is suffered with high cost and not commercially viable in China at present[5]. Therefore, this alternative is not realistic and can not be taken as a credible scenario.

Among all these scenarios, the one that does not face any prohibitive barrier and is the most economically attractive should be considered as the baseline scenario. The above analysis demonstrates that baseline scenario 2: Continued operation of the existing power plants in South China Power Grid and the addition of new generation sources to meet increased electricity demand is the most viable baseline scenario as it does not face any prohibitive barriers and is the most economically attractive option.

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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As per the decision 17/cp.7, paragraph 43, a CDM project activity is additional if anthropogenic emissions of GHGs by sources are reduced below those that would occur in the absence of registered CDM project activity. The methodology requires the project proponent to determine the additionality based on 'Tools for demonstration and assessment of additionality' (version 04) to demonstrate its additionality.

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

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

Alternative 1: The proposed project activity not undertaken as a CDM project activity

Alternative 2: Continued operation of the existing power plants in South China Power Grid and the addition of new generation sources to meet increased electricity demand

Alternative 3: New fossil fuel (coal/gas/diesel) based power station

Alternative 4: Construction of a power station utilizing other renewable resources such as wind power, solar power or biomass

As it is mentioned in section B.4, alternatives 1, 3 and 4 are not realistic and credible alternatives to the proposed project activity. Alternative 1 is not economically attractive for the project participant and

[1] http://www.gov.cn/gongbao/content/2002/content_61480.htm
[2] The Feasibility Study Report of Liangwan Hydropower Station, Page 1-3
[3] http://www.gx.xinhuanet.com/wq/fengshan/gk.htm
[4] http://www.gx01.com/bamaxian/bmgk.htm
[5] http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=5884

alternatives 3 and 4 should be excluded for further analysis.

Sub-step 1b. Enforcement with mandatory laws and regulations.

As it is shown in section B.4, alternative 3 is prohibited by Chinese power regulations, while alternatives 1, 2, and 4 are in conformity with applicable laws and regulations. The continued operation of the existing power plants in South China Power Grid and the addition of new generation sources to meet increased electricity demand is the most credible alternative scenario.

Step 2: Investment analysis

The purpose of this step is to determine whether the project activity is economically or financially more attractive for the project participant than other alternatives without additional revenue/funding, possibly from the sale of emission reductions (CERs). The investment analysis was conducted through the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

The "Tools for the demonstration and assessment of additionality" suggest three analysis methods including simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the project will earn the revenues not only from the CDM but also from electricity sales, the option I is not appropriate method. Investment comparison analysis method is applicable to project whose alternatives are similar investment projects. The alternative baseline scenario of the project is provision of equivalent amount of annual power output by South China Power Grid rather than new investment projects. Therefore option II is not an appropriate method. The project will use benchmark analysis method based on the consideration that benchmark IRR of the hydropower sector is available.

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

According to "Economic evaluation rules for small hydropower projects" (SL16-95) issued by Ministry of Water Resources, the benchmark IRR on total investment for small hydropower projects is 10%[6].

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

(1) Basic parameters for IRR calculation

The basic parameters for calculation of financial indicators are shown in table B 5-1 (below):

Table B 5-1 Basic parameters for IRR calculation

No.	Parameter	Value	Source
1	Installed capacity	25MW	Feasibility Study Report(FSR)
2	Annual electricity supplied to the grid	84,770MWh	FSR
3	Project lifetime	25 years	FSR
4	Total investment	RMB 186,949,500 Yuan	FSR
5	Electricity tariff	0.260 Yuan/kWh	FSR
6	Operating cost	RMB 4,587,000 Yuan	FSR
7	Crediting period	7×3 years	Renewable crediting period for consideration
8	Expected CERs price	10.0 \$/tCO_2e	Assumed
9	Value added tax	17%	FSR
	Income tax	15%	FSR
	City build tax	1%	FSR

[6] http://cdm.unfccc.int/UserManagement/FileStorage/ILCEMAJS7IYS6TUO65G98QO4VO1YFE

	Additional tax for education funds	3%	FSR

(2) Comparison of IRR for the project and the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators (such as IRR) of the project are lower than the benchmark, the project is considered as financially unattractive.

Table B 5-2 Financial indicators of the project activity

	IRR of total investment (Benchmark=10%)
Without CDM revenues	7.80%
With CDM revenues	10.69%

Table B 5-2 shows the IRR of the project, with and without CDM revenues. Without support of CDM, the IRR of total investment is lower than the benchmark 10%. Therefore, the project is not financially attractive. With support of CDM, CERs revenue will significantly improve IRR of total investment, which exceed the benchmarks. Therefore, with support of CDM revenue, the project can be considered as financially attractive to investors.

Sub-step 2d. Sensitivity analysis

The objective of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in support of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

For the project, the following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

(1) Total investment

(2) Annual operating cost

(3) Electricity supplied by the project activity

(4) Electricity tariff

When the above four financial indicators fluctuate within the range of -10% to +10%, the IRR of total investment of the project varies to different extent. The impacts to IRR of total investment by above parameters fluctuation are (not considering CERs income) seen in table B 5-3 and figure B 5-1.

Table B 5-3 Sensitivity analysis of the IRR (total investment) of the project activity without CDM

Fluctuation range of parameters	-20%	-10%	-5%	0	5%	10%	20%
Electricity supplied by the project activity	5.12%	6.51%	7.16%	7.80%	8.41%	9.00%	10.14%
Electricity tariff	5.12%	6.51%	7.16%	7.80%	8.41%	9.00%	10.14%
Total investment	10.11%	8.85%	8.30%	7.80%	7.32%	6.88%	6.09%
Annual operating cost	8.31%	8.05%	7.92%	7.80%	7.66%	7.53%	7.27%

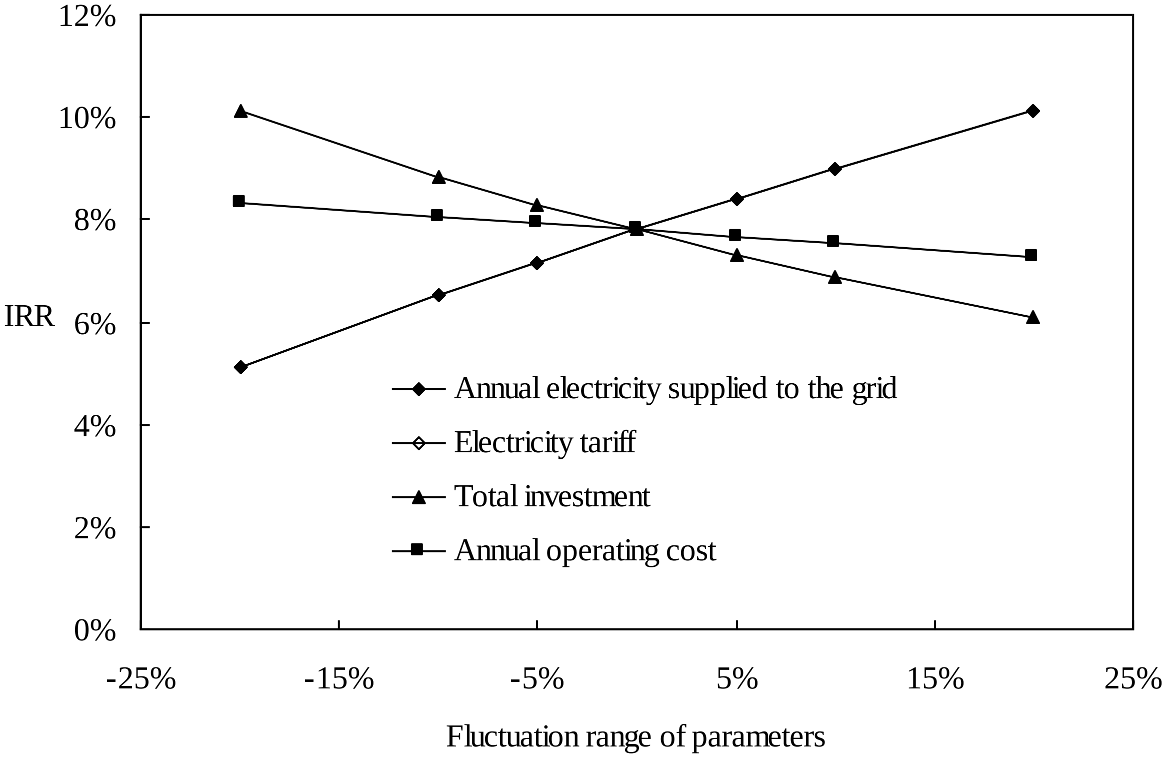

Figure B 5-1 Sensitivity analysis of the IRR (total investment) of the project activity without CDM

The table B 5-3 and figure B 5-1 show that the IRR will decrease with increase of total investment or annual operating cost, and it will increase with decrease of total investment or annual operating cost. When the total investment decreases 19.25%, the IRR is equal to benchmark 10%. When the annual operating cost decreases 90%, the IRR is equal to benchmark 10%. The table B 5-3 and figure B 5-1 also show that the IRR will increase when the annual electricity supplied to the grid or electricity tariff increases, and it will decrease with decrease of the annual electricity supplied to the grid or electricity tariff. When annual electricity supplied to the grid or electricity tariff increases 18.7%, the IRR is equal to benchmark 10%. The detailed and further analysis for likelihood of financial parameters fluctuation is as follows:

1) As for total investment

According to the information issued by China Logistics Information Center, the composite price of production material had gradually increased from January 2006 to February 2008, and that of steel material(main material for constructing the hydropower station) also had gradually increased from January 2006 to February 2008[7]. There is clearly a trend of increasing investment costs and therefore the total investment of the project activity is extremely unlikely to decrease 19.25%.

2) As for operating cost

According to the Feasibility Study Report of the project activity, annual operating cost is consist of maintenance cost, workers wage and welfare cost, the fee for water resource use, reservoir maintenance cost and environment protection fund, insurance cost and other cost etc, which are decided and calculated by some parameters such as the number of the workers, the installed capacity, the capital asserts and the

[7] www.clic.org.cn/portal/rootfiles/2008/04/22/1208662673219784-1208662673221302.pdf

generated electricity etc[8]. The number of the workers and the installed capacity are fixed, the generated electricity are relatively stable (as demonstrated below), and the capital asserts will be increased (as demonstrated above). Furthermore, according to the official statistics (Ministry of Labour and Social Security), the worker salary had increased 12.8% in 2005 and 12.7% in 2006(excluding inflation)[9,10]. Therefore, it is impossible that the annual operating cost decreases 90%. The IRR of the project activity can not reach the benchmark when the reasonable change of the annual operating cost.

3) As for annual electricity output to the grid

According to Feasibility Study Report of the project activity, the electricity output to the grid was estimated and calculated based on a long series hydrology data through the measurement at the hydrometric station as long as 41 years[11]. Therefore, the electricity supplied to the grid will not be changed so much and its value will be relatively stable, and can not be increased 18.7%. So, the IRR of the project activity can't reach the benchmark when the reasonable change of annual electricity output to the grid.

4) As for electricity tariff

When the electricity tariff increases 18.7%, the IRR equals to the benchmark rate 10%. However it is impossible that the electricity tariff increases 18.7%. The electricity tariff of the project activity was determined based on the negotiating result between the project entity and the Guangxi Power Grid Company. The electricity tariff of the small hydropower station in China is generally low[12], and it is difficult for the project entity, a county-level private enterprise, to get a higher electricity tariff in the future by negotiating with the Guangxi Power Grid Company, a provincial state-owned company. Furthermore, the quantity of electricity generated by the project activity that is a run-of-river hydropower station is unstable, which reduces the possibility of electricity being purchased at higher price by the Guangxi Power Grid Company in the future[13,14]. In a word, it can be expected that the electricity tariff would not be increased 18.7% during the defined crediting period.

Based on the above analysis, without support from CERs income, the project is not economically attractive, therefore the project is additional.

Step 4. Common practice analysis

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

According to *Classification & design safety standard of hydropower projects (DL5180-2003)* issued by the Ministry of Water Resources of People's Republic of China in 2003, the hydropower plant with capacity less than 50MW is defined as small scale hydropower projects. The proposed project activity is a small scale hydropower station with a total installed capacity of 25MW (below 50MW). Projects applied in common practice analysis are defined as hydropower projects with similar installed capacity (less than 50MW) in Guangxi Zhuang Autonomous Region. According to *China Water Resource Yearbook 2006*, there are fourteen hydropower projects operated in Guangxi Zhuang Autonomous Region with the total installed capacity of 808MW. There are six hydropower projects with the installed capacity smaller than 50MW (other 8 hydropower projects with capacity larger than 50MW are excluded) whose information is shown in the table B 5-4 (Note: project's information about name and installed capacity are from *China Water Resources YearBook 2006* and

8 The Feasibility Study Report of 25MW Liangwan Hydropower Project in Hechi City, page 12-4
9 http://www.gongshang120.com/readarticle.asp?id=1452
10 http://www.molss.gov.cn/gb/news/2007-05/18/content_178167.htm
11 The Feasibility Study Report of 25MW Liangwan Hydropower Project in Hechi City, page 4-14~4-23
12 http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=145635
13 http://www.ghcb.com.cn/index_content.asp?sub_newid=4&id=4508
14 http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=145635

http://www.smelz.gov.cn/news/105970.htm, other information is from the following addresses).

Table B 5-4 Hydropower projects in Guangxi Zhuang Autonomous Region (Installed capacity smaller than 50MW)

No.	Project Name	Installed Capacity	Largest Shareholder	Operation Time	Type of Project Owner
1	Caotouping Hydropower Plant	28MW	Guangxi Guangneng Hydroelectric Co., Ltd.	2003	Provincial Hydroelectric Development Company
http://www.ghcb.com.cn/gcyj_content.asp?sub_newid=55&id=502 http://bbs.xaut.net/archiver/?tid-28018.html http://www.gxcic.net/template/001/jbzl.aspx?URID=7216					
2	Tianhu Hydropower Plant	30MW	Guangxi Tianhu Hydropower Station	1992	-
Chen Jie. Planning and practice of high-head hydropower plants in Guangxi. Guangxi Water Resources & Hydropower Engineering, 2006, 2.					
3	Chengbihe Hydropower Plant	30MW	Chengbihe Reservoir Management Bureau	1997	State-owned
http://www.gxbssjw.gov.cn/index.php3?file=detail.php3&kdir=289708&nowdir=289708&id=168823&detail=2					
4	Xiaqiao Hydropower Plant	50MW	Guangxi Longjiang Hydroelectric Development Co., Ltd.	2006	-
http://www.smelz.gov.cn/news/85118.html					
5	Yemao Hydropower Plant	37.5MW	Guangxi Guimao Hydroelectric Development Co., Ltd.	1991	Enterprises with Share Participation of State
http://www.gxwater.gov.cn/WebEditor/UploadFile/2007813183134876.doc					
6	Guiping Navigation Junction Hydropower Plant	46.5MW	Guangxi Xijiang Navigation Construction Development Co., Ltd.	1993	State-owned
http://www.gxxijiang.com/about01.asp http://www.gpxzfw.gov.cn/viewnews.asp?id=407					

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

From 10th February 2002, China has begun undertaking significant reform in electric power sector, including dividing the former single national power company into regional companies, separating generation and distribution responsibilities, and shaping the tariff competition policy. Therefore, Tianhu Hydropower Project (1992), Chengbihe Hydropower Project (1997), Yemao Hydropower Project (1991) and Guiping Navigation Junction Hydropower Project (1993) are different from the proposed project activity and can be excluded from the common practice analysis. Thus we define the similar projects as small scale hydropower projects in Guangxi Zhuang Autonomous Region commissioned after 2002.

The existing similar hydro projects in Guangxi Zhuang Autonomous Region do not call into question the claim that the proposed project is financially unattractive as discussed in Step 2 because there are essential distinctions between them. In terms of the project shareholders, Caotouping Hydropower Project was developed by a provincial hydroelectric developer, which is easier to get the loan and financing from the bank because of their strong capacity to afford the loan and their excellent credit records. As for the proposed project activity, the project entity is a county-level private enterprise, and they can not easily get the trust from the Bank and are difficult to apply for the loan to invest the hydro power project because of their weak ability of affording the loan and bad credit performance[15].

The Xiaqiao Hydropower Project, like the project activity, was in the process of finding carbon finance help because of economical unfeasibility and other barriers[16]. This project can also be excluded from the common practice analysis.

In conclusion, the proposed project activity is different from these similar projects in Guangxi Zhuang Autonomous Region. The proposed project is not a common practice in Guangxi Zhuang Autonomous Region.

If the proposed project activity is registered as a CDM project, the project owner will get the following benefits: (1) the CDM revenues can improve the poor financial index of the proposed project, and make the project more financial attractive; (2) the CDM revenues will increase the revenues of the proposed project, which can reduce the pressure from long-term investment needed by the project activity and cash flow risks; (3) the CDM revenues can provide cash support to employ excellent operators and managers.

[15] http://www.ccn86.com/news/topic/20070508/22468_2.shtml
[16] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1679.pdf

The history of considering CDM:

The time schedule of the project activity especially related to CDM consideration is as follow:

Year	Date	Milestone	Evidence/Remarks
2004	April	EIA Report finished	Environmental Impact Assessment(EIA) Report
	June	FSR completed	FSR(Feasibility Study Report)
	5th June	EIA Report approved	Approval letter by Environmental Protection Bureau of Guangxi Zhuang Autonomous Region
2005	20th June	Serious decision for CDM Development	Board Decision on CDM Application of Liangwan Hydropower Station of Hechi Liangwan Electric Power Development Co., Ltd. due to finance difficult of this Hydropower project
	15th August	Letter regarding intention of developing the CDM project activity	Intent letter on jointly developing CDM project activity between the project owner and Shanghai Yinzhou Investment Management Co., Ltd.
	30th September	FSR approved	Approval letter by Development and Reform Commission of Guangxi Zhuang Autonomous Region
	December	Starting to construction	Builder's licence of Liangwan Hydropower Project issued by Hydropower & Electrization Development Bureau of Water Conservancy Office in Guangxi dated 31 December 2005 (permit valid date from December 2005 – December 2007)
2007	7th March	Electricity power dispatch agreement	The power dispatch agreement between Hechi Liangwan Hydroelectric Development Co., Ltd. and Guangxi Power Grid Company
	May	PDD of Liangwan Hydropower Project finished	PDD of 25MW Liangwan Hydropower Development Project
	3rd July	Contract for validation of the project activity by DNV signed	Contract for Validation of Liangwan Hydropower Project by DNV
	26 August	LoA of China DNA	Chinese Letter of Approval issued by NDRC on 26 August 2007
2008	August(expected)	Electricity generation start	

From the above time schedule, it can be shown that the project entity was aware of the important function of CDM to implement the project activity and the decision for CDM development has been made by the Directorate due to finance difficult of Liangwan Hydropower Project. Realizing the importance of the future cash flow from the CERs revenues, the funds had been collected to invest the project activity, and the project activity started to construct in December 2005.

The Liangwan Hydropower Station started to be constructed in December 2005, and the contract for validation of the project activity was signed on 3rd July 2007. The time gap between the starting date of the project activity and the date of signing contract was about one year and six months. The explanation for the time gap between the project starting date and the start of the validation is as follows:

(1) Shanghai Yinzhou Investment Management Co., Ltd. decided to stop developing all CDM projects, including the Liangwan Hydropower Project. The project entity (Hechi Liangwan Electric Power Development Co., Ltd.) decided to commission Shanghai Xintan Investment Management Co., Ltd. to develop the project activity under CDM on 6th August 2006. After that, Shanghai Xintan Investment Management Co., Ltd. began to compile the PDD and the other relevant materials. The change of the project developer resulted in wasting plenty of time, and the application for validation of the Liangwan Hydropower Project by Chinese DNA and DOE had to be put off.
(2) After large numbers of business negotiation between the CERs buyers and the project developer, MGM was finally selected as the CERs buyer of the Liangwan Hydropower Project, and the pre-contract agreement (Term Sheet) was signed on 12th December 2006.
(3) If all CDM application materials are provided to Chinese DNA for approval before determining the CERs buyer, the project activity can only be developed as unilateral CDM project. However, the project entity didn't agree that the project activity to be developed as unilateral CDM project. Therefore, the project developer didn't provide all CDM application materials to Chinese DNA until 16th March 2007.
(4) The Chinese CDM Council, who is responsible for approving of application for CDM projects in China, only has one meeting every month. The Chinese CDM Council didn't notify the project entity and the project developer to take part in the meeting held by them until 19th June 2007. The project entity and project developer attended the thirty-third meeting held by Chinese CDM Project Application Validation Council on 28th June 2007. After that, the application for CDM project was approved by the Chinese DNA.
(5) Only the application for CDM project was submitted to the Chinese DNA on March 16th for Chinese LoA, MGM agreed to sign the formal purchasing agreement, and the formal purchasing agreement was signed on 28th April 2007. Then MGM prepared to arrange the validation of the project activity.
(6) The validation contract of Liangwan Hydropower Project was signed by MGM and DNV on 3rd July 2007. The PDD of Liangwan Hydropower Project was published on 7th July 2007.

In conclusion, the proposed project activity passes all the necessary steps of additionality analysis, and hence is additional. In the absence of the proposed project activity, equivalent amount of annual power output by the grid (South China Power Grid) will be supplied, and the power plants (mainly coal-fired) that provide this electricity would keep on discharging carbon dioxides into the air.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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The baseline scenario applicable to the project activity is 'Provision of equivalent amount of annual power output by South China Power Grid'. Accordingly, the baseline scenario emission factor of the displaced electricity has been calculated on the basis of ACM0002/Version 06. The combined margin has been calculated as described in the methodology while taking the relevant grid definitions and emission factors.

The most recent available information on the fuel consumption of South China Power Grid is the data of 2005 recorded in *China Energy Statistical Yearbook 2006*, and the grid emission factor will be calculated accordingly.

The baseline grid emission factor (EF_y) is calculated as the simple average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$). In accordance with version 06 of ACM0002, the baseline emission factor should be calculated as described below:

Determination of baseline emissions:

STEP 1. Calculate the Operating Margin Emission Factor(s) ($EF_{OM,y}$)

Based on one of the four following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount grid generating output. Among the total electricity generations in 2001-2005 of South China Power Grid where the project connected into, the low-cost/must run resources constitute less than 50% of total amount grid generating output. The detailed information could be seen in Table B 6-1.

Table B 6-1 Annual electricity generation of South China Power Grid 2001-2005

year	Electricity generation (GWh)			Proportion of low cost and must run resources (%)
	Total generation	Thermal power	Hydropower etc.	
2001[17]	245,940	162,910	82,895	33.71
2002[18]	268,676	183,733	84,943	31.62
2003[19]	323,149	222,780	100,369	31.06
2004[20]	376,277	263,574	112,702	29.95
2005[21]	402,250	287,187	115,063	28.60

In accordance with ACM0002/Version06, the Simple OM emission factor ($EF_{OM,,y}$) 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. The formula of $EF_{OM,simple,y}$ calculation is as below:

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

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[22] 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

[17] China Electric Power Yearbook 2002 P625

[18] China Electric Power Yearbook 2003 P593

[19] China Electric Power Yearbook 2004 P709

[20] China Electric Power Yearbook 2005 P485

[21] China Electric Power Yearbook 2006 P586

[22] As per ACM0002/Version06, an import from a connected electricity system should be considered as one power source

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 source *j* in the year *y*.

According to ACM0002/Version06, when OM emission factor ($EF_{OM,y}$) is calculated by using simple OM or average OM, if the plants and data are not available, i.e. lacking of data on generation/power supply, amount of fuel consumption, fuel type and emission factor etc., the aggregated generation and fuel consumption data could be used. The aggregated generation and fuel consumption data of the 5 sub-regional grids (Guangdong, Guangxi, Yunnan, and Guizhou) which constitute South China Power Grid are used for the project.
The CO_2 emission coefficient $COEF_{i,j,y}$ is then obtained from the following equation as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \quad (2)$$

Where:
NCV_i is the net calorific value mass or volume of the fuel (GJ/mass or volume unit of the fuel) ;
$OXID_i$ is the oxidation factor of fuel;
$EF_{CO_2,i}$ is the CO_2 emission factor per GJ of fuel (tCO_2/GJ).

If available, local values of NCV_i and $EF_{CO2\ i}$ shall be used. If not, country-specific values (see IPCC Good Practice Guidance) are preferable to IPCC world-wide default values. In this PDD, NCV_i of different fuels are obtained from *China Energy Statistical Yearbook 2006.* With regard to the fuel types where NCV_i fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO2,\ i}$ of fossil fuel come from IPCC default values.

The Simple OM Emission Factor ($EF_{OM,\ simple,y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of South China Power Grid, excluding those of low cost and must-run power sources. These data are obtained from the *China Electric Power Yearbook* (2004~2006, published annually) and *China Energy Statistical Yearbook* (2004~2006). Based on these data, the *OM* emission factor ($EF_{OM,y}$) is calculated ex-ante as a 3-year average (2003~2005), based on the most recent statistics available. The details could be seen in Annex 3.

The Operating Margin Emission Factor ($EF_{OM,y}$) could be calculated according to above equation and data of South China Power Grid in 2003-2005 in Annex 3.

The resulting OM emission factor is:

EF_{OM}= **1.0120** tCO_2/MWh

STEP 2. Calculation of the Build Margin Emission Factor ($EF_{BM,y}$)
It is calculated as the generation-weighted average emission factor (tCO_2e/MWh) of a sample of power plants of grid, as follows:

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

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in years *y*;

$COEF_{i,m,y}$ is the CO_2 emission coefficient (tCO_2e/mass or volume unit of the fuel) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m* in year *y*.

Calculations for the Build Margin emission factor ($EF_{BM,y}$) has been done as ex-ante based on the most recent information available on plants already built for sample Group *m* of South China Power Grid at the time of PDD submission. The sample Group *m* consists of either:
a) The five power plants that have been built most recently, or
b) The power plants capacity additions in the electricity system generation (in MWh) and that have been built most recently.

As per the clarifications are given by EB[23], the project activity can:
1) Use of capacity additions during 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 to calculate BM emission coefficient.
3) 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.

As the limit of data obtained for calculation the proportion of Coal-fired, Gas-fired and oil-fired power capacity to the total power capacity in South China Power Grid, this PDD will adopt the following method to calculate BM emission factor:
① Use the data of fuel consumption in the latest year to calculate the proportion of the GHGs emissions of Coal-fired, Oil-fired and Gas-fired resources to the total GHGs emissions, the proportion is given by:

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

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

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

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in tce) consumed in province *j* in year(s) y,
$COEF_{i,j,y}$ 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*,

[23] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

② 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, and the above data to calculate the emission factor of thermal power.

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

Where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ the emission factor of the most efficient level of Coal-fired, Oil-fired and Gas-fired respectively of the best technology commercially available.

③ Use the data obtained in ② and the increased percentages of thermal power to calculate Build Margin emission factor of South China Power Grid.

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

Where,

CAP_{Total} is the total newly added capacity of power capacity,

$CAP_{Thermal}$ is the newly added capacity of thermal power.

The result is **0.6643**tCO_2e/MWh. This value will be considered fixed along the first 7-year crediting period. The details could be seen in Annex 3.

STEP 3. Calculation of the Baseline Emission Factor (EF_y)

Based on ACM0002/Version06, the baseline emission factor EF_y was calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$).

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

Default weights of 50% as specified in ACM0002/Version06 are employed in this project.

$W_{OM} = W_{BM} = 0.5$

Hence EF_y=0.5×$EF_{OM,y}$ +0.5×$EF_{BM,y}$

EF_y =0.5×1.0120 tCO_2/MWh + 0.5×0.6643 tCO_2/MWh

=0.8381 (tCO_2/MWh)

STEP 4. Calculation of the Baseline Emissions *(BE_y)*

According to ACM0002/Version06, the baseline emissions (BE_y) are calculated as:

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

Where:

BE_y are the baseline emission of South China Power Grid in year *y*,

EG_y is the electricity generated by the project and supplied to the grid,

And EF_y is the grid emission factor in year *y*

As per the feasibility study of the project activity, the annual net power supply by the project activity corresponding to 25MW actual power is 84,770 MWh, and the baseline emission factor as calculated in step 3 is **0.8381** tCO_2e/MWh.

$$BE_y = EG_{y_y} \times EF_y$$
=71,046 tCO_2e

Determination of project emissions:
The power density is 31.25W/m^2, which is more than 10 W/m^2. As per ACM0002 (version 06), the project emissions are zero, that is: PE_y = 0.

Determination of leakage emissions
As above ACM0002, the leakage of the project activity is not considered, that is: L_y = 0.

Determination of emission reductions
Since the project emissions and leakage emissions are zero in the project activity, the emission reductions of the project activity (ER_y) are equal to baseline emissions (BE_y). The emission reductions of the project activity are **71,046** tCO_2e.

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

>>

Data / Parameter:	EG_{GEN}
Data unit:	GWh
Description:	Power generation of South China Power Grid in 2001-2005
Source of data used:	China Electricity Power Yearbook(2002-2006)
Value applied:	Refer to section B.6 and Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Reliable local data used to calculate ex-ante the proportion of low-cost/must run resources to total amount of grid power generation and Operation Margin emission factor (including imports).
Any comment:	The method of calculation of Operation Margin emission factor are selected according to percent of low-cost/must run resources to total amount grid generating output.

Data / Parameter:	$F_{i,j}$
Data unit:	10^4t or 10^8m^3
Description:	Amount of fuel consumed by the power sources delivering electricity to South China Power Grid
Source of data used:	China Energy Statistical Yearbook 2004, 2005, 2006
Value applied:	Refer to Annex 3

Justification of the choice of data or description of measurement methods and procedures actually applied :	Reliable local data used to calculate ex-ante the Operation Margin emission factor
Any comment:	Obtained from China Energy Statistical Yearbook 2004, 2005, 2006, and needn't to be updated ex-post.

Data / Parameter:	NCV_i
Data unit:	MJ/t,m^3,tce
Description:	It is the net calorific value (energy content) per mass or volume unit of the fuel consumed by the power sources delivering electricity to South China Power Grid.
Source of data used:	China Energy Statistical Yearbook 2006
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Reliable local data used to calculate ex-ante the Operation Margin emission factor
Any comment:	Obtained from China Energy Statistical Yearbook 2006, and needn't to be updated ex-post.

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ
Description:	Carbon emission factor of the fuel consumed by the power sources delivering electricity to South China Power Grid.
Source of data used:	IPCC Guidelines 2006: Chapter 1, page 1.21-1.24
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to calculate the grid emission factor.
Any comment:	Obtained from 2006 IPCC Guidelines, and needn't to be update ex-post.

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	The oxidation rate of the fuel consumed by the power sources delivering electricity to South China Power Grid.
Source of data used:	IPCC Guidelines 2006: Chapter 1, page 1.21-1.24
Value applied:	Refer to Annex 3

Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to calculate ex-ante the Operation Margin emission factor
Any comment:	Obtained from 2006 IPCC Guidelines, and needn't to be updated ex-post.

Data / Parameter:	Installed capacity
Data unit:	MW
Description:	Installed capacity of South China Power Grid in 2003-2005
Source of data used:	China Electricity Power Yearbook (2004-2006)
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	To calculate the Build Margin emission factor
Any comment:	Obtained from China Electricity Power Yearbook 2004-2006, and needn't to be updated ex-post.

Data / Parameter:	Best efficiency level of thermal power[24]
Data unit:	%
Description:	The efficiency level of the best coal-based, oil-based, and gas-based power generation technology commercially available in China.
Source of data used:	Notification on Determining Baseline Emission Factors of China Power Grid
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to calculate ex-ante the Build Margin emission factor
Any comment:	Official data

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

>>

Step 6.3-1 Estimate of GHG emissions by sources:

The power density is 31.25W/m^2, which is more than 10 W/m^2. As per ACM0002 (version 06), the project emissions are zero, that is: $PE_y = 0$.

Step 6.3-2 Estimated leakage:

As above ACM0002, the leakage of the project activity is not considered, that is: $L_y = 0$.

[24] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1850
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf

Step 6.3-3 Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:
As the baseline emission factor (EF_y) is 0.8381 tCO_2e/MWh, the annual electricity displaced by the project activity (EG_y) is 84,770MWh, then the annual baseline emissions of the project activity (BE_y) are 71,046 tCO_2e.

$BE_y = EG_y \times EF_y$ = 84,770 MWh/year ×0.8381 tCO_2/MWh **=71,046 tCO_2e/year**

Step 6.3-4 Estimate of emission reductions:
Since the project emissions and leakage emissions are zero in the project activity, the emission reductions of the project activity (ER_y) are equal to baseline emissions (BE_y). The emission reductions of the project activity are **71,046** tCO_2e.

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008.11-12	0	11,841	0	11,841
2009	0	71,046	0	71,046
2010	0	71,046	0	71,046
2011	0	71,046	0	71,046
2012	0	71,046	0	71,046
2013	0	71,046	0	71,046
2014	0	71,046	0	71,046
2015.1-10	0	59,205	0	59,205
Total (tonnes of CO_2e)	0	497,322	0	497,322

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

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B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$EG_{Supply,y}$
Data unit:	MWh
Description:	Power supplied to the grid by the project activity
Source of data to be used:	On-site instrumentation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	84,770MWh

Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	Please refer to B.7.2.
Any comment:	

Data / Parameter:	$EG_{Import,y}$
Data unit:	MWh
Description:	Electricity purchased from the Grid by the project activity
Source of data to be used:	On-site instrumentation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0MWh
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording
QA/QC procedures to be applied:	Please refer to B.7.2.
Any comment:	

Data / Parameter:	A_{PJ}
Data unit:	km^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 to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.8
Description of measurement methods and procedures to be applied:	Measured from topographical surveys at start of the project
QA/QC procedures to be applied:	
Any comment:	

B.7.2. Description of the monitoring plan:

>>

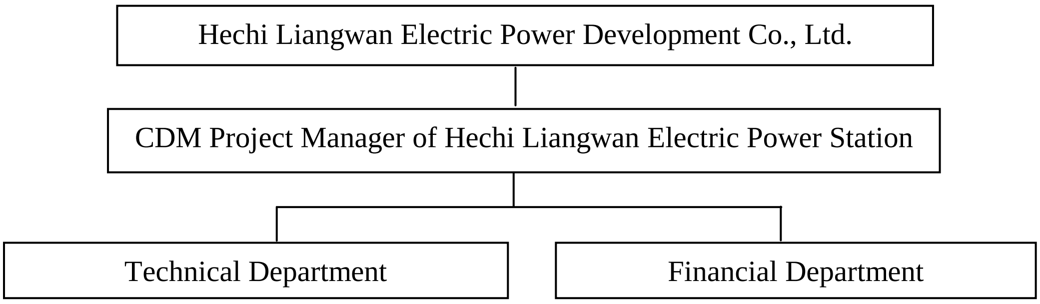
The baseline scenario of the project activity has been identified in accordance with ACM0002/Version06 as provision of equivalent amount of annual power output by the grid (South China Power Grid) where the proposed project is connected into. Therefore, the monitoring methodology was designed as required by ACM0002/Version06.

1. Monitoring data

The emission reductions of the project activity are based on two factors: *CM* of South China Power Grid which will be calculated ex-ante and it does not need to be updated ex-post during the first crediting period as the project activity has chosen the renewable crediting period, and the net electricity delivered to South China Power Grid by the project activity which will be determined through calculating the difference between electricity supplied to and drawn from South China Power Grid monitored and recorded during the operational life of the power station. All the data should be documented (electronic and paper) during and two years after the crediting period.

2. Management system

The data from the monitoring will be stored and arranged by the database management system. The project entity has already set up a management system of the power station. The following is an illustration of the management structure:



The CDM project manager of Hechi Liangwan Electric Power Station is in charge of the overall management of the station, and responsible for the tasks related to registration. The general management department consists of technical department and financial department. The technical department is responsible for calibration and maintenance of instruments, monitoring data record, check and statistic, and preservation. The financial department is responsible for collecting and preserving financing data for checking, including recording and bill of buying and selling power.

3. Monitoring device and installation

The electricity supplied to the grid by the project activity and the power purchased from the grid can be monitored by the kilowatt meters installed in the control room. The bidirectional electricity meter, which is the multi-functional electric energy meter with the precision of 0.5S, monitors the power supplied to the grid by the project activity and the power imported from the grid. The technical characteristics of all electricity meters should match the technical requirement of “Stationary Multi-functional Alternating Active Electric Meter with Precision of 0.2S and 0.5S” (GB/T-17883-1999) and “Multi-functional Electric Meter” (DL/T614-1997). Before operation of the project activity, all electricity meters will be jointly checked and accepted by the project entity and Guangxi Power Grid Company according to the technical requirement of “Technical Management Rules of Electricity Measurement Device” (DL/T448-2000).

4. Monitoring plan

The project entity and CDM developer should jointly implement monitoring plan to ensure the measuring accuracy of the net electricity supplied to the grid by the project activity. The electricity supplied to the grid by the project activity and the power purchased from the grid will be monitored via the following steps:

(1) The monitoring data from the electricity meters will be jointly read by the project entity and Guangxi Power Grid Company on 24:00 of the last day every month, and should be verified by both sides together.

(2) Guangxi Power Grid Company will provide data of power supply by the project activity to the project entity.
(3) The project entity will provide the invoices of power sale to Guangxi Power Grid Company, and save the hard copy of these invoices.
(4) Guangxi Power Grid Company will provide data of power consumed by the project activity to the project entity.
(5) The invoices of purchasing power from Guangxi Power Grid will be gotten and saved by the project entity.
(6) On normal condition, the monitoring data of electricity supplied to the grid by the project activity and the power purchased from the grid will be read from the main electricity meter. The data from the auxiliary electricity meter will be used to check the data from the main electricity meter. Once the main electricity meter is found to be malfunctioning, the monitoring data will be read from the auxiliary electricity meter.
(7) The net power supply will be calculated by the project entity according to the power supplied by the project activity and power purchased from the grid by the project activity.
(8) During the course of CERs verification, the project entity will provide the monitoring data and the invoices of sale and purchasing power to the DOE.

5. Maintenance and calibration of electricity meter

The electricity meters should be purchased and installed by the project entity, which will also be responsible for managing and maintaining them, ensuring the reliability of the system and the accuracy of the readings. The project entity will plan to train the staff who are in charge of monitoring. The train courses include skills of electricity meters' maintenance and operation.
All measuring instruments would be calibrated by the electricity measuring organization, which should be recognized by the national measure management department, together with the project entity and Guangxi Power Grid Company. The electricity meter should be checked and sealed in the presence of representatives from every side. Neither party should open the seal in the absence of the other. Once the reading error of instruments exceeds the permitted error range or the instrument is found to be malfunctioning, the action should be taken according to related terms in the sale and purchase power contract signed by the project entity and Guangxi Power Grid Company.

6. Monitoring data management

The monitoring data will be filed at the end of every month, and saved in the video disc. The monitoring data will also be saved in form of printing. Paper-form documents such as maps, tables, EIA reports, etc. will also be used in relation to the monitoring plan so as to verify the exactitude of information. To facilitate the verifiers to obtain ER verification related documents and information of the proposed project activity, the project entity will provide an index on relevant materials and monitoring information. All monitoring data will be preserved throughout the whole crediting period and the following two years.

7. Monitoring report

At the end of every year during the whole crediting period, the CDM project manager of Hechi Liangwan Electric Power Station will be responsible for writing a monitoring report. Its content includes power generated and consumed by the project activity monitoring report, Emission Reductions calculation report, monitoring device maintaining and checking records.

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)

>>

Date of completing the final draft of this baseline section: 05/06/2007
Name of person/entity determining the baseline: GAO Weijie
Tel: +86-21-58830956，+86-21-50875022
Fax: +86-21-50870309
E-mail: 13301618120@133sh.com
Organization: Shanghai Xintan Investment Management Co. Ltd.

In addition, the application of the baseline and monitoring methodology was checked by MGM International SRL in May 2007.

Shanghai Xintan Investment Management Co. Ltd. and MGM International are not project participants.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
31/12/2005(Starting to construction)

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

>>
The expected operational life of the project activity is to exceed 25 years.

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

>>
The project uses renewable crediting period.

C.2.1. Renewable crediting period

>>

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

>>
1 November 2008, or the date of registration, whichever is the latest.

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

>>

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 Environmental Impact Assessment (EIA) report for this project activity has already been approved by Guangxi Zhuang Autonomous Region Environmental Protection Bureau on 5th June, 2004. Combined with the EIA report, the environmental impacts arising from the project activity are summarized as follows.

Land submersion

After implementation of the project activity, there are only 0.0928km^2 cultivated land submerged by the project activity. And no housing will be drowned by the project activity, which means no emigration brought by the project activity.

Propagation protection

There is no reserved propagation in the reservoir area. Therefore, the construction of the project activity has definite impact on plant and animal. During the construction of the project activity, some wood will be used to build work shed. These woods should be collected from other places in order to reduce consumption of plant resource in the reservoir area.

Soil and water losses

Soil and water losses would take place with the construction of the project activity because of excavation of earth, construction and solid waste dumping. In order to avoid this problem, some measures should be taken such as building walls to block waste residues, planting vegetation and building water discharging facility. With the implementing of these measures, the problem will be solved effectively.

Wastewater impact on environment

There will be wastewater produced during project construction. However, it won’t be discharged directly into the river basin until after certain treatment. So it will not influence the water quality. Used oil during the construction period of the project activity will be collected and disposed. To discharge of the used oil into rivers is strictly forbidden. The sanitary wastewater will be treated in the waste water treatment and not be discharged into rivers directly.

Noise impact on environment

During construction, noise will be generated by machinery. There is no resident area around the project site, but the workers will be impacted by the noise. Consequently, some measures, such as the construction schedule will be reasonably arranged, will be taken to reduce the impacts of noise to minimum.

Air pollution

The project activity will cause air pollution from engineering digging and blasting, transporting and utilizing of building materials during construction and these will have temporary impacts on the quality of local air environment. Many measures will be taken to reduce these adverse impacts on local air environment. For example, straw bag will be used to cover the blasting surface as blowing up in the open air. The concrete stirring device will be equipped with dust removing equipment in order to reduce releasing dust.

Solid waste management
The solid waste produced from the project activity includes construction waste during the construction period and the domestic garbage during the construction and operation time. Parts of construction waste will be recycled. The residual construction waste which can not be reused will be transported to the waste disposal site for avoiding the residue lost. For the domestic garbage, the project entity will set enough garbage bins in the relevant area. Then the domestic garbage will be sent to landfill to avoid the environment pollution.

As discussed above, the project activity will produce definite environmental impact. However, the environmental impact of the project activity during the construction period is short, and the impacts identified will be mitigated through the implementation of sound environmental protection measures. The environmental impact of the project during the operation period can be negligible.

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:

>>
With mitigation controls planned, and taking into consideration the contribution made by the project to sustainable development for the local and national area, the project will have an overall positive impact on the local and global environment. All negative environmental impacts are subject to effective mitigation measures as described above.

SECTION E. Stakeholders' comments

>>

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

>>

The project participant collected the opinions from residents and villager around the site of the project activity by questionnaire in February 2004. 120 questionnaires were sent and the survey received 100% participation (120 questionnaires returned out of 120).

The information of persons who took part in this questionnaire was summarized as follows:

1. Sex			
Male	Female		
63.5%	36.5%		
2. Maximum educational qualification			
Undergraduate and above	High school	Primary school and below	
27.5%	35.5%	37%	
3. Occupation			
Farmer	Worker	Cadre	Individual family
29.2 %	20.8 %	41.7 %	8.3 %

The questionnaire includes the following questions:

1. The relation between you and the project activity.
2. What is your opinion about the impact to the environment?
3. What is your opinion of the project activity's impact on local economy?
4. What is your attitude about construction of this project activity?
5. What is the primary factor influenced you during the construction of this project?
6. What is your advice on construction of project activity and environmental protection?
7. Which is your concern about this project activity?
8. Other opinions.

E.2. Summary of the comments received:

>>

The stakeholder consultation processes highlighted responses in the following areas:

- 91.7 percent interviewee agreed with construction of the project activity, and 8.3 percent interviewee considered construction of the project activity unconcerned. There is no opponent among these interviewees.
- 79.1 percent interviewee thought that construction of the project activity would bring in related economic benefits for the local community and lead to sustainable economic and industrial growth in the region. 80.5 percent interviewee thought that the project activity will satisfy increasing electricity demand of Fengshan County and Bama County.
- 42.5 percent interviewee thought that the main environmental impact is submersion of cultivated land. 20 percent interviewee thought that the discharge of Bama county wastewater would be influenced by the project activity.
- 54.2 percent interviewee suggested that the water quality of river should be protected in order to avoid pollution. 62 percent interviewee suggested that the pollution sources in the reservoir should be strictly controlled.

- In this investigation, most people hoped that the project activity should be implemented as soon as possible.

As a whole, the stakeholder generally supported the construction of the project activity.

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

>>

These suggestions from the public will be seriously considered by the project participant. All negative environmental impacts presented by the public will be subject to effective mitigation measures as described in Section D.1.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>
No public funding from any Annex I parties are involved in the project activity.

Annex 3

BASELINE INFORMATION

>>

1. Calculation of *OM* emission factor

Table 3-1 Annual electricity generation of South China Power Grid of 2001-2005

No.	Year	Electricity generation/GWh			Percentage of hydropower /%
		Total Power	Thermal power	Hydropower	
1	2001	245,940	162,910	82,895	33.71
2	2002	268,676	183,733	84,943	31.62
3	2003	323,149	222,780	100,369	31.06
4	2004	376,277	263,574	112,702	29.95
5	2005	402,250	287,187	115,063	28.60
China Electric Power Yearbook 2002 page. 625 China Electric Power Yearbook 2003 page. 593 China Electric Power Yearbook 2004 page. 709 China Electric Power Yearbook 2005 page. 485 China Electric Power Yearbook 2006 Page. 586					

Table 3-2 Operation Margin of South China Power Grid in 2003

Fuel type	unit	Provinces and city cover by South China Power Grid					Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized/%	Average Low Calorific Value MJ/t,km^3,tce	CO_2 Emissions tCO_2e
		Guangdong	Guangxi	Guizhou	Yunnan	Total				K=D×F×G×H×44/12/ 10000
		A	B	C	D	E=A+B+C+ D	F	G	H	K=D×F×G×H×44/12/ 1000 (gas)
Raw Coal	10^4t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20908	175993455.05
Cleaned Coal	10^4t	0.05				0.05	25.8	100	26344	1246.07
Other washed coal	10^4t			36.38	20.37	56.75	25.8	100	8363	448971.84
Coke	10^4t				0.5	0.5	29.2	100	28435	15222.20
Coke Oven Gas	10^8m^3				0.04	0.04	12.1	100	16726	2968.31
Other Coal Gas	10^8m^3	3.21			11.27	14.48	12.1	100	5227	335797.81
Crude Oil	10^4t	6.85				6.85	20	100	41816	210055.71
Gasoline	10^4t	0.02				0.02	18.9	100	43070	596.95
Diesel	10^4t	31.9			0.76	32.66	20.2	100	42652	1031759.27
Fuel Oil	10^4t	627.22	0.3			627.52	21.1	100	41816	20301304.48
PLG	10^4t					0	17.2	100	50179	0.00
Refinery Gas	10^4t	2.85				2.85	15.7	100	46055	75560.14
Natural Gas	10^8m^3					0	15.3	100	38931	0.00
Other Petroleum Products	10^4t	11.35				11.35	20	100	38369	319357.98
Other Coking Products	10^4t					0	25.8	100	28435	0.00
Other Energy	10^4t	93.21			22.35	115.56	0	100	0	0.00
Imported from Central China Power Grid	MWh	11100				Average emission factor of Central China Power Grid(tCO_2e/MWh)		0.797346		8850.5375
Total										198745146.3475
Thermal power generated	MWh	143351000	17079000	43295000	19055000					
Station service power consumption rate	%	5.5	8.43	7.4	8.01					
Thermal power supply	MWh	135466695	15639240	40091170	17528695	208725799.8				

Table 3-3 Operation Margin of South China Power Grid in 2004

Fuel type	unit	Provinces and city cover by South China Power Grid					Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized/%	Average Low Calorific Value MJ/t,km^3,tce	CO_2 Emissions tCO_2e K=D×F×G×H×44/12/ 10000
		Guangdong	Guangxi	Guizhou	Yunnan	Total				
		A	B	C	D	E=A+B+C +D	F	G	H	K=D×F×G×H×44/12/ 1000 (gas)
Raw Coal	10^4t	6017.7	1305	2643.9	1751.28	11717.88	25.8	100	20908	231767573.55
Cleaned Coal	10^4t	0.21				0.21	25.8	100	26344	5233.50
Other washed coal	10^4t					0	25.8	100	8363	0.00
Coke	10^4t					0	29.2	100	28435	0.00
Coke Oven Gas	10^8m^3					0	12.1	100	16726	0.00
Other Coal Gas	10^8m^3	2.58				2.58	12.1	100	5227	59831.38
Crude Oil	10^4t	16.89				16.89	20	100	41816	517932.98
Gasoline	10^4t									
Diesel	10^4t	48.88			1.83	50.71	20.2	100	42652	1601975.28
Fuel Oil	10^4t	957.71				957.71	21.1	100	41816	30983494.25
PLG	10^4t					0	17.2	100	50179	0.00
Refinery Gas	10^4t	2.86				2.86	15.7	100	46055	75825.26
Natural Gas	10^8m^3	0.48				0.48	15.3	100	38931	104833.40
Other Petroleum Products	10^4t	1.66				1.66	20	100	38369	46707.86
Other Coking Products	10^4t					0	25.8	100	28435	0.00
Other Energy	10^4t	79.42				79.42	0	100	0	0.00
Imported from Central China Power Grid	MWh	10951240				Average emission factor of Central China Power Grid (tCO_2e/MWh)		0.827319		9060168.565
Total										274223576.025
Thermal power generated	MWh	169389000	20143000	49720000	24322000					
Station service power consumption rate	%	5.42	8.33	7.06	7.56					
Thermal power supply	MWh	160208116.2	18465088	46209768	22483257	247366229				

Table 3-4 Operation Margin of South China Power Grid in 2005

Fuel type	unit	Provinces and city cover by South China Power Grid					Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized/%	Average Low Calorific Value MJ/t,km^3,tce	CO_2 Emissions tCO_2e
		Guangdong	Guangxi	Guizhou	Yunnan	Total				K=D×F×G×H×44/12/ 10000
		A	B	C	D	E=A+B+C +D	F	G	H	K=D×F×G×H×44/12/ 1000 (gas)
Raw Coal	10^4t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442601.85
Cleaned Coal	10^4t				0.15	0.15	25.8	100	26344	3738.21
Other washed coal	10^4t			10.39	33.88	44.27	25.8	100	8363	350237.59
Coke	10^4t	4.79			8.05	12.84	29.2	100	28435	390906.18
Coke Oven Gas	10^8m^3				0.79	0.79	12.1	100	16726	58624.07
Other Coal Gas	10^8m^3	1.87			15.96	17.83	12.1	100	5227	413485.84
Crude Oil	10^4t	10.91				10.91	20	100	41816	334555.88
Gasoline	10^4t	0.68				0.68	18.9	100	43070	20296.31
Diesel	10^4t	31.96	2.02		1.81	35.79	20.2	100	42652	1130638.84
Fuel Oil	10^4t	887.21				887.21	21.1	100	41816	28702703.26
PLG	10^4t					0	17.2	100	50179	0.00
Refinery Gas	10^4t	4.92				4.92	15.7	100	46055	130440.66
Natural Gas	10^8m^3	0.93				0.93	15.3	100	38931	203114.71
Other Petroleum Products	10^4t	1.7				1.7	20	100	38369	47833.35
Other Coking Products	10^4t					0	25.8	100	28435	0.00
Other Energy	10^4t	104.66	133.15		59.72	297.53	0	100	0	0.00
Imported from Central China Power Grid	MWh	96363000				Average emission factor of Central China Power Grid (tCO_2e/MWh)			0.772159	74407596.5
Total										369636773.25
Thermal power generated	MWh	176453000	25023000	58430000	27281000					
Station service power consumption rate	%	5.58	7.95	7.34	6.94					
Thermal power supply	MWh	166606923	23033672	54141238	25387699	269169531				

Table 3-5 CO_2 emissions of Central China Power Grid in 2003

Fuel type	Unit	Jianxi	Henan	Hubei	Hu'nan	Chong qing	Sichuan	Subtotal	Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized (%)	Average Low Calorific Value (MJ/t,km^3,tce)	CO_2 Emissions tCO_2e H=G*D*E*F*44/12/10000 (mass)
		A	B	C	D	E	F	G=A+B+C +D+E+F	H	I	J	H=G*D*E*F*44/12/1000 (gas)
Raw Coal	10^4t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100	20908	273971539.89
Cleaned Coal	10^4t							0	25.8	100	26344	0.00
Other washed coal	10^4t	2.03	39.63			106.12		147.78	25.8	100	8363	1169146.40
Coke	10^4t				1.22			1.22	29.2	100	28435	37142.18
Coke Oven Gas	10^8m^3			0.93				0.93	12.1	100	16726	69013.15
Other Coal Gas	10^8m^3							0	12.1	100	5227	0.00
Crude Oil	10^4t		0.5	0.24			1.2	1.94	20	100	41816	59490.23
Gasoline	10^4t							0	18.9	100	43070	0.00
Diesel	10^4t	0.52	2.54	0.69	1.21	0.77		5.73	20.2	100	42652	181015.94
Fuel Oil	10^4t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100	41816	157229.00
PLG	10^4t							0	17.2	100	50179	0.00
Refinery Gas	10^4t	1.76	6.53		0.66			8.95	15.7	100	46055	237285.34
Natural Gas	10^8m^3					0.04	2.2	2.24	15.3	100	38931	489222.52
Other Petroleum Products	10^4t							0	20	100	38369	0.00
Other Coking Products	10^4t							0	25.8	100	28435	0.00
Total												276371084.65

Table 3-6 CO_2 emissions of Central China Power Grid in 2004

Fuel type	Unit	Jianxi	Henan	Hubei	Hu'nan	Chong qing	Sichuan	Subtotal	Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized (%)	Average Low Calorific Value (MJ/t,km^3,tce)	CO_2 Emissions tCO_2e H=G*D*E*F*44/12/10000 (mass)
		A	B	C	D	E	F	G=A+B+C +D+E+F	H	I	J	H=G*D*E*F*44/12/1000 (gas)
Raw Coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20908	339092605.29
Cleaned Coal	10^4t		2.34					2.34	25.8	100	26344	58316.13
Other washed coal	10^4t	48.93	104.22			89.72		242.87	25.8	100	8363	1921441.23
Coke	10^4t		109.61					109.61	29.2	100	28435	3337011.41
Coke Oven Gas	10^8m^3			1.68		0.34		2.02	12.1	100	16726	149899.53
Other Coal Gas	10^8m^3					2.61		2.61	12.1	100	5227	60527.09
Crude Oil	10^4t		0.86	0.22				1.08	20	100	41816	33118.27
Gasoline	10^4t		0.06			0.01		0.07	18.9	100	43070	2089.33
Diesel	10^4t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42652	266627.32
Fuel Oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41816	464893.14
PLG	10^4t							0	17.2	100	50179	0.00
Refinery Gas	10^4t	3.52	2.27					5.79	15.7	100	46055	153506.38
Natural Gas	10^8m^3						2.27	2.27	15.3	100	38931	495774.61
Other Petroleum Products	10^4t							0	20	100	38369	0.00
Other Coking Products	10^4t							0	25.8	100	28435	0.00
Total												346035809.73

Table 3-7 CO_2 emissions of Central China Power Grid in 2005

Fuel type	Unit	Jianxi	Henan	Hubei	Hu'nan	Chong qing	Sichuan	Subtotal	Carbon Emission Factor (tC/TJ)	Fraction of Carbon Oxidized (%)	Average Low Calorific Value (MJ/t,km³,tce)	CO_2 Emissions tCO_2e H=G*D*E*F*44/12/10000 (mass)
		A	B	C	D	E	F	G=A+B+C +D+E+F	H	I	J	H=G*D*E*F*44/12/1000 (gas)
Raw Coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100	20908	352614496.76
Cleaned Coal	10^4t	0.02						0.02	25.8	100	26344	498.43
Other washed coal	10^4t		138.12			89.99		228.11	25.8	100	8363	1804669.00
Coke	10^4t		25.95		105			130.95	29.2	100	28435	3986695.05
Coke Oven Gas	10^8m^3			1.15		0.36		1.51	12.1	100	16726	112053.61
Other Coal Gas	10^8m^3		10.2			3.12		13.32	12.1	100	5227	308896.88
Crude Oil	10^4t		0.82	0.36				1.18	20	100	41816	36184.78
Gasoline	10^4t		0.02			0.02		0.04	18.9	100	43070	1193.90
Diesel	10^4t	1.3	3.03	2.39	1.39	1.38		9.49	20.2	100	42652	299797.78
Fuel Oil	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41816	286959.09
PLG	10^4t							0	17.2	100	50179	0.00
Refinery Gas	10^4t	0.71	3.41	1.76	0.78			6.66	15.7	100	46055	176572.11
Natural Gas	10^8m^3						3	3	15.3	100	38931	655208.73
Other Petroleum Products	10^4t							0	20	100	38369	0.00
Other Coking Products	10^4t				1.5			1.5	25.8	100	28435	40349.27
Total												360323575.39

Table 3-8 Total generated power and supply power of Central China Power Grid in 2003

Province's name	Total generated power	Station service power consumption rate	Total supply power	Total(MWh)
	MWh	%	MWh	
Jiangxi	31029000	6.43	29,033,835	
Henan	100975000	7.68	93,220,120	
Hubei	78307000	3.81	75,323,503	
Hu'nan	53902000	4.58	51,433,288	
Chongqing	20292000	8.97	18,471,808	
Sichuan	82782000	4.41	79,131,314	
Total(MWh)			346,613,868	346,613,868

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Table3-9 Total generated power and supply power of Central China Power Grid in 2004

Province's name	Total generated thermal power	Thermal station service power consumption rate	Total supply thermal power	Total generated hydro power	Hydro power station service power consumption rate	Total supply hydro power	Others	Total (MWh)
	MWh	%	MWh	MWh	%	MWh	MWh	
Jiangxi	30127000	7.04	28,006,059	3890000	1.2	3843320		
Henan	109352000	8.19	100,396,071	6884000	0.43	6854398.8		
Hubei	43034000	6.58	40,202,363	69512000	0.12	69428585.6		
Hu'nan	37186000	7.47	34,408,206	24236000	0.51	24112396.4		
Chongqing	16520000	11.06	14,692,888	5670000	2.09	5551497	725000	
Sichuan	34627000	9.41	31,368,599	58902000	0.39	58672282.2		
Total(MWh)			249,074,186			168,462,480	725,000	418,261,666

China Electric Power Yearbook 2005

Table 3-10 Total generated power and supply power of Central China Power Grid in 2005

Province’s name	Total generated power	Station service power consumption rate	Total supply power	Total （MWh)
	MWh	%	MWh	
Jiangxi	35000000	6.48	32,732,000	
Henan	138300000	7.32	128,176,440	
Hubei	129100000	2.51	125,859,590	
Hu’nan	64000000	5	60,800,000	
Chongqing	23620000	8.05	21,718,590	
Sichuan	101700000	4.27	97,357,410	
Total(MWh)			466,644,030	466,644,030

China Electric Power Yearbook 2006

Table 3-11 Weighted average Operation Margin emission factor of South China Power Grid

Year	$EF_{OM,simple,y}$ （tCO_2e/MWh）	GEN_y （MWh）	CO_2 emission （tCO_2e）
2003	0.952132	208,736,900	198,745,146
2004	1.061576	258,317,469	274,223,576
2005	1.011228	365,532,531	369,636,773
Total		832,586,900	842,605,495
Weighted average OM of South China Power Grid 2003-2005			1.0120

2. Calculation of *BM* emission factor

Table 3-12 $EF_{Coal,Adv}$, $EF_{Gas,Adv}$ and $EF_{Oil\ Adv}$

	parameter	Efficiency[25]	Carbon Emission factor（tC/TJ）	Oxidation Factor	Emission factor tCO_2/MWh
		A	B	C	D=3.6/A/1000×B×C×44/12
Coal-fired power plant	$EF_{Coal,Adv}$	36.53%	25.8	1	0.9323
Gas-fired power plant	EF_{GasAdv}	45.87%	15.3	1	0.4403
Oil-fired power plant	$EF_{Oil\ Adv}$	45.87%	21.1	1	0.6072

[25] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf
http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1850

Table 3-13 Calculation of λ_{Coal}, λ_{Oil} and λ_{Gas}

		Guangdong	Guangxi	Guizhou	Yunnan	Total	Calorific Value	Carbon emission factor	Oxidation factor	Emissions
Fuel type	unit	A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/100
Raw Coal	10^4t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442601.85
Clean Coal	10^4t				0.15	0.15	25.8	100	26344	3738.21
Other Washed Coal	10^4t			10.39	33.88	44.27	25.8	100	8363	350237.59
Coke	10^4t	4.79			8.05	12.84	29.2	100	28435	390906.18
Sub-total										264187483.84
Crude Oil	10^4t	10.91				10.91	20	100	41816	334555.88
Gasoline	10^4t	0.68				0.68	18.9	100	43070	20296.31
Kerosene	10^4t	31.96	2.02		1.81	35.79	20.2	100	42652	1130638.84
Diesel	10^4t	887.21				887.21	21.1	100	41816	28702703.26
Fuel Oil	10^4t	1.7				1.7	20	100	38369	47833.35
Other Petroleum Products	10^4t					0	25.8	100	28435	0.00
Sub-total										30236027.63
Natural gas	10^7m^3				0.79	0.79	12.1	100	16726	58624.07
Coke Gas	10^7m^3	1.87			15.96	17.83	12.1	100	5227	413485.84
Other Gas	10^7m^3					0	17.2	100	50179	0.00
PLG	10^4t	4.92				4.92	15.7	100	46055	130440.66
Refinery Gas	10^4t	0.93				0.93	15.3	100	38931	203114.71
Sub-total										805665.28
Total										295229176.74

Data source: China Energy Statistical Yearbook 2006

As per the above date and the related formulation in the PDD: λ_{Coal}=89.48%， λ_{Oil}=10.24%， λ_{Gas}=0.27%

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.8976$$

Table 3-14 Installed capacity of South China Power Grid in 2005

Installed capacity	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total
Thermal power	MW	35182.6	4931.2	4758.4	9634.8	54507
Hydropower	MW	9035.7	6085.3	7993.1	7233	30347.1
Nuclear power	MW	3780	0	0	0	3780
Wind power and others	MW	83.4	0	0	0	83.4
Total	MW	48081.7	11016.5	12751.5	16867.8	88717.5

Table 3-15 Installed capacity of South China Power Grid in 2004

Installed capacity	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Tianshengqiao	Total
Thermal power	MW	30172.9	4378.1	4306.9	7801.8	46659.7	30172.9
Hydropower	MW	8584.6	5040.4	7058.6	6896.5	27580.1	8584.6
Nuclear power	MW	3780.0	0	0	0	3780.0	3780.0
Wind power and others	MW	83.4	0	0	0	83.4	83.4
Total	MW	42621.0	9418.5	11365.5	14698.3	78103.3	42621.0

Table 3-16 Installed capacity of South China Power Grid in 2003

Installed capacity	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Tianshengqiao	Total
Thermal power	MW	27231.4	3190.1	3556.8	6465.8	0	40444.1
Hydropower	MW	8107.2	4525.2	6543.2	3713.7	2520	25409.3
Nuclear power	MW	3780	0	0	0	0	3780
Wind power and others	MW	83.4	0	0	0	0	83.4
Total	MW	39202	7715.3	10100	10179.5	2520	69716.8

Table 3-17 Increased installed capacity in South China Power Grid from 2003 to 2005

	2003	2004	2005	Difference between 2003 and 2005	Percentage of installed capacity (%)
	A	B	C	D=C-A	
Thermal power（MW）	40444.1	46659.7	54507	14062.9	74.01%
Hydropower（MW）	25409.3	27580.1	30347.1	4937.8	25.99%
Nuclear power（MW）	3780	3780.0	3780	0	0.00%
Wind power and others（MW）	83.4	83.4	83.4	0	0.00%
Total（MW）	69716.8	78103.3	88717.5	19000.7	100.00%
Fraction of newly increased thermal Plants (%)	78.58%	88.04%	100%		

Table 3-18 *BM* emission factor of South China Power Grid

Emission factor of thermal power （tCO_2e/MWh）	Increased percentages of thermal power %	*BM* emission factor （tCO_2e/MWh）
0.8976	74.01	0.6643

Table 3-19 Calculation of *CM* emission factor of South China Power Grid

OM（tCO_2e/MWh）	*BM* （tCO_2e/MWh）	*CM*（tCO_2e/MWh）
A	B	C=A×0.5+B×0.5
1.0120	0.6643	0.8381

Annex 4

MONITORING INFORMATION

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The monitoring information please infers to section B.7.2 and there is no additional monitoring information.