Project design document form for CDM project activities

(Version 06.0)

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	China Yongzhou Xiangqi Hydropower Project
Version number of the PDD	03
Completion date of the PDD	03/07/2015
Project participant(s)	Huaneng Hunan Xiangqi Hydropower Co., Ltd. Climate Bridge Ltd. Luso Carbon Fund
Host Party	P.R.China
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope: 1. Energy Industries (renewable -/non-renewable sources) Applied methodology: ACM0002- *Consolidated baseline methodology for grid-connected electricity generation from renewable sources* (Version 13.0.0)
Estimated amount of annual average GHG emission reductions	225,775 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The China Yongzhou Xiangqi Hydro power Project (hereinafter referred to as ‘the project), developed by Huaneng Hunan Xiangqi Hydropower Co., Ltd., involves the construction and operation of a run-of-river hydro power plant that utilizes the water resources of Xiangjiang River for power generation.

The total installed capacity of the project is 80MW by employing 4 sets of turbines and generators with installed capacity of 20MW each. The surface area of the new reservoir at full water level is 6,687,001 m2, and the power density is 12.0W/m2. All electricity generated will displace part of the electricity generated by CCPG which is dominated by fossil fuel-fired power plants, and thus achieve the goal of reducing greenhouse gas (GHG) emissions.

The project is expected to generate electricity of 318,000MWh annually and supply net electricity of 311,672MWh to the grid each year, which is equivalent to annual emissions reduction of 225,775 t CO_2e.

Prior to the implementation of the project activity, the electricity generated by the project was supplied by the CCPG, which is the same as the baseline scenario.

As a hydro power project, the proposed project will contribute to the region’s sustainable development through the following ways:

- Creating short-term and long-term job opportunities in the project area during both periods of project construction and operation.
- Displacing part of the electricity generated by coal-fired power plants, and thus improving the local environment and reducing greenhouse gas (GHG) emissions.

A.2. Location of project activity

A.2.1. Host Party

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P.R.China

A.2.2. Region/State/Province etc.

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Hunan Province

A.2.3. City/Town/Community etc.

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Yongzhou City/Qiyang County/Huangnitang town

A.2.4. Physical/Geographical location

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The project is located on the main stream of Xiangjiang River at the junction of Huangnitang Town, Qiyang County, Yongzhou City and Guiyang Town, Qidong County, Hengyang City. The project uses run-of-river technology, and the geographical coordinates of the powerhouse are 112.1596E and 26.5122N. Figure A-1 shows the location of the proposed project.

Figure A-1 Geographic location of the project

A.3. Technologies and/or measures

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The proposed project adopts run-of-river hydro power technology which utilizes the natural flow of the Xiangjiang river to generate electricity.The project mainly consists of a concrete dam, a diversion system, a powerhouse, a tailrace and a transformer station. Water from the Xiangjiang

River is first retained by the dam and then diverted through the water diversion system to the powerhouse to spin the turbines of associated generators for electricity generation. The installed capacity of the project is 80 MW, with 4 sets of 20 MW turbines and associated generators. The annual operation hour is estimated to be 3,975 hours, and the plant load factor (PLF) is therefore 45.38%. Before the nearby Meixi substation is completed, all the generated electricity will be delivered to the Baishui substation; after the Meixi substation is completed, part of the generated electricity will be delivered to the Meixi substation and the rest of the electricity will still be delivered to the Baishui substation. All electricity will then be delivered to Hunan Grid, and finally to CCPG. Table A-1 below shows the technical parameters of the project.

Table A-1 Key Technical Parameters of the project[1]

	Turbine
Quantity	4
Model	GZ-WP-600
Rated Power	20.62 MW
Rated water head	7.2m
Rotate speed	93.75r/min
Flux	316.63m^3/s

	Generator
Quantity	4
Model	SFWG20-64/6400
Rated Capacity	20 MW
Rated Voltage	10.5 kV
Rotate Speed	93.75r/min
Power factor	0.9

The electricity generated by the project should have been supplied by CCPG, prior to the project implementation, which is the same as the baseline scenario.

No technology transfer from other countries is involved in the project activity.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Huaneng Hunan Xiangqi Hydropower Co., Ltd. (The Project Owner)	No
UK	Climate Bridge Ltd.	No
Portugal	Luso Carbon Fund	No

[1] Purchase contract and Instruction-book for turbines and generators

A.5. Public funding of project activity

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The project activity does not involve public funding from Parties included in Annex I of the UNFCCC.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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The approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 13.0.0) is used for the proposed project.

In line with application of the methodology the proposed project draws on the "Tool for the demonstration and assessment of additionality" (Version 06.0.0), "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) and "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02).

For more information regarding the methodology, please refer to
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodology and standardized baseline

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According to ACM0002, the project should meet the requirements in "Applicability", and the justification is as follows:

Clauses	Requirements of the ACM0002	Scenario of the project	conclusion
1.	This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project is a greenfield CCPG-connected renewable power generation project.	Applicable
2.	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The project activity involves the installation of the power plant with a run-of -river reservoir.	Applicable
4.	In case of hydro power plants, one of the following conditions must apply: ● The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of any of reservoir; or	According to the PDR, the project will construct a dam to form a new reservoir, the surface area of the water is 6,687,001 m^2	Applicable to 4. (C)

	• The project activity is implemented in an existing single or multiple reservoir, where the volume of any of reservoir is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	when the reservoir is full, and the power density of the proposed project as calculated in A.2 is 12.0 W/m^2, which is greater than $4W/m^2$.	
5	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	Not applicable, the project only involves a single reservoir.	N/A
6	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not applicable, the project is a greenfield project without retrofits, replacements, or capacity additions.	N/A

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

Therefore, the methodology is applicable to the project activity.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions 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 scenario	For hydropower plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	The power density, as calculated in A.1 is 12.0W/m^2, larger than 10W/m^2. According to ACM0002, the project emission is 0.
		N_2O	No	Minor emission source.

The project activity will transfer the electricity generated to the CCPG, which is the project electricity system, so the spatial extent of the project boundary encompasses all power plants that physically connect to the CCPG, which includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality, according to the guideline by China DNA[2]. In addition, CCPG imported net electricity from North West China Power Grid (NWCPG) and North China Power Grid (NCPG), so the NWCPG and NCPG are the connected electricity systems, which are also included in the boundary. The flow diagram of the project boundary is shown in Figure B-1 below.

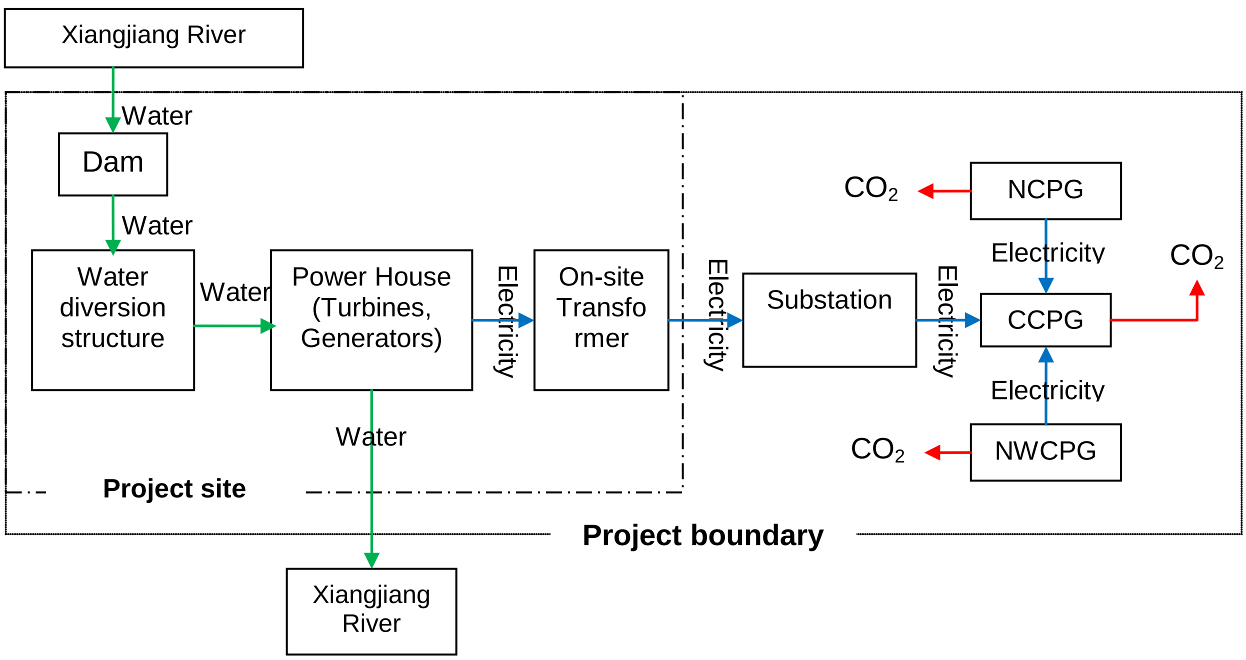

Figure B-1 Diagram of the project boundary

[2] http://cdm.ccchina.gov.cn/zyDetail.aspx?newsId=52505&TId=161

B.4. Establishment and description of baseline scenario

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As the project activity is the installation of new grid-connected hydropower plant and the electricity generated will be transmitted to the CCPG through Hunan Grid. In accordance to ACM0002, the baseline scenario of the proposed project is electricity delivered to the CCPG by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The baseline emissions are equal to power generated by the project activity delivered to CCPG, multiplied by the grid's baseline emission factor which is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the "Tool to calculate the emission factor for an electricity system". The detailed calculation for emission reductions are specified in B.6 and Annex 3.

The key parameters used for calculating baseline emissions of the project are listed in Table B.4:

Table B-1 Key parameters for calculation of baseline emission

Parameter	Value	Data Source
The operating margin (EF_{OM})	1.0297 tCO_2e/MWh	China's DNA: 2011 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
The build margin (EF_{BM})	0.4191 tCO_2e/MWh	China's DNA: 2011 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
The combined margin (EF_{CM})	0.7244 tCO_2e/MWh	China's DNA: 2011 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
Net electricity supplied to the grid ($EG_{facility,y}$)	311,672 MWh	PDR

B.5. Demonstration of additionality

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The "*Tool for the demonstration and assessment of additionalit*y" is used to demonstrate the additionality of the project activity through the following steps:

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

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

According to paragraph (4) of the "*Tool for the demonstration and assessment of additionality*" (Version 05.2.1), project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity. The following two realistic and reliable alternatives available to the proposed project are identified:

Alternative 1: The project activity not implemented as a CDM project;
Alternative 2: Provision of equivalent amount of annual power output by the CCPG where the proposed project is connected to.

Sub-step 1b. Consistency with mandatory laws and regulations:

The Chinese power sector has undergone a transformation to a market-oriented system. Therefore, investment in a power generation project is an individual power project developer's

decision, based on the project return and risk profile[3]. There are no laws compelling the project developer to develop hydroelectric plants, thus **Alternatives 1** and **2** identified are in line with all applicable laws and regulations.

The main sectoral policy relevant to this Project activity is the 'Renewable Energy Law of the People's Republic of China', which came into effect 01/01/2006, and which aims to promote renewable energy in the Host Country. This Law demonstrates the Chinese Government's commitment to the development of renewable energy as part of the overall energy development strategy, and encourages grid-connected power generation from renewable sources. Nevertheless, there are no direct incentives, such as financial grants, higher tariffs, or subsidised loans available for these types of project.

In addition, although energy efficiency and renewable energy were included in the agenda for the Host Country's 11th Five-Year Plan (2006-2010), there is no legislative requirement to meet the projections under this plan[4].

Alternative 1 and **Alternative 2** are both in compliance with Chinese relevant laws and regulations.

Step 2 Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the *"Tool for the demonstration and assessment of additionality"* there are three options available for applying the investment analysis:

Option I: Simple cost analysis;
Option II: Investment comparison analysis or
Option III: Benchmark analysis

The proposed project will adopt Option III Benchmark Analysis, because:

1. Option I is not applicable as the proposed project will generate revenue from sales of electricity in addition to CDM income;
2. Option II is not applicable as the realistic alternative of the proposed project is to supply equivalent electricity from CCPG, which is not a specific project and therefore cannot be compared with the project activity[5].

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

According to the "Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects"[6] the post-tax project IRR of electric power industry is regulated as 8 %, which is widely used as the benchmark for the similar registered projects Therefore, the proposed project selects 8% as its post-tax IRR benchmark.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

The main parameters for the calculation of financial indicators for the proposed project are summarized in below table B-2.

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[3] Source: State Council's Decision on Reforming Investment Approval Process, 16/07/2004.

[4] See: Point Carbon's CDM & JI Monitor: *Chinese official defends additionality of renewables in CDM,* 21/03/2007

[5] *Paragraph 19, Guidelines On the Assessment of Investment Analysis (Annex 13, EB61)* http://cdm.unfccc.int/Reference/Guidclarif/reg/index.html

[6] Published by the Operation Department of Power Generation and Transmission under State Power Corporation of China. 10/09/2002.

Table B-2 Main parameters for the calculation of financial indicators

Item	Unit	Value	Data Source
Installed Capacity	MW	80	PDR
Operating Hours at Full Capacity	Hours	3,975	PDR
Effective Power Factor		0.99	PDR
Internal Power Consumption	%	1	PDR
Transmission loss	%	0	PDR
Grid Emission Factor	tCO_2/MWh	0.7244	China's DNA: 2011 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
Electricity Tariff (including VAT)	CNY/kWh	0.327	PDR
Total Static Investment	CNY	1,050,089,900[7]	PDR
Operation & Maintenance Expenses for the first operation year[8]	CNY	5,944,943	PDR
Operation & Maintenance Expenses for the 2^{nd} ~30^{th} operation year	CNY	14,862,358	PDR
Value Added Tax Rate	%	17	PDR
Surcharge for Education	%	3	PDR
City Maintenance & Construction Tax	%	5	PDR
Income Tax Rate	%	25	PDR
Expected CER Price	EUR/ tCO_2e	10	Assumed market price
Expected Project lifetime	Years	33	PDR

Table B-3 below shows the project IRR with and without the income from the CDM revenues.

Table B-3 Comparison of IRR for the proposed project and the financial benchmark

Item	Without CDM Revenue	Benchmark rate (after tax)	With CDM Revenue

[7] Investment structure: construction engineering (inc. equipment and other expenses): 684.89million; investment on land expropriation and resettlement: 323.63million; investment on environment protection and water and soil conservancy: 7.95million; reserve money 33.67million. The total static investment is about 1.05billion.

[8] According to the PDR, the power generation of the first operation year is just 40% of the full load year, and the O&M cost is also 40% of the full load year.

Project IRR (after tax)	4.99%	8%	6.70%

Since the IRR of the proposed project is 4.99%, which is lower than the benchmark IRR of 8%, the proposed project is not considered as financially attractive. With the CDM revenues, however, the project IRR will be substantially improved and reach 6.70%.

Sub-step 2d: Sensitivity analysis (only applicable to Options I and III):

The sensitive analysis is conducted to check whether, under variation of ±10%, the project IRR remains below the benchmark. The four main factors affecting the financial indicators of the project are:

- Total static investment
- Electricity tariff
- Annual O&M cost
- Annual net electricity delivered to the grid

Table B-4 summarizes the results of the sensitivity analysis and Figure B-2 provides a graphic depiction of the sensitivity analysis.

Table B-4 Impact of Variations of Key Inputs on Project IRR

Variation / Parameter	-10%	-5%	0%	5%	10%
Total static investment	5.77%	5.37%	4.99%	4.60%	4.22%
Electricity tariff	4.12%	4.58%	4.99%	5.36%	5.71%
Annual O & M cost	5.12%	5.05%	4.99%	4.92%	4.85%
Annual net electricity delivered to the grid	4.13%	4.58%	4.99%	5.36%	5.71%

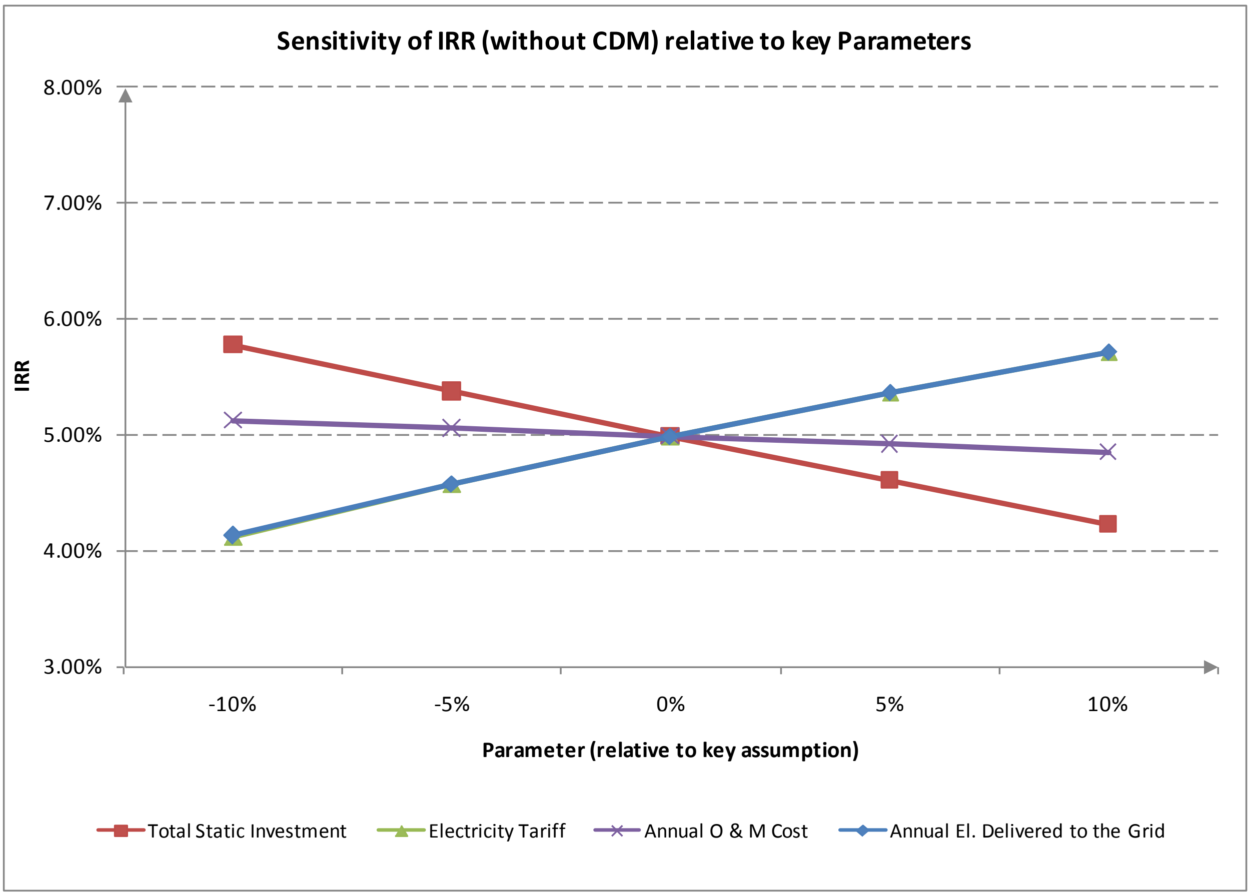

Figure B-2 Sensitivity analysis of the proposed project

Total static investment

With a decrease in the total investment by 10%, the project IRR is 5.77%, still lower than the benchmark of 8%. The IRR can exceed the benchmark rate of 8% only if investment is cut by 31.12%. Up to the commissioning of the fourth generator, the actual happened investment is about 967.58 million CNY, 92.14% of the budget estimate, which is over the critical percentage of 69%. In addition, China's PPI (Production Price Index) and CPI (Consumer Price Index) have been rising since 2009 [9], which would have directly resulted in the soaring prices of raw materials, labor, and equipment. Finally, hydropower project costs have been increasing in recent years in China. [10] Therefore, it is impossible that total static investment will be reduced by such an extent that the IRR crosses the benchmark.

Electricity tariff

The project IRR can satisfy the benchmark rate of 8% only if the tariff is increased by more than 44.38% up to 0.472CNY/kWh. When PDR was in design, tariff of 0.327 CNY/kWh was applied, which is higher than the approved tariff in Hunan province in year 2008, 0.326 CNY/kWh[11]. After the project is in full commissioning, the actual transaction tariff is 0.39 CNY/kWh (inc. VAT), which is lower than the critical tariff to reach benchamrk, so there is no possibility for a tariff rising by the 44.38% to 0.472CNY/kWh.

Annual O&M cost

The change of annual O&M cost has little impact on IRR variation as can be seen from the

[9] http://www.xinhua08.com/news/zhuanti/2011/2011_6/index.html

[10] http://www.hydrocost.org.cn/price/priceIndex.jsp

[11] Xiangjiadian[2008]158# http://www.priceonline.gov.cn/Shownews.asp?ID=119175

above figure and therefore IRR is least sensitive to this parameter. When it decreases by 10%, the IRR only rises by approximately 0.13%. The O&M cost mainly includes cost of human resources, cost of material and water sources and cost of maintenance. It can be concluded form the China Statistical Yearbook 2005~2009 that the average wage of staff and workers in Hunan has been rising, while the Purchasing Price Index in Hunan has been rising too. Therefore, a decrease in O&M cost is highly unlikely. Even when O&M cost=0, the IRR only reaches 6.18%, still below benchmark 8%.

Annual net electricity delivered to the grid

The project IRR can achieve 8% only if annual electricity delivered to the grid increases by more than 44.55%. However, this assumption will not happen as the estimated value of power generation is calculated on a strong statistical basis, namely on data derived from 46 years of water flow measurement (1961-2006) conducted by the hydrological station on Xiangjiang River. The PDR is completed by an independent third party, Hunan Hydro & Power Design Institute, so the annual operating hours of the project in the PDR are reliable. The electricity amount of transmission loss and internal consumption make up only a small proportion of total power generation and has no significant impact to feed-in power. Even when no power loss (effective power factor deemed to be 1, internal consumption deemed to be 0), the IRR only reaches 5.14%, still lower than benchmark 8%. Conclusively the expected amount of feed-in electricity is reliable and can't be significantly altered.

Based on the above analysis, the IRR still remains below the benchmark in all cases. So it can be concluded that the proposed project is not financially attractive in the absence of the CDM revenues given the variation of four parameters in a -10% ~+10% range, and then proceed to the Step 4 common practice analysis.

Step 3: Barrier analysis

Not applicable

Step 4: Common practice analysis

Guideline on Common practice (Version 02.0) is applied here for common practice analysis.

Sub-step 1: Define the applicable output range

Unit cost per output has been used as the unit cost per capacity does not reflect the widely differing operational hours of different projects in the renewable energy sectors. While fossil fired power plants can control their output and maximise the same without restrictions besides annual maintenance, allowing for a reasonable comparison of unit costs per capacity, the same is not valid for renewable energy. Hence, the different long term average operational hours must be considered in the comparison of unit costs and annual output is selected for the definition of the applicable range.

The designed annual output of the project is 318,000MWh, so the ± 50% annual output range is 159,000~477,000MWh.

Sub-step 2: Identify similar projects

The conditions to be fulfilled included:

- Applicable geographic area: Considering the size of the P.R. of China and the geographical differences (e.g. access to natural resources, climate, terrain) as well as social-economic differences (e.g. regulatory framework, infrastructure, economic development levels, economic structure, access to technology, access to financing, tariff levels) between the provinces, the applicable geographic area is Hunan province.
- Applicable energy source and goods: the proposed project uses hydraulic energy to generate electricity, so hydropower projects are defined for similar projects.

- Applicable project size: as sub-step 1, the similar projects should deliver the output of 159,000~477,000MWh electricity.
- Applicable commercial operation starting date: the start date of the proposed project activity is 12th Apr. 2010, so the similar projects should start commercial operation before that.

Based on China Water Resource Year Book of 2005~2010 (public available information issued by government departments), hydropower projects in Hunan of which the installed capacity is larger than 18.15MW[12] and of which commercial operation is before 12th Apr. 2010 (starting date of the proposed project) is listed in below Table B-5 Based on additional public available information, more information (e.g. annual output, Construction starting year, Commissioning year, CDM project or not) about the 29 projects are identified:

Table B-5 Similar projects to be assessed

Item	Project name	Installed capacity (MW)	Designed annual output (MWh)	Construction starting year	Commissioning year	CDM or Non-CDM
1	Yaotian[13]	50.0	220,000	Not available	1988	Non-CDM
2	Leizhong[14]	40.5	138,180	1999	2003	Non-CDM
3	Baiyun[15]	54.0	96,410	1992	1995	Non-CDM
4	Yanzhou[16]	31.0	154,000	1976	Not available	Non-CDM
5	Sanjiangkou[17]	62.5	242,000	1976	1989	Non-CDM
6	Chengguan[18]	26.2	96,220	1970	1974	Non-CDM
7	Chengjiangkou[19]	25.0	90,990	Not available	Not available	Non-CDM
8	Shimiantan[20]	27.9	90,400	Not available	1993	Non-CDM
9	Yongxing[21]	30.0	94,530	Not available	1994	Non-CDM
10	Damantianxing[22]	30.0	129,000	1994	1997	Non-CDM

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12 Installed capacity is available in Yearbook, but the annual output is not, so to be conservative, the lower limit of installed capacity range is defined to be 159,000MWh/8,760h=18.15MW.

13 http://baike.baidu.com/view/4606940.htm

14 http://baike.baidu.com/view/4606930.htm

15 http://baike.baidu.com/view/4076942.htm

16 http://mall.cnki.net/magazine/Article/HNSL199501001.htm

17 http://baike.baidu.com/view/3809353.htm

18 http://www.okzjj.com/cityinfo/14580535793.html

19 http://www.chinarein.com/zxqk/detail.asp?id=3423&ArticlePage=1

20 http://www.chinarein.com/ndlk/ncdqh/web/2002/docs/2002-10/2002-10-09.htm

21 http://www.people.com.cn/GB/paper49/143/13514.html

22 http://baike.baidu.com/view/3809448.htm

Item	Project name	Installed capacity (MW)	Designed annual output (MWh)	Construction starting year	Commissioning year	CDM or Non-CDM
11	Songjiazhou[23]	39.0	168,830	1994	Not available	Non-CDM
12	Yangmingshan II[24]	25.0	77,917	Not available	Not available	Non-CDM
13	Neixia II[25]	26.0	71,340	1976	1986	Non-CDM
14	Gaotan[26]	57.0	280,000	Not available	1996	Non-CDM
15	Mangtangxi[27]	60.0	267,600	1998	2000	Non-CDM
16	Chunyangtan[28]	35.2	159,000	1977	1982	Non-CDM
17	Shuangpai[29]	135.0	585,000	1958	1962	Non-CDM
18	Shuifumiao[30]	30.0	109,000	1958	1960	Non-CDM
19	Ouyanghai[31]	39.0	199,000	1966	1975	Non-CDM
20	Nanjindu[32,33]	60.0	293,000	1989	1992	Non-CDM
21	Wuqiangxi[34]	1,200.0	5,370,000	1956	1994	Non-CDM
22	Lingjintan[35]	270.0	1,215,000	1994	1998	Non-CDM
23	Wanmipo[36]	240.0	792,000	2001	2003	Non-CDM
24	Jinweizhou[37]	63.2	292,000	1994	2002	Non-CDM
25	Hongjiang[38]	270.0	970,000	1998	2003	Non-CDM

[23] http://www.hntj.gov.cn/sxfx/yzfx/200404160113.htm

[24] http://mall.cnki.net/magazine/Article/SDSJ200704001.htm

[25] http://www.yzcity.gov.cn/gtb/index.jsp?url=http%3A%2F%2Fwww.yzcity.gov.cn%2Fart%2F2006%2F9%2F13%2Fart_2668_144503.html

[26] http://www.cnki.com.cn/Article/CJFDTotal-HNSL199603006.htm

[27] http://baike.baidu.com/view/4954620.htm

[28] http://baike.baidu.com/view/4566627.htm

[29] http://baike.baidu.com/view/4542969.htm

[30] http://www.hnwr.gov.cn/tzs/sjmsdz/

[31] http://www.hnwr.gov.cn/tzs/oyhgqglj/

[32] http://baike.baidu.com/view/5509992.htm

[33] http://www.yzemap.cn/news_view.asp?newsid=91

[34] http://baike.baidu.com/view/89233.htm

[35] http://baike.baidu.com/view/1972754.htm

[36] http://baike.baidu.com/view/1972763.htm

[37] http://baike.baidu.com/view/3219457.htm

[38] http://baike.baidu.com/view/3221834.htm

Item	Project name	Installed capacity (MW)	Designed annual output (MWh)	Construction starting year	Commissioning year	CDM or Non-CDM
26	Sanbanxi[39,40]	1,000.0	2,428,000	2002	2006	Non-CDM
27	Majitang[41]	55.5	278,000	1976	1983	Non-CDM
28	Dongping[42]	72.0	291,200	2004	2007	CDM[43]
29	Zhuxikou[44]	74.0	295,200	2005	2008	CDM[45]

Assessment process and results:

- 2 registered CDM projects, Dongping and Zhuxikou projects are excluded for the further analysis.
- 17 projects whose annual output is out of the range of 159,000~477,000MWh, Leizhong, Baiyun, Yanzhou, Chengguan, Chengjiangkou, Shimiantan, Yongxing, Damantianxing, Yangmingshan II, Neixia II, Shuangpai, Shuifumiao, Wuqiangxi, Lingjintan, Wanmipo, Hongjiang and Sanbanxi are excluded for further analysis.
- 10 projects are remained for further analysis, including project Yaotian, Sanjiangkou, Songjiazhou, Gaotan, Mangtangxi, Chunyangtan, Ouyanghai, Nanjindu, Jinweizhou and Majitang.

Sub-step 3: Identify N_{all}

Based on the above analysis, only 10 projects fulfil the conditions and are included in N_{all}, therefore, N_{all}=10.

Sub-step 4: Identify N_{diff}

Different technologies are defined as those that have differing Investment climate:
The year 2002 marked a critical stage for the China power sector. Before the year 2002, the electricity tariff of each power plant was determined based on the principle of full-cost recovery according to the "Notice on Implement methods of Various Power Tariff"[46]. In other words, project developers could obtain sufficient return guaranteed by the provincial government. In the year 2002, China commenced a program of power sector restructuring. The China State Power Corporation (CSPC) was split into five regional companies and two grid companies[47]. Subsequently the national policy changed. In accordance with the "Measures for the implementation of separation of power tariff"[48], the electricity tariff was determined on the basis of average costs of power generation using the same advanced technology and built within the same period under the provincial power grids. Therefore the 10 projects identified in N_{all} are all included in N_{diff}, and N_{diff}=10.

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[39] http://baike.baidu.com/view/1226925.htm

[40] http://finance.sina.com.cn/roll/20060720/0907808999.shtml

[41] http://baike.baidu.com/view/834869.htm

[42] http://baike.baidu.com/view/4643938.htm

[43] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1188225533.57/view

[44] http://baike.baidu.com/view/4263651.htm

[45] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218469210.47/view

[46] No.101Shuidiancaizi [1987], http://www.scicpa.org.cn/html/hyfw/default.asp?id=46&vid=4795

[47] http://www.93.gov.cn/review/jnggkfsszn/rsth/1803194258614362041.shtml

[48] http://www.ccei.org.cn/show_trz.asp?ID=36417
http://qzprice.gov.cn/ZHCE-1/gjfg/2001/2001701.htm

Sub-step 5: calculate F

It can be concluded that N_{diff}=N_{all}=10, and $F = 1 - \frac{N_{diff}}{N_{all}} = 1 - \frac{10}{10} = 0 < 20\%$, and N_{all}-N_{diff}=0 < 3

Result of common practice assessment

F_{max}=0 < 20%
N_{all}-N_{diff}=0 < 3

The project is not common practice.

<u>CDM Consideration and Implementation</u>

Table B-6 below shows the timeline of the project key events which indicates when CDM was considered and how it is incorporated into the project implementation.

Table B-6 Timeline of Milestone Events in the Project Development

Time	Project implement event
03/2005	Completion of Environment Impact Assessment Report
03/06/2005	Approval of Environment Impact Assessment Report [49] by Environmental Protection Bureau of Hunan province
22/12/2008	Project approval of Development and Reform Commission of Hunan province
05/2009	Completion of Preliminary Design Report
07/09/2009	Approval of PDR
12/04/2010	Signature of construction contract (starting date of the project)
15/06/2010	Signature of turbine and generator contract
05/12/2011	Confirmation letter of the validity of EIA approval on 3rd Jun. 2005[50] issued by Environmental Protection Bureau of Hunan province
09/2012	Expected full commissioning Date

Time	CDM event achievement
18/05/2009	Board resolution with decision of CDM activity implementation based on PDR
20/10/2009	Signature of CDM consultant Agreement
20/09/2010	Notification letter for CDM consideration confirmed by EB
09/10/2010	Notification letter for CDM consideration confirmed by NDRC
10/05/2011	Signature ERPA with Climate Bridge Ltd.
09/2011	Stakeholder survey

The EIA of the project was approved in Jun 2005. Due to the poor financial situation of the project, there was no investor until 2008 when Huaneng Power International, Inc. started to

[49] According to Clause 16, Chapter 4 of Order 29 issued by National Environment Protection Bureau, the valid period of EIA approval is 5 years.

[50] The confirmation letter was required by China DNA during LoA application, and was accepted by China DNA.

assess the project and the Feasibility Study Report (FSR) was finished in May 2008 and got project approval by Development and Reform Commission of Hunan province on 22nd Dec. 2008. In Mar. 2009 Huaneng Hunan Xiangqi Hydropower Co., Ltd. was established as the project owner of the project. Due to the change of reservoir regulation model[51], Hunan Hydraulic and Hydropower Design Institute was employed to complete the PDR. The project owner was informed that there have been some registered CDM hydropower projects in Hunan and got financial support. Knowing the benefits of CDM would significantly improve the project IRR, on 18th May 2009, the board made the decision to invest the project and apply CDM for the project. After some market survey, the consultant agreement was signed in October 2009 between the project owner and Changsha WuSeShi Environmental Protection Technology Co. Ltd. 5 months later, the construction contract was signed, marking the start of the project. The project owner sent CDM prior consideration letter to UNFCCC EB and China NDRC in September 2010. After that he project owner and Climate Bridge Ltd. signed the emission reduction purchasing agreement（ERPA）on 10 th May 2011 after negotiation. The commissioning date is expected to be in Sep. 2012.

In conclusion, CDM was seriously considered by the project owner prior to the start of the proposed project.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Project Emissions (PE_y)

According to ACM0002, project emissions can be calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (1)$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The project will install two on-site diesel generators with total capacity of 600 kW (2×300kW) which will be used to generate power for operation of the gate of the dam at emergency circumstance when the project cannot generate electricity and the backup power supply is cut off simultaneously. According to ACM0002 (version 13.0.0), the use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected, therefore the project emissions from diesel consumption can be neglected and $PE_{FF,y} = 0$.
The project is not a geothermal power plant, thus $PE_{GP,y} = 0$.
Therefore, $PE_y = PE_{HP,y}$

The proposed hydropower project is a new project and results in a new reservoir, and its power density of is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (2)$$

[51] The flow to discharge flood rise from 1,280.4m^3/s to 1,400m^3/s and the backwater length rise from 51.79km to 60.8km.

Where:

PD	=	Power density of the project activity (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 hydro power 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 reservoirs, this value is zero

For the proposed project, Cap_{BL} = 0, A_{BL} = 0, Cap_{PJ} = 80MW (estimated), and A_{PJ} = 6,687,001m^2 (estimated). PD=12.0W/m^2, which is greater than 10W/m^2. Therefore, according to ACM0002, PE_y=0 tCO_2e.

Baseline Emissions (BE_y)

According to ACM0002, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, and shall be calculated as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \qquad (3)$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	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" (tCO_2/MWh)

$$EG_{PJ,y} = EG_{facility,y} \qquad (4)$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

The "combined margin" emission factor of the electricity system (CM) is calculated based on the estimation of the "operating margin" (OM) and the 'build margin' (BM), according to 'Tool to calculate the emission factor for an electricity system'. The following six steps are applied to determine OM, BM, and CM used for calculating the project baseline emissions:

Step 1: Identify the relevant electricity systems

According to the delineation of the project electricity system and connected electricity systems published by China's DNA[52], the project electricity system for the proposed project is Central China Power Grid which covers the grids of which includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality.

There is net electricity imported from the NWCPG and NCPG to the CCPG grid. The Option B) is selected among the following options to determine the OM for net electricity imported:

[52] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

0 tCO_2/MWh; or

a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 (d) of the “Tool to calculate the emission factor for an electricity system’’; or

b) The simple operating margin emission rage of the exporting grid, determined as described in step 4(a) of the “Tool to calculate the emission factor for an electricity system”, if the conditions for this method, as described in step 3 below, apply to the exporting grid; or

c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 4 (b) of the “Tool to calculate the emission factor for an electricity system”.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.
Based on China’s real situation, Option I is selected, and grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of operating margin emission factor ($EF_{grid,OM,y}$) can be based on one of four options listed as follows:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, Option (b) and Option (c) cannot be possibly used for the proposed project. For the most recent 5 years (2005-2009), the low-cost/must run resources constituted less than 50% of total power generation of CCPG and the relevant ratios are respectively were 38.60%, 35.12%, 35.46%, ,39.43% and 37.87% for 2005, 2006, 2007, 2008 and 2009. Hence, the low operating cost/must run sources is much less than 50% of the total grid generation, which complies with the defined condition of Option (a), but not Option (d). Based on these reasons, **Option (a)** is selected to calculate the Operating Margin emission factor of the proposed project.

The Simple OM emission factor can be calculated using either of the two following data vintages for year(s) y:

- **Ex ante option:** If the *ex ante* option is chosen, the emission factor is determined once at the validation stage. Thus, no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, or
- **Ex post option:** If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

This PDD uses **Ex ante Option** for $EF_{grid,simple\ OM,\ y}$ calculation to be in accordance with the baseline emissions factor calculation for regional power grids published by China DNA.

Step 4: Calculate the operation margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emission per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based 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 B can only be used if:

(a) The necessary data for option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

As the data required by option A is not available in China, and the nuclear and renewable power generation are considered as low-cost/must0run power sources and the quantity of electricity supplied to the grid by these sources is known in china, and off-grid power plants are not included in the calculation. Therefore, Option B is used for calculating project OM as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (5)$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO2 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)
$NC_{i,y}$	=	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* (tCO2/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 relevant year as per the data vintage chose in Step 3

Based on the most recent three years (2007~2009) where the data are the latest and available at the time of this PDD submission, the $EF_{grid,OM\ simple,y}$ is estimated to be 1.0297 tCO_2e/MWh. Please refer to Annex 3 for detailed calculation.

Step 5 Calculate the build margin emission factor (BM)

In terms of vintages of data, project participants can choose between one of the following two options:

Option 1 For the first crediting period, Calculate the Build Margin Emission Factor $EF_{grid\ BM\ y}$, *ex-ante* based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not

require monitoring the emission factor during the crediting period.

Option 2 For the first crediting period, the build margin emission factor shall be updated annually, *ex post,* including those units built up to the year of registration of the project activity or, if information up to year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The PDD chooses **Option 1**, which requires the project participant to calculate the Build Margin Emission Factor $EF_{grid\ BM\ y}$, *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of PDD submission.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

(d) Exclude from SETsample the power units which started to supply electricity to the grid more than10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set (SETsample-CDM) the annual electricity generation (AEGSET-sample-CDM, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. AEGSET-sample-CDM ≥ 0.2 × AEGtotal), then use the sample group SETsample-CDM to calculate the build margin. Ignore steps (e) and (f).

(e) Include in the sample group SETsample-CDM the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set (SETsample-CDM->10yrs).

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants supply electricity to the grid that comprise 20% of the annual

electricity generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the following deviations are adopted to calculate the BM[53]:

First, to calculate the newly added installed capacity and the contribution component of other various power generation technologies, then calculate of the weight of newly added installed capacity of each power generation technology, and finally, to calculate BM emission factor using the commercially optimal efficiency level of each power generation technology.

According to the "Tool to calculate the emission factor for an electricity system", the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2e/MWh) of all power units *m* during the most recent year *y* for which power generation data is available. The calculation equation is as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (6)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year *y* (tCO_2e/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available.

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can't be separated from the existing statistical data, the following measures are taken for the calculation:

First, based on the available data of the latest year, determine the ratio of CO_2 emissions from coal, oil, and gas consumption for power generation to the total CO_2 emission; Second, to calculate the emission factor of the thermal power based on the weight of CO_2 emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20% of the newly added capacity.

Sub-Step 1: Calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total CO_2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \qquad (7)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \qquad (8)$$

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[53] http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad (9)$$

Where:

$F_{i,j,y}$	=	the amount of fuel *i* (tce) consumed by plants in province *j* in year *y*
$NCV_{i,y}$	=	the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{co2,i,j,y}$	=	the CO_2 emission factor of fossil fuel type i in province *j* in year *y*

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-Step 2: Calculate the emission factor of thermal power ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (10)$$

$EF_{Coal,\ Adv}$, $EF_{Oil,\ Adv}$, $EF_{Gas,\ Adv}$ are the operating margin emission factors respectively consumed by coal-fired, oil-fired and gas-fired generation technology at the commercially optimal efficiency.

Sub-Step 3: Calculation of BM in the grid.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (11)$$

Where:

$CAP_{thermal,,y}$	=	the added installed capacity of thermal power generation sources (MW) in year *y*
$CAP_{total,\ y}$	=	the total added installed capacity of all kinds of power generation sources (MW) in year y which comprises at least 20% of the existing installed capacity
$EF_{Thermal\ ,y}$	=	the emission factor of thermal power plants in year *y*

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2010. The potential emission factors are sourced from *"2006 IPCC Guidelines for National Greenhouse Gas Inventories*" Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.

According to the latest and available data at the time of this PDD submission, $EF_{grid,\ BM,y}$ *i*s calculated to be 0.4191 tCO_2e/MWh. Please refer to Annex 3 for the details of calculation.

<u>Step 6: Calculate the combined margin emissions factor</u>

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

• The project activity is located in a Least Developed Country (LDC) or in a country with less than
10 registered projects at the starting date of validation; and

• The data requirements for the application of step 5 above cannot be met.

The PDD will choose option A.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = \omega_{OM} \times EF_{grid,OM,y} + \omega_{BM} \times EF_{grid,BM,y} \qquad (12)$$

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)
ω_{BM}	=	Weighting of build margin emissions factor (%)
ω_{OM}	=	Weighting of operating margin emissions factor (%)

As specified in “Tool to calculate the emission factor for an electricity system”, the proposed hydropower project shall use ω_{OM}=0. 5 and ω_{BM} =0.5 for the first crediting period, and ω_{OM}0.25 and ω_{BM} =0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.
So for the first crediting period, the $EF_{grid,CM,y}$= 0.75×1.0297+ 0.25×0.4191=0.7244 t CO_2/MWh

Leakage
According to the ACM0002, no leakage emissions are considered.

Emissions Reduction (ER_y)
According to the ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad (13)$$

Where:

ER_y	=	Emission reductions in year y (tCO_2/yr)
BE_y	=	Baseline emissions in year y (tCO_2/yr)
PE_y	=	Project emissions in year y (tCO_2/yr)

Based on the previous steps:
$ER_y = BE_y = EG_{facility,y} \times EF_{grid,CM,y}$

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	$FC_{i,y,}$
Unit	10^4t or 10^8m^3
Description	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*; or The amount of fossil fuel type *i* consumed in the project electricity system of province *j* in year *y.*
Source of data	*China Energy Statistical Yearbook 2008-2010*
Value(s) applied	See Annex 3 for details
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of OM and BM.
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	*China Energy Statistical Yearbook 2009.*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of OM and BM
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
Unit	t C/TJ
Description	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y*
Source of data	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Used for the calculation of OM and BM
Additional comment	-

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to the grid by all power sources in the project electricity system, not including low-cost/must-run power plants/units, in year y
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of OM.
Additional comment	-

Data / Parameter	$EF_{coal,Adv,y}$
Unit	$kgCO_2/TJ$
Description	Emission factors reflecting the efficiency level of the best coal-based power generation technology commercially available in China.
Source of data	Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.

Value(s) applied	87,300
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of *BM*
Additional comment	-

Data / Parameter	$EF_{Oil, Adv, y}$
Unit	$kgCO_2/TJ$
Description	Emission factors reflecting the efficiency level of the best oil-based power generation technology commercially available in China.
Source of data	Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value(s) applied	75,500
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of *BM*
Additional comment	-

Data / Parameter	$EF_{Gas, Adv, y}$
Unit	$kgCO_2/TJ$
Description	Emission factors reflecting the efficiency level of the best gas-based power generation technology commercially available in China.
Source of data	Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value(s) applied	54,300
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of $EF_{BM,}$
Additional comment	-

Data / Parameter	$CAP_{i, j, y}$
Unit	MW
Description	Installed capacity of power source *i* of province *j* of the CCPG in the year *y*
Source of data	*China Electric Power Yearbook 2008-2010*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	Official released data

Purpose of data	Used for the calculation of BM
Additional comment	

Data / Parameter	Cap_{BL}
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.
Source of data	Project site
Value(s) applied	0
Choice of data or Measurement methods and procedures	Based on methodology
Purpose of data	Used for the calculation of project emissions
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2
Description	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 reservoirs, this value is zero
Source of data	Project site
Value(s) applied	0
Choice of data or Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data	Used for the calculation of project emissions
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

>>
According to section B.6.1, the baseline emission factor of the CCPG ($EF_{grid, CM, y}$) is calculated as 0.7244 tCO_2e/MWh. The annual net electricity supplied to the grid is estimated to be 311,672MWh in the operation year.
Therefore, the baseline emissions can be calculated as follows:

$$\boldsymbol{BE_y} = EG_{facility,y} \times EF_{grid, CM, y} = 311{,}672 MWh \times 0.7244 tCO_2e/MWh = 225{,}775 tCO_2e$$

The annual estimated emission reductions of the project activity equal to the baseline emissions:
$\boldsymbol{ER_y} = BE_y = 225{,}775 - 0 - 0 = 225{,}775\ tCO_2e$.

Major risks and uncertainties, which can influence the estimated emission reduction, are mainly the runoff of the river.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
15/11/2012-14/11/2013	225,775	0	0	225,775
15/11/2013-14/11/2014	225,775	0	0	225,775
15/11/2014-14/11/2015	225,775	0	0	225,775
15/11/2015-14/11/2016	225,775	0	0	225,775
15/11/2016-14/11/2017	225,775	0	0	225,775
15/11/2017-14/11/2018	225,775	0	0	225,775
15/11/2018-14/11/2019	225,775	0	0	225,775
Total	1,580,425	0	0	1,580,425
Total number of crediting years	7			
Annual average over the crediting period	225,775	0	0	225,775

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{export,y}$
Unit	MWh
Description	Electricity supplied by the project activity to the grid in year *y*
Source of data	Data for ex ante calculation is obtained from the PDR. Actual data will be obtained from on-site measurement.
Value(s) applied	311,672
Measurement methods and procedures	The parameter will be continuously measured and recorded on a monthly basis.
Monitoring frequency	Continuously measured and monthly recorded.
QA/QC procedures	Meters will be calibrated yearly based on the relevant national and industrial standards. Cross check measurement results with records for sold electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{import, y}$
Unit	MWh
Description	Electricity imported from the grid by the proposed project in year *y*
Source of data	Data for ex ante calculation is assumed as zero. Actual data will be obtained from on-site measurement.

Value(s) applied	0
Measurement methods and procedures	The parameter will be continuously measured and recorded on a monthly basis.
Monitoring frequency	Continuously measured and monthly recorded.
QA/QC procedures	Meters will be calibrated yearly based on the relevant national and industrial standards. Cross check measurement results with records for purchased electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{Emergency,import,\ y}$
Unit	MWh
Description	Electricity imported from the grid by the 10kV backup line in year *y*
Source of data	Data for ex ante calculation is assumed as zero. Actual data will be obtained from substation measurement.
Value(s) applied	0
Measurement methods and procedures	The parameter will be continuously measured and recorded on a monthly basis.
Monitoring frequency	Continuously measured and monthly recorded.
QA/QC procedures	Meters will be calibrated yearly based on the relevant national and industrial standards. Cross check measurement results with records for purchased electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{facility,y}$
Unit	MWh
Description	Net Electricity delivered to the grid by the proposed project
Source of data	It shall be determined as a difference between quantity of electricity supplied by the project plant to the grid and quantity of electricity delivered to the project plant from the grid.
Value(s) applied	311,672
Measurement methods and procedures	The parameter will be calculated and recorded for the purpose of project verification.
Monitoring frequency	Continuously measured and monthly recorded.
QA/QC procedures	The calculation will be conducted by the internal CDM verifier at the project site. Cross check measurement results with records for sold and purchased electricity.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	Cap_{PJ}
Unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site

Value(s) applied	80
Measurement methods and procedures	The nameplates of the generators will be checked on site
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

Data / Parameter	A_{PJ}
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
Value(s) applied	6,687,001
Measurement methods and procedures	The surface area will be measured on site by a certified organisation
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

B.7.2. Sampling plan

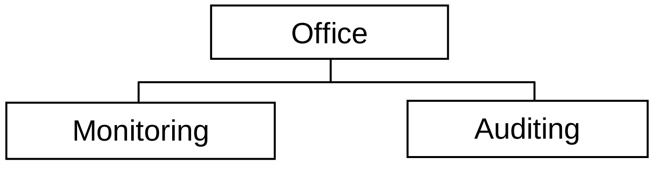
>>
N/A.

B.7.3. Other elements of monitoring plan

>>
An overall monitoring plan will be applied in order to guarantee the actual long-term measurement of GHG emission reductions of the proposed project and to have complete and reliable emission reductions calculation. The details of the monitoring plan are summarized as follows:

1. Operation and management structure of monitoring

In order to obtain reliable monitoring data, the project developer will establish a monitoring management structure. Clear responsibilities will be assigned to all staff involved in the CDM project. A CDM manager will be appointed who has the overall responsibilities for the monitoring of the project. The measurement of the electricity exports and imports will be carried out by a few monitoring officers. In addition, the project developer will designate internal verifiers who will be responsible for internal verification of the measurement, collection of electricity sales and purchase records and the calculation of the emission reductions.



FigureB-3 Operations and Management Structure of the proposed project

2. Monitoring equipment and installation

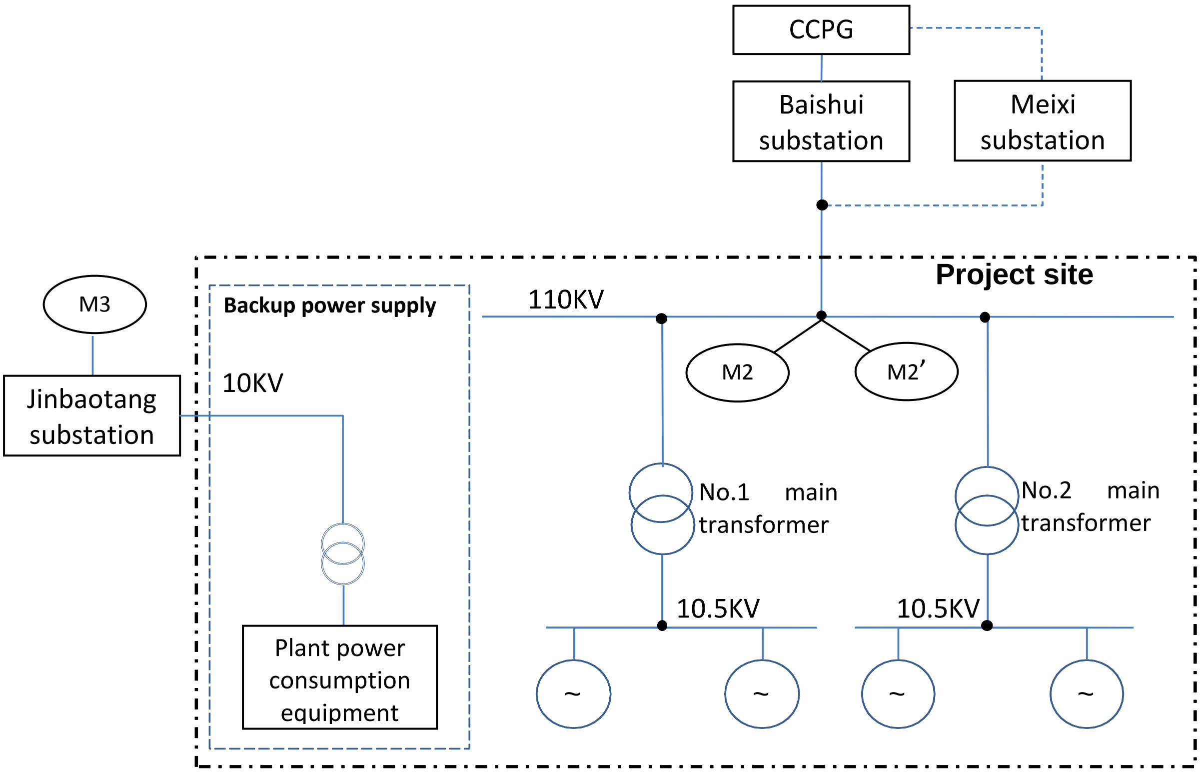
The data requires monitoring for the project is the amount of electricity exported to the grid and the amount of electricity imported from the grid (refer to Section B.7.1). The electricity generated by four generators will be connected to the two on-site transformers which will increase the voltage and then be delivered to the nearby substations:

- Before the nearby Meixi substation is completed, all the generated electricity will be delivered to the Baishui substation.
- After the Meixi substation is completed, part of the generated electricity will be delivered to the Meixi substation and the rest electricity will still be delivered to the Baishui substation.

All electricity will finally be delivered to Hunan Grid, and to CCPG.

The metering systems include M_2, M_2'and M_3 (in Figure B-4), of which M_2, M_2' will both be installed at the project site and M_3 will be installed at the substation. \M_2 is the main meters, which is installed at the higher voltage side of both of the two main transformers based on Power Purchase Agreement and used as the measuring meters, and M_2' is the backup meters. M_2 and M_2' are both bi-directional meters which will measure the amount of electricity supplied to the grid and the amount of electricity imported from the grid. M_2' will be used for measurement when M_2 is in malfunction. Net electricity delivered to the grid of M_2 (M_2') minus the electricity imported from the grid through M3 is the total net electricity delivered to the grid of the project. M_3 is used to measure the electricity imported from the 10kV backup power supply grid for emergencies.

All meters should be installed in accordance with the national standard 'electricity meter installation technical management code' (DL/T448-2000). The accuracy of the meters for active electricity will be no less than 0.5.



FigureB-4 Diagram of grid connection

3. Data collection and management

The project owner and the local power grid company will read and check the meters and record the data on a regular basis. The monitored data will be archived electronically each month. The project owner also needs to keep and back up the original and backup copies of electricity sales and purchase records provided by the power grid company periodically for cross check.

All written documents such as diagrams, reports should be stored and available to the verifier so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

4. Quality assurance and quality control

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to the relevant national and industrial regulations. The meters should be annually calibrated in accordance with the relevant national and industrial regulations by an independent qualified calibration entity. Data and records will be checked prior to being recorded and archived, and possible errors would be identified in this step. In case the main meter operates abnormally, the readings from the back up meter will be adopted. If both main and back-up meters are out of work, the data monitored within this certain period shall not be counted.

The surface area of the reservoir is measured in the surface of the water (A_{PJ}) after the implementation of the project activity and when the reservoir is full, to be measured regularly in m^2 by a qualified third entity.

Training on CDM monitoring will be provided to the relevant staff to guarantee the implementation of the monitoring plan.

5. Monitoring results and verification

The verification of the monitoring results of the project activity is required for each crediting period. The monitoring results will be complied in a monitoring report that will be served as a basis for project verification in each crediting year.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

The baseline study and monitoring methodology of the proposed project was completed on 03/07/2015.

Contact person: Shanfeng Huang
Entity: Climate Bridge Ltd
Address: Suite 19D, Sanhe Centre, 121 Yanping Road, Jing’an District, Shanghai, China
Tel: +86 21 6246 2036
Fax: +86 21 2301 9950
Cell: +86 1362 1631 413
E-mail: huang.shanfeng@climatebridge.com

The entity responsible for completing the CDM-MR-FORM is one of the project participants listed in Appendix 1.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
12/04/2010 (signature of Construction Contract)

C.1.2. Expected operational lifetime of project activity

>>
30 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewable.

C.2.2. Start date of crediting period

>>
15/11/2012 or the date of effective registration of CDM project activity whichever is later.

C.2.3. Length of crediting period

7 years for the first renewable crediting period.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The project owner retained a third party, Hunan Hydro & Power Institute, to conduct the Environmental Impact Assessment (EIA) on the Project. The EIA report was completed in March 2005 and was approved by Hunan Province Environmental Protection Bureau (EPB) on 3rd June 2005[54]. A summary of the main findings of the EIA is provided as follows:

1. Waste water

Wastewater in the construction period mainly consists of industrial wastewater and domestic wastewater. Industrial wastewater is mainly produced in the machine and material treatment such as sandstone rinsing and concrete mixing. Wastewater mainly containing sandstone or other materials with high levels of acidity is not allowed to be discharged directly in to the river. Oily wastewater from machinery is treated in the oil removal tank. Wastewater containing sandstone will be treated in the sedimentation tank for recycling. The domestic waste water will be used for irrigation after being processed in the latrines. Therefore, there is no adverse effect on the surrounding environment.

Some domestic wastewater will be produced during the operation period, which will be piped to the cesspool for settlement and degradation. Then comprehensive wastewater disposal equipment, combining settlement, aerobic processes, disinfection, etc., will treat wastewater in order to meet the relevant discharge standards before discharging.

2. Noise pollution

[54] Refer to “xianghuanping [2005] No. 51”

Noise is mainly from the activities of excavation, drilling, dynamiting and transport vehicles. Since the construction site is far away from the residential areas, the impact on the local population is limited. Appropriate measures should be taken to mitigate the noise impacts and protect the onsite workers. 1. Set up construction equipments as far as possible from people activities and apply noise isolation room for them. 2. Choose low noise equipments that meet national environmental protection standard. 3. Provide noise proof measures to protect the construction workers. 4. Adopt rotating shifts and ensure work hours not exceed eight hours. 5. Avoid exploration and control traffic flow at night. After applying these measures, the negative effects can be reduced to a minimal level.

3. Air pollution

Air contamination mainly comes from rock excavation, and transportation of construction materials, the major pollutants of which are TSP, SO_2 and NO_2. The following measures will be applied to prevent and control air pollution: 1. Construction materials should be covered with clothes during transportation.2. Dust removal equipments will be employed. 3. Road sprinklers will water several times at the construction site. 4. Provide dust–proof masks to the construction workers. Therefore the pollution to the atmosphere will not be serious.

4. Solid waste

Waste slag and residential waste will be generated during the construction period. A slag yard will be constructed at the upstream, where waste slag will be transported for land filling and road construction. Residential waste will also be periodically collected and transported to the yards for land filling. The slag yard is required to be earthed and vegetated after the construction. In this way the negative impact of slag is not serious.

5. Ecological environment

The reservoir impoundment will lead to water reduction in the downstream, but a certain amount of ecological flow (77.9m^3/s) will be ensured in order to minimize adverse impacts on aquatic organisms. After such a measure is taken, the impact is not significant.

6. Water and soil loss

Water and solid loss will come along with the construction of the project because of excavation and solid waste dumping. A water and soil conservation programme will be carried out by the project developer. Engineering and planting prevention will conducted in the affected places right after the completion of the construction work. As a result, it is anticipated that the water and soil condition in the surrounding area will not be damaged.

7. Land occupation

The reservoir inundation has impacts on ten towns in Qiyang County and Qidong County. In order to guarantee their living standard equal to or better than the previous situation, the affected residents will be compensated in accordance to “PRC Law on Land Management” and “Resettlement of Migrants for large and Medium Water Conservation and Power Construction Project”.

8. Immigration

The project involves 1,251 resettled people and 1,784 affected people[55] . The project owner will carry out the related compensation program according to the < Approval of Migration Resettlement Planning Report for the Xiangqi Project [Doc. No. xiangyihan [2009] 154#]>.

In conclusion, as a clean renewable energy project, the project will not have significant negative impact on the local environment during the construction and operation.

D.2. Environmental impact assessment

>>

The project conforms to the host country's environmental impact assessment requirements and has been approved by environmental protection departments of the host country. The implementation of the project has no significant environmental impacts.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The stakeholders of the project, including several resettled people, the local authorities and the workers of the project, were invited to the stakeholder consultation. To collect stakeholders' comments on the project, the survey plan and the questionnaire were designed. The questionnaires were then distributed to the local village committees. The notice to call on the participants were published a week before the survey, and the survey was conducted on the 11th and~ 16th of September. 2011. After briefly introducing the project, questionnaires were distributed to the participants. During the survey, the participants raised questions not involved in the questionnaire and project owner gave detailed explanation, which was recorded in the survey summary. The characters of the participants are as follows:

Table E-1 characters of participants

Item		Number	Percentage
Total Collected Questionnaires		150	100%
Gender	Male	106	70.7%
	Female	44	29.3%
Age	<30	28	18.7%
	30~50	68	45.3%
	> 50	54	36.0%
Nationality	Han	150	100.0%
	Minority	0	0.0%
	Indigenous people	0	0.0%
Educational background	Junior and below	80	53.3%
	High school	48	32.0%
	College and above	22	14.7%
Living address	Huangnitang Town	70	46.7%
	Guiyang Town	4	2.7%
	Panshi Town	28	18.7%
	Jinbaotang Town	6	4.0%
	Baishui Town	18	12.0%
	Others	24	16.0%
Survey object	Civil servants of authorities	8	5.3%
	Workers of the project	16	10.7%
	Resettled household	64	42.7%
	Affected people	62	41.3%

It can be concluded from the above table that all type of identified stakeholders were involved in the survey. There are no minority groups in the project boundary, so all the participants were of Han Nationality.

E.2. Summary of comments received

>>

150 copies of questionnaires were handed out with 150 received, so the response rate is 100%. The data from the questionnaires was processed and analyzed and the result is as follows:

Table E-2 Summary of stakeholders' comments

No.	Questions	Attitude or Opinion	Amount	Percentage
1	To reduce the gap between power demand and supply, do you agree the project is the best option?	Agree	143	95.3%
		Don't agree	0	0.0%
		Not sure	7	4.7%
2	What do you think the project will affect the water usage of the local residents?	No impact	138	92.0%
		Minor impact	12	8.0%
		Major impact	0	0.0%
3	What do you think the project will affect the local vegetation?	No impact	10	6.7%
		Minor impact	133	88.7%
		Major impact	7	4.7%
4	What do you think the project will affect the local wild animals?	No impact	35	23.3%
		Minor impact	106	70.7%
		Major impact	9	6.0%
5	What do you think the project will affect the flow regime of the river?	No impact	44	29.3%
		Minor impact	102	68.0%
		Major impact	4	2.7%
6	What do you think the project will affect the local power supply?	Positive	150	100.0%
		Negative	0	0.0%
		Not sure	0	0.0%
7	What do you think the project will affect the local transportation?	Positive	150	100.0%
		Negative	0	0.0%
		Not sure	0	0.0%
8	What do you think the project will affect the local irrigation?	Positive	144	96.0%
		Negative	0	0.0%
		Not sure	6	4.0%
9	What do you think the project will affect the local flood control?	Positive	150	100.0%
		Negative	0	0.0%
		Not sure	0	0.0%
10	What do you think the project will affect the local employment?	Positive	146	97.3%
		Negative	0	0.0%
		Not sure	4	2.7%
11	Is the migration resettlement and compensation process made fair and transparent?	Yes	148	98.7%
		No	0	0.0%
		Not sure	2	1.3%
12	What do you think the project will affect the local economy development?	Positive	150	100.0%
		Negative	0	0.0%
		Not sure	0	0.0%
13	What's your comprehensive attitude about the project?	Supportive	150	100.0%
		Objective	0	0.0%
		Not sure	0	0.0%

The results indicate that 95.3% of the participants agree that the project is the best option to reduce the gap between local power demand and supply, 100% of them think the project will cause no major impact on the water usage of the local residents, most of the them think the project will cause minor impact on the environment and the economic and social impact is positive. All the resettled people agree that the migration resettlement and compensation process was fair and transparent. All the participants are supportive of the project.

During the survey, there were some interaction between the local stakeholders and the PO, which are mainly:

- About transportation:
  Do they have to pay to pass the bridge and the navigation channel?
- About irrigation:
  Do they have to pay for the water usage for irrigation?
- About flood:
  What will the project contribute to the flood control?
- About employment:
  What priority will the project give to the local residents in hiring?
- About environment protection:
  What will be done for the environment protection?
- About the resettlement and compensation of the immigrants:
  How much will they get paid?
- About the appeal procedure:

How can the immigrants raise complaints?

E.3. Report on consideration of comments received

>>

- About transportation:
  One of the purposes of the project is navigation, and the capacity of channel is designed to be 1,000 tonnages. The road on top of the dam and from the dam to the Guiyang Town is constructed. According to the Statement of the Local Marine Bureau, after the complete of the project, all the pass of navigation, bridge and road constructed by the project is free. And the bridge may have some influence on the residents whose income depends on the ferry-boat was compensated.
- About irrigation:
  The contract of free water intake for irrigation has been signed between the project owner and the local government. Although the water intake for irrigation will reduce the power generation, project owner thinks they, as a stated owned company, are obligated to take the social responsibility.
- About flood:
  Flood control was considered during design of the project. The Emergency Response Plan was designed according to the Guideline on Emergency Response Plan for Safety Management of Reservoir and Dam, and the project has passed the Evaluation and Acceptance of the Safety of the Dam.
- About employment:
  During the construction period, employment opportunities are offered to the local residents. During the operation period, the local residents are hired for the logistics service. The local residents will benefit from the improved transportation, fishing and the local economy environment,
- About environment protection:
  The project has independent environmental protection investment, such as the water and soil conservation solution, dust pollution and noise pollution control, the ecological flow for the downstream and the slag treatment. These activities will be acceptance checked by the relevant department.
- About the resettlement and compensation of the immigrants:
  The consultation with affected groups was involved during the whole compensation process.
  - Measurement

  The occupied and submerged land has been measured jointly by the project owner, governmental officers and villager representatives. The measurement result has been approved by each of the involved household and the village committees, and been bulletined at each village for comments. After recheck, the occupied and submerged land is determined.
  - Compensation standard

  The compensation standard is in line with national and provincial regulations and has been approved by the Provincial Migration Management Bureau.
  - Compensation agreement

The compensation agreements have been signed between the project owner and the local government.

- Payment and acceptance check

The project owner has paid the local government, who paid the involved stakeholder. The people or community who get the payment signed or fingerprinted or seal for agreement. The activities involved in 74.5 m migration have been acceptance checked by the Migration Bureau.

- About the appeal procedure:

If the immigrants raise complaints about the migration issues, they can appeal to the local village committee or the local migration bureau, which will coordinate to solve the problem. If the immigrants are not satisfied with the result, they can appeal to the courthouse directly. By far, no negative comments have been received.

SECTION F. Approval and authorization

>>

The letter(s) of approval from Party(ies) for the project activity is available on the following website: https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1352706366.92/view

- - - - -

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Huaneng Hunan Xiangqi Hydropower Co., Ltd.
Street/P.O. Box	Xizhong Road, Wuxi Town, Qiyang County
Building	Renwubu Building
City	Yongzhou City
State/Region	Hunan province
Postcode	426100
Country	Peoples' Republic of China
Telephone	0746-3862446
Fax	0746-3257872
E-mail	hn_chenxin@163.com
Website	-
Contact person	Zhang Jianlin
Title	Director
Salutation	Mr
Last name	Zhang
Middle name	-
First name	Jianlin
Department	-
Mobile	+86 152 7460 9998
Direct fax	0746-3257872
Direct tel.	0746-3862446
Personal e-mail	hn_chenxin@163.com

Project participant and/or responsible person/ entity	☒ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Climate Bridge Ltd.
Street/P.O. Box	Buckingham Palace Road
Building	Level 2, 91-93 Buckingham Palace Road
City	London
State/Region	London
Postcode	SW1W 0RP
Country	United Kingdom of Great Britain and Northern Ireland
Telephone	+44 207 828 4332
Fax	+44 207 100 9963
E-mail	paul.berdugo@climatebridge.com
Website	www.climatebridge.com
Contact person	Paul Berdugo
Title	Director
Salutation	Mr.
Last name	Berdugo
Middle name	
First name	Paul
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	paul.berdugo@climatebridge.com

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Luso Carbon Fund
Street/P.O. Box	Rua Tierno Galvan
Building	Torre 3 10th Floor, Amoreiras
City	Lisbon
State/Region	Lisbon
Postcode	1070-274
Country	Portugal
Telephone	+351 213 806 510
Fax	+351 213 806 519
E-mail	lsouto@mco2.pt
Website	www.lusocarbonfund.com
Contact person	Luis Souto
Title	Head of Carbon Investments
Salutation	Mr.
Last name	Souto
Middle name	
First name	Luis
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	lsouto@mco2.pt

Appendix 2. Affirmation regarding public funding

N/A.

Appendix 3. Applicability of methodology and standardized baseline

N/A.

Appendix 4. Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

The baseline information for calculation of *OM*, *BM* and *CM* emission factors of Central China Power Grid is shown in the Report on 2011Baseline Emission Factors for Regional Power Grids by China DNA at http://cdm.ccchina.gov.cn released on 20[nd] Oct. 2011. The concrete processes are shown in the following tables.

Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table1 below.

Table 1 Low calorific values, CO_2 emission factor and oxidation factor of fuels

Fuel type	Default Carbon Content	OXID	IPCC CO_2 Emission Factor (the Lower Limits of the 95% Confidence Intervals)	Low Calorific Value
	（tc/TJ）	（%）		（MJ/t,km^3）
	H	I	($kgCO_2$/TJ)	
Raw Coal	25.8	100	87,300	20908
Cleaned Coal	25.8	100	87,300	26344
Other Washed Coal	25.8	100	87,300	8363
Briquette	26.6	100	87,300	20908
Coke	29.2	100	95,700	28435
Coke Oven Gas	12.1	100	37,300	16726
Other Gas	12.1	100	37,300	5227
Crude Oil	20	100	71,100	41816
Gasoline	18.9	100	67,500	43070
Diesel Oil	20.2	100	72,600	42652
Fuel Oil	21.1	100	75,500	41816
LPG	17.2	100	61,600	50179
Refinery Gas	15.7	100	48,200	46055
Natural Gas	15.3	100	54,300	38931
Other Petroleum Products	20	100	72,200	41816
Other Coke Oven Products	25.8	100	95,700	28435
Other Energies	0	0	0	0

Data Source：The emission factors and oxidation factors are form *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.3,1.4, page 1.21-1.24, chapter 1Volume 2 Energy*. The net calorific values are quoted from *China Energy Statistical Yearbook 2009*

1. Calculation of Simple *OM* Emission Factor of CCPG for Year 2007

Table 2 CO_2 Emission Data of Data of CCPG in Year 2007

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Effective CO_2 EF	OXID	CO_2 emission factor of fossil fuel	Average Low Calorific Value	CO_2 emission （tCO_2e）
									（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,m^3）	L=G*J*K/100000 (for mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G*J*K/10000 (for volume unit)
Raw Coal	10^4t	2200.57	9357	3479.81	2683.81	1547.7	3239	**22507.89**	25.8	100	87,300	20,908	410,829,404
Cleaned Coal	10^4t		3.07			3.8		**6.87**	25.8	100	87,300	26,344	157,998
Other Washed Coal	10^4t	0.04	87.16		2.06	96.42		**185.68**	25.8	100	87,300	8,363	1,355,631
Briquette	10^4t						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke	10^4t							**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^8m^3	0.08	2.61	0.25	0.31	0.91		**4.16**	12.1	100	37,300	16,726	259,534
Other Gas	10^8m^3	29.17	25.79		24.69		23.98	**103.63**	12.1	100	37,300	5,227	2,020,444
Crude Oil	10^4t		0.43					**0.43**	20	100	71,100	41,816	12,784
Gasoline	10^4t				0.04	0.01		**0.05**	18.9	100	67,500	43,070	1,454
Diesel Oil	10^4t	0.98	3.21	2.51	2.83	1.93		**11.46**	20.2	100	72,600	42,652	354,863
Fuel Oil	10^4t	0.42	1.25	1.33	0.63	0.64	1.74	**6.01**	21.1	100	75,500	41,816	189,742
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	1.43	10.01	0.97	0.7			**13.11**	15.7	100	48,200	46,055	291,022
Natural Gas	10^8m^3		0.12	0.18		0.2	1.87	**2.37**	15.3	100	54,300	38,931	501,007
Other Petroleum Products	10^4t							**0**	20	100	72,200	41,816	0

Other Coke Oven Products	10^4t							**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	23.43	63.65	35.95	29.46	23.21		**175.7**	0	0	0	0	0
												Subtotal	415,974,066
Data source: China Energy Statistical Yearbook 2008													

Table 3 CCPG Fuel-fired Electricity Generation and *OM* EF in Year 2007

Province	Total generation (10^8 kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)		
Jiangxi	421	42,100,000	7.72	38,849,880		
Henan	1773	177,300,000	7.55	163,913,850		
Hubei	609	60,900,000	6.69	56,825,790	Electricity CCPG imported from NWCPG MWh	3,005,400
Hunan	542	54,200,000	7.18	50,308,440	Simple OM in NWCPG in 2007	1.01129
Chongqing	288	28,800,000	9.2	26,150,400	Total Emissions tCO_2	419,013,395
Sichuan	451	45,100,000	8.68	41,185,320	Total Power Supply MWh	380,239,080
Total				377,233,680	EF	1.10197

Data source: China Electric Power Yearbook 2008

2. Calculation of Simple OM Emission Factor of the CCPG for Year 2008

Table 4 CO_2 Emission Data of Data of CCPG in Year 2008

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Effective CO_2 EF	OXID	CO_2 emission factor of fossil fuel	Average Low Calorific Value	CO_2 emission（tCO_2e）
									（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,m^3）	L=G*J*K/100000 (for mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G*J*K/10000 (for volume unit)
Raw Coal	10^4t	2137.08	9480.74	2852.29	2620.44	1421.42	2727.61	**21239.58**	25.8	100	87,300	20,908	387,679,342

Cleaned Coal	10^4t		1.68			3.27		**4.95**	25.8	100	87,300	26,344	113,842
Other Washed Coal	10^4t	0.04	80.54		2.06	101.75		**184.39**	25.8	100	87,300	8,363	1,346,213
Briquette	10^4t				6.12		0.01	**6.13**	26.6	100	87,300	20,908	111,889
Coke	10^4t		0.78		0.92			**1.7**	29.2	100	95,700	28,435	46,261
Coke Oven Gas	10^8m^3	0.1	4.19	0.37	0.24	6.66	0.01	**11.57**	12.1	100	37,300	16,726	721,829
Other Gas	10^8m^3	23.67	41.36		3.31	0.37	0.01	**68.72**	12.1	100	37,300	5,227	1,339,814
Crude Oil	10^4t		0.17					**0.17**	20	100	71,100	41,816	5,054
Gasoline	10^4t							**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4t	0.88	7.02	2.82	3.41	1.59		**15.72**	20.2	100	72,600	42,652	486,775
Fuel Oil	10^4t	0.07	1.45		1.29		3.14	**5.95**	21.1	100	75,500	41,816	187,848
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	0.21	3.91	2.78	0.71		0.01	**7.62**	15.7	100	48,200	46,055	169,153
Natural Gas	10^8m^3		4.02	0.16		0.05	12.92	**17.15**	15.3	100	54,300	38,931	3,625,430
Other Petroleum Products	10^4t			0.59				**0.59**	20	100	72,200	41,816	17,813
Other Coke Oven Products	10^4t						0.01	**0.01**	25.8	100	95,700	28,435	272
Other Energies	10^4tCe	18.16	68.11	62.35	11.42	64.87		**224.91**	0	0	0	0	0
												Subtotal	395,851,534
Data source: China Energy Statistical Yearbook 2009													

Table 5 CCPG Fuel-fired Electricity Generation and *OM* EF in Year 2008

Province	**Total generation (10^8 kWh)**	**Total generation (MWh)**	**Self-consumption electricity (%)**	**Total supply (MWh)**		
Jiangxi	405	40,500,000	6.5	37,867,500	Electricity CCPG imported from NWCPG MWh	3,144,070
Henan	1890	189,000,000	7.22	175,354,200	Simple OM in NWCPG in 2008	0.98254

Hubei	553	55,300,000	6.62	51,639,140	Electricity CCPG imported from NCPG MWh	33,200
Hunan	537	53,700,000	6.46	50,230,980	Simple OM in NCPG in 2008	1.00495
Chongqing	286	28,600,000		28,600,000	Total Emissions tCO_2	398,974,078
Sichuan	401	40,100,000	10.21	36,005,790	Total Power Supply MWh	382,874,880
Total				379,697,610	EF	1.04205

Data source: China Electric Power Yearbook 2009

3. Calculation of Simple OM Emission Factor of the CCPG for Year 2009

Table 6 CO_2 Emission Data of Data of CCPG in Year 2009

Fuel type	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Sub-total**	**Effective CO_2 EF**	**OXID**	**CO_2 emission factor of fossil fuel**	**Average Low Calorific Value**	**CO_2 emission （tCO_2e）**
									（tc/TJ）	**（%）**	**($kgCO_2$/TJ)**	**（MJ/t,m^3）**	**L=G*J*K/100000 (for mass unit)**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	**K**	**L=G*J*K/10000 (for volume unit)**
Raw Coal	10^4t	2184.31	9339.64	2888.29	2810.69	1413.64	2817.31	**21453.88**	25.8	100	87,300	20,908	391,590,892
Cleaned Coal	10^4t		3.35					**3.35**	25.8	100	87,300	26,344	77,044
Other Washed Coal	10^4t		59.93			136.75	97.94	**294.62**	25.8	100	87,300	8,363	2,150,991
Briquette	10^4t				2.63			**2.63**	26.6	100	87,300	20,908	48,005
Coke	10^4t		1.08	0.06	0.09			**1.23**	29.2	100	95,700	28,435	33,471
Coke Oven Gas	10^8m^3	0.09	6.04	1.2		1.03		**8.36**	12.1	100	37,300	16,726	521,564
Other Gas	10^8m^3	30.76	56.64		4.23	7.57		**99.2**	12.1	100	37,300	5,227	1,934,074
Crude Oil	10^4t		0.1					**0.1**	20	100	71,100	41,816	2,973
Gasoline	10^4t							**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4t	0.69	4.28	1.23	1.55	1.19		**8.94**	20.2	100	72,600	42,652	276,830
Fuel Oil	10^4t	0.02	1.44	0.48	1.27	0.06	4	**7.27**	21.1	100	75,500	41,816	229,522

LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t	0.25	2.18	0.82	1.91			**5.16**	15.7	100	48,200	46,055	114,544
Natural Gas	10^8m^3		7.69	0.27		0.14	21.84	**29.94**	15.3	100	54,300	38,931	6,329,176
Other Petroleum Products	10^4t			0.29				**0.29**	20	100	72,200	41,816	8,755
Other Coke Oven Products	10^4t							**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	12.47	76.3	26.69	14.96	84.8		**215.22**	0	0	0	0	0
												Subtotal	403,317,841
Data source: China Energy Statistical Yearbook 2010													

Table 7 CCPG Fuel-fired Electricity Generation and *OM* EF in Year 2009

Province	**Total generation (10^8 kWh)**	**Total generation (MWh)**	**Self-consumption electricity (%)**	**Total supply (MWh)**		
Jiangxi	445	44,500,000	5.8	41,919,000	Electricity CCPG imported from NWCPG MWh	3,262,010
Henan	1985	198,500,000	6.62	185,359,300	Simple OM in NWPG in 2009	1.00759
Hubei	630	63,000,000	6.21	59,087,700	Electricity CCPG imported from NCPG MWh	2,233,290
Hunan	634	63,400,000	6.39	59,348,740	Simple OM in NCPG in 2009	0.96418
Chongqing	306	30,600,000		30,600,000	Total Emissions tCO_2	408,757,899
Sichuan	504	50,400,000	7.92	46,408,320	Total Power Supply MWh	428,218,360
Total				422,723,060	EF	0.95455

Data source: China Electric Power Yearbook20010

4. Calculation of Simple OM Emission Factor of the CCPG

Table 8 Calculation of Simple *OM* Emission Factor of CCPG

	Total Power Supply (MWh)	**CO_2 emission (tCO_2)**	***OM* Emission Factor (tCO_2/MWh)**
2007	380,239,080	419,013,395	1.10197

2008	382,874,880	398,974,078	1.04205
2009	428,218,360	408,757,899	0.95455
The weighted average *OM* Emission Factor (tCO_2/MWh**)**			**1.02973**

The Operating Margin (*OM*) emission factor is the weighted average emission factors of year 2007-2009, as follows: $\boldsymbol{EF_{OM}}$ **= 1.0297** tCO_2/MWh

Calculation of the Build Margin emission factor ($EF_{BM,y}$)

1. Calculation of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table 9 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	NCV (MJ/t or 1000m³)	Emission factor (tC/TJ)	Oxidation rate (%)	Emission (tCO_2e)
Energy	Unit	A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/100000
Raw Coal	10^4t	2,184.31	9,339.64	2,888.29	2,810.69	1,413.64	2,817.31	21,453.88	20,908	87,300	1	391,590,892
Cleaned coal	10^4t	0	3.35	0	0	0	0	3.35	26,344	87,300	1	77,044
Other washed coal	10^4t	0	59.93	0	0	136.75	97.94	294.62	8,363	87,300	1	2,150,991
Briquette	10^4t	0	0	0	2.63	0	0	2.63	20,908	87,300	1	48,005
Coke	10^4t	0	1.08	0.06	0.09	0	0	1.23	28,435	95,700	1	33,471
Other Coke Oven Products	10^4t	0	0	0	0	0	0	0.00	28,435	95,700	1	0
Sub-Total												393,900,403
Crude oil	10^4t	0	0.1	0	0	0	0	0.1	41,816	71,100	1	2,973
Gasoline	10^4t	0	0	0	0	0	0	0	43,070	67,500	1	0
Diesel	10^4t	0.69	4.28	1.23	1.55	1.19	0	8.94	42,652	72,600	1	276,830
Fuel oil	10^4t	0.02	1.44	0.48	1.27	0.06	4	7.27	41,816	75,500	1	229,522

Other petroleum products	10^4t	0	0	0.29	0	0	0	0.29	41,816	72,200	1	8,755
Sub-Total												518,081
Nature gas	10^7m^3	0	76.9	2.7	0	1.4	218.4	299.4	38,931	54,300	1	6,329,176
Coke oven gas	10^7m^3	0.9	60.4	12	0	10.3	0	83.6	16,726	37,300	1	521,564
Other coal gas	10^7m^3	307.6	566.4	0	42.3	75.7	0	992	5,227	37,300	1	1,934,074
LPG	10^4t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10^4t	0.25	2.18	0.82	1.91	0	0	5.16	46,055	48,200	1	114,544
Sub-Total												8,899,358
Total												403,317,841

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According to Table 9 and formula (7), (8), (9) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal,y} = 97.66\%,\ \lambda_{Oil,y} = 0.13\%,\ \lambda_{Gas,y} = 2.21\%$$

2. Calculating the fuel-fired emission factor ($EF_{Thermal}$)

Table 10 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply (%)	Emission Factor of Fuel ($kgCO_2/TJ$)	Oxidation Factor	Emission Factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1,000,000*B*C
Coal-fired Power Plant	$EF_{Coal,Adv,y}$	39.45	87,300	1	0.7967
Oil-fired Power Plant	$EF_{Oil,Adv,y}$	51.77	75,500	1	0.5250

Gas-fired Power Plant	$EF_{Gas,Adv,y}$	51.77	54,300	1	0.3776

$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ =0.7871 tCO_2e/MWh。

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

Table 11 Installed Capacity data of CCPG in Year 2009

	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	11,500	43,100	15,670	15,900	6,800	12,270	105,240
Hydro power	MW	3,770	3,650	30,010	11,460	4,530	25,810	79,230
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	60	50	10	2	10	0	132
Total	MW	15,330	46,800	45,690	27,362	11,340	38,080	184,602

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Table 12 Installed Capacity data of CCPG in Year 2008

	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	9,340	42,680	14,210	14,430	6,660	12,770	100,090
Hydro power	MW	3,710	3,020	29,050	10,650	4,060	22,240	72,730
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	30	30	10	0	0	0	70
Total	MW	13,080	45,720	43,280	25,080	10,730	35,010	172,890

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Table 13 Installed Capacity data of CCPG in Year 2007

	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal power	MW	9,270	38,540	13,040	13,360	6,370	12,000	92,580
Hydro power	MW	3,570	2,740	24,020	9,220	2,240	19,860	61,650
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	0	0	10	17	24	0	51
Total	MW	12,840	41,280	37,070	22,597	8,634	31,860	154,281

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Table 14 Calculation of *BM* Emission Factor of CCPG

	Installed capacity in 2007	Installed capacity in 2008	Installed capacity in 2009	Newly added capacity from 2007 to 2009[1]	Newly added capacity from 2008 to 2009[2]	Share in total capacity additions
	(MW)	(MW)	(MW)	(MW)	(MW)	
	A	B	C	D	E	
Thermal power	92,580	100,090	105,240	20,280.4	10,467.5	53.25%
Hydro power	61,650	72,730	79,230	17,726.9	6,500	46.54%
Nuclear power	0	0	0	0	0	0.00%
Wind power and Other	51	70	132	81	62	0.21%
Total	**154,281**	**172,890**	**184,602**	**38,088.3**	**17,029.5**	**100.00%**
Share in total installed capacity of 2009				20.63%	9.23%	

1,2 with consideration of installed capacity, capacity of units under shutdown, the pumped-storage power generating capacity

$$EF_{BM,y}=0.7871\times53.25\%=0.4191\ tCO_2/MWh$$

Calculating the baseline emission factor (EF_y)

According to formula (8) in section B.6.1, the baseline emission factor of the SCPG is calculated as:

$$EF_y = 1.0297 \times 0.75 + 0.4191\times 0.25 = \mathbf{0.7244\ tCO_2/MWh}$$

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

Appendix 5. Further background information on monitoring plan

N/A.

Appendix 6. Summary of post registration changes

Permanent change to the monitoring plan:

In the registered PDD, there were two main meters (M1 and M2) and two backup meters (M1' and M2') located at the higher voltage side of each main transformer for monitoring electricity supplied to the grid and imported from the grid, the readings of M1 plus M2 were the total quantity.

Now the meter M1 and M1' have been removed and meter M2 and M2' is now located at the higher voltage side of the two main transformers for monitoring the total electricity supplied to the grid and imported from the grid.

The meters are owned by the grid company and this change of monitoring meters is required by the power purchase agreement (PPA) and is beyond project owner's control. According to Clause 5 (C) Appendix 1 of the CDM project standard, this kind of situation does not need prior approval of the Board.

This change does not impact the accuracy and the completeness of the monitoring parameters and the emission reduction calculation.

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