Project design document form
(Version 10.1)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Guangxi Baise Dongsun Hydropower Project
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	Version 08
Completion date of the PDD	14/11/2017
Project participants	Guangxi Baise Dongsun Hydropower Station (as the project owner) The Kansai Electric Power Co.,Inc. (as the CER buyer)
Host Party	People's Republic of China
Applied methodologies and standardized baselines	Selected methodology: ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources -- Version 17.0
Sectoral scopes linked to the applied methodologies	Sectoral Scope: 1 Energy industries (renewable energy resources
Estimated amount of annual average GHG emission reductions	37,731tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The proposed project (hereafter, referred to "the Project") is designed to construct a 24MW (12MW×2) run-of-river diversion type hydropower station on the upstream of Youjiang River,within Pingxu Village, Yangxu Town, Youjiang District, Baise City, Guangxi Zhuang Autonomous Region, P. R. China. It will provide an annual on-gird electricity of 75,830 MWh to be connected to South China Power Grid (SCPG). The reservoir surface area at flooded water level is identified to be 1 km^2, and the power density of the project is calculated to be 24 W/m^2 (24 MW/1 km^2). The Project mainly consists of an overflow weir, non-overflow weir, a 24MW (12×2MW) powerhouse, two main transformers and one set of transmission line linked to Baise Bailin 110kV substation in Baise Grid, which will be finally connected to SCPG.

The project owner has been studying CDM project opportunities since the decision to undertake the project as a CDM project activity in October, 2004. It took time to know about CDM for the project owner because CDM scheme was not clear in China at that time. The project had not been financed by CDM for those period due to lack of know-how.

On the eleventh, October, 2006, the project site experienced floods and the rubber gate was damaged, so the project owner had to change the design programme into a steel gate, which was completed on the June, 2008. The damaged cost of this project was 23,000,000RMB; the total investment exceeded 10%.

This damage decisively hindered the construction of the project and financial support by CDM was urgently required. Having undergone hardship of prolonged construction, operation finally started on June 2008.

The area covered by SCPG is dominated by thermal power plants. The project will displace equivalent fossil fuel-based electricity in SCPG by making use of clean and renewable energy, thus generating great amount of anthropogenic GHGs emission reductions annually. It is estimated that the Project would achieve37,731tCO_2e annual GHGs reductions during the second 7-year crediting period. The Project provides a combination of positive social, economic, and environmental development benefits as below:

- Reduce the emission of GHGs and environmental pollutants, thus it will protect the local environment;
- Supply reliable and clean power to effectively mitigate the local power shortage;
- Create new employment opportunities: maximum 1,479 labours are needed at the peak time in the construction phase and 25 permanent positions will be provided during the operation phase;
- The living standard of the local residents will be obviously improved.

These social, economic and environmental benefits emphasis on the important sustainable benefits of this proposed CDM activity to the country and region, and further contribute to the national Western Development Strategy.

A.2. Location of project activity

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The project is located on the upstream of Youjiang River, within Pingxu Village, Yangxu Town, Youjiang District, Baise City, Guangxi Zhuang Autonomous Region, P. R. China. With the geographical coordinate of 106°30′15″E, 23°54′38″N, it is about 15.4km from Baise City, and 283.4km from Nanning City-the capital city of Guangxi Zhuang Autonomous Region. Geographical location of the project is demonstrated as the figures 1~3 below:

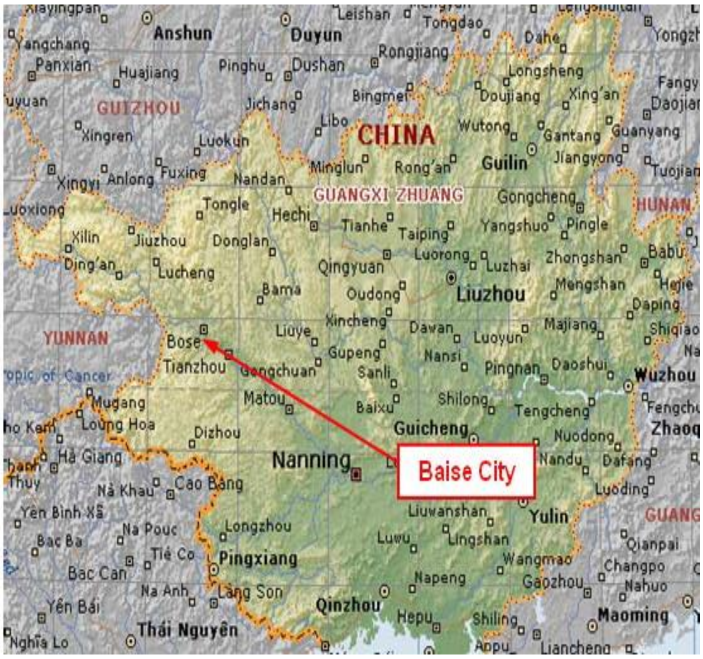

Figure 1: Geographical map of China **Figure 2: Geographical map of Guangxi**

Figure 3: Specific location of the project

A.3. Technologies/measures

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As a run-of-river hydropower scheme, the project includes the main components as below:

- An overflow weir consisting of a plain steel gate 100m long and 6.5m high at the top and a regulation gate weir.
- A non-overflow weir mainly consisting of connecting dams at the right and left sides of the overflow weir with maximum height of 23.1m and 21.1m respectively.

- A powerhouse consisting of 2 generator units with capacity of 12MW for each set.
- Two main transformers with the rated capacity of 16,000kVA each;

Table 1: Parameters of the key components of the proposed project

Equipment	Parameters		Manufacturer
Turbine	Type	GZ1250A-WP-640	Guangdong Shaoguan Zhongli Generating Equipment Co., Ltd
	Rated Capacity	12.5MW	
	Rated Water Head	4.7m	
	Rated Water Flow	300m^3/s	
	Rated Rotated Speed	68.2r/min	
	Lifetime	30 years	
Generator	Type	SFWG12-88/7100	Guangdong Shaoguan Zhongli Generating Equipment Co., Ltd
	Rated Capacity	12MW	
	Rated Voltage	6300V	
	Lifetime	30 years	

- One set of 35kV transmission line for power evacuation, connected to Bailin 110kV Substation in Baise Grid, and finally connected to SCPG. The net on-grid electricity will be monitored by the main Meter M4 (M4A/M4B) installed within 304 exit of Baishui Line. There is also a main meter M5 (M5A/M5B) will be installed at Bailin substation in the Baise Grid for measuring the power delivered to the grid. Under normal circumstances, electricity will be determined by the main Meter M4. When the main Meter is out of order, the readings from the other main Meter M5 will be used for reference. In addition, project owner will install two backup meters (M1 and M2) on generator site to monitor the electricity generation (TEG_y).

All equipment mentioned above are produced domestically; hence there is no foreign technology transfer.

The annual operation hours of the project are 3,159.58[1] hours, thus the plant load factor of the project is 0.36 (=3,159.58h/ (24h/d*365d)).

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host Party)	Guangxi Baise Dongsun Hydropower Station (as the project owner)	No
Japan	The Kansai Electric Power Co., Inc. (as the CER buyer)	No

A.5. Public funding of project activity

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There is no public funding from Annex I countries involved in the project activity.

A.6. History of project activity

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It is confirmed that:

[1] =75,830/24=3159.58

(a) The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);
(b) The proposed CDM project activity is not a project activity that has been deregistered.

The proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA.

There is no registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired existing in the same geographical location as the proposed CDM project activity.

A.7. Debundling

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Not applicable

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

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The approved methodology applied in the project activity is ACM0002 (version 17.0) –“Grid connected electricity generation from renewable sources”. Reference:
http://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN

This methodology also refers to the latest approved version of the following tools:
“Tool to calculate the emission factor for an electricity system (version 06.0)” is applied in the project.
Reference: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf
Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Version 03.0.1).
Reference: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0).
Reference: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

B.2. Applicability of methodologies and standardized baselines

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

- The proposed project is a run-of-river hydropower project with reservoir having power density at 24 W/m^2 (flooded surface area of 1 km^2) greater than threshold of 10 W/m^2;
- The Project is not an activity that involves switching from fossil fuels to renewable energy at the project site; and
- The geographic and system boundaries for the relevant electricity grid (SCPG) which the project is connected with can be clearly identified and information on the characteristics of the grid is available.

B.3. Project boundary, sources and greenhouse gases (GHGs)

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The project boundary for the proposed project is represented by the South China Power Grid (SCPG). SCPG includes the five provincial grids (Yunnan, Guizhou, Guangxi, Hainan and Guangdong), within which there is clearly defined spatial and geographical extent of the power plants and transmission system, and all electricity can be dispatched without significant

transmission constraints. Moreover, geographical boundary of the South China Power Grid is also clearly defined as a regional grid according to the "*2015 Baseline Emission Factors for Regional Power Grids in China*", updated by the Chinese DNA on June 06, 2016. Also, the geographic boundary of SCPG is clear. Therefore, SCPG is considered as the grid boundary for the proposed project for determining the build margin (BM) and operating margin (OM) emission factors.

To satisfy the growing demand for electricity supply, SCPG also imports electricity from Central China Power Grid (CCPG), which accounts for 3.09%, 3.33% and 2.22% of total electricity supply of SCPG in 2011, 2012 and 2013, respectively. These amounts of imports have been considered for OM and BM calculation. Figure 4 below shows the composition of South China Power Grid.

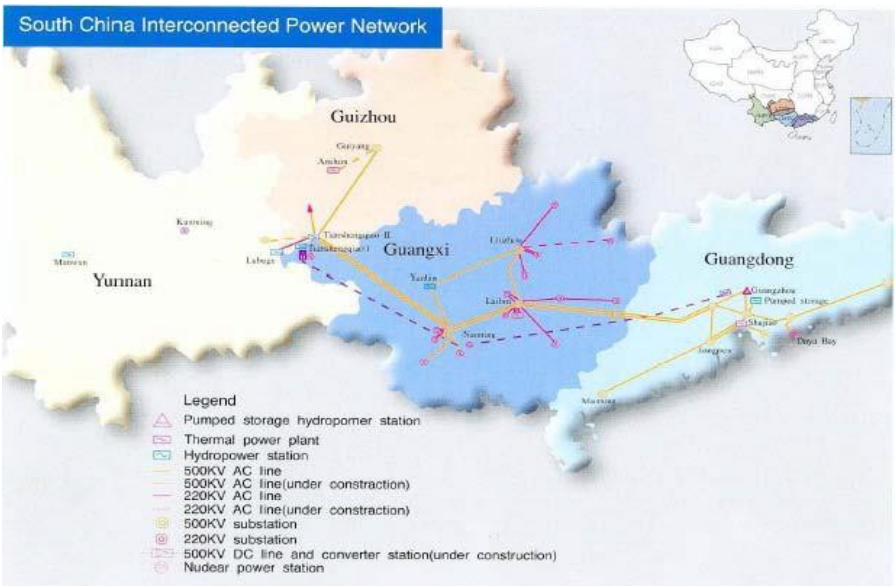

Figure 4: The South China Power Grid

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

The flow diagram below physically delineates the project boundary and its relevant information.

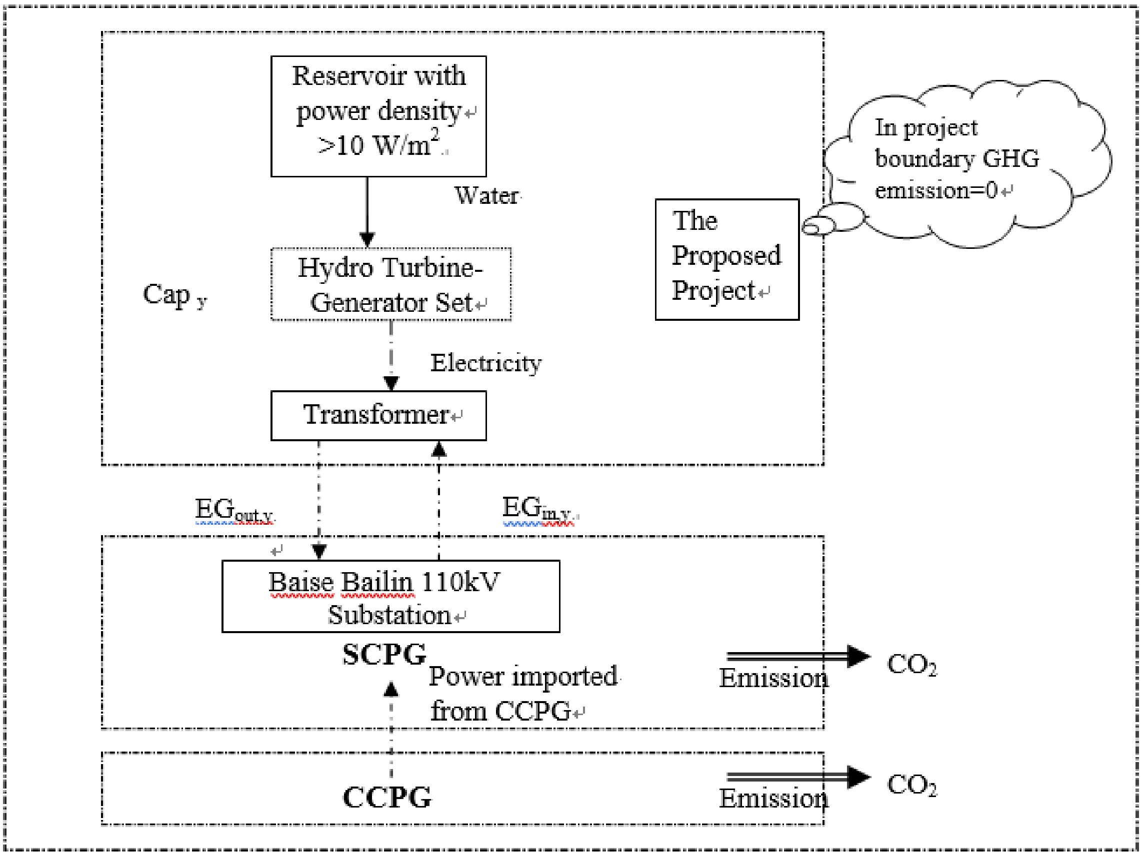

Figure 5 Flow diagram of the project boundary

B.4. Establishment and description of baseline scenario

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The project power plant is connected to the Guangxi Grid via the local grid network, and thus finally to South China Power Grid (SCPG). The SCPG includes the Guangdong, Guangxi, Yunnan, Hainan and Guizhou Grids. According to ACM0002, the baseline scenario of the project is:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plant and by the addition of new generation sources connected to the SCPG, as reflected in the combined margin (CM) calculations described in the *"Tool to calculate the emission factor for an electricity system" Version 06.0.*

For the second crediting period, the continued validity of the original baseline should be assessed.

According to the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (version 03.0.1)", the stepwise procedure as follows should be adopted:

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. Although national policies favour the development of renewable energy sources, total renewable resource based power generation accounts for less than 37.73% of total power generation in the SCPG in 2013. Hence in the absence of the project activity electricity would still have been generated in the existing fossil fuel power plants or by the addition of new fossil fuel power plants connected to the SCPG.

Step 1.2: Assess the impact of circumstances

There is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

This sub-step is applicable to the project activity since the baseline is the continuation of the current practice, i.e. the electricity would be supplied by the power grid in the absence of the project activity. It is clear that the power grid as an electricity system would maintain its technical possibility for a much longer time than the crediting period of the project activity.

Step 1.4: Assessment of the validity of the data and parameters

There are some parameters, which were determined at the start of the first crediting period and not monitored during the first crediting period, are not valid anymore. So the current baseline needs to be updated for the second crediting period according to the tool. This update includes Grid Emission Factor and all values used in its calculation (including OM, BM and emission factors from fuels etc).

Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the second crediting period but data and parameters needs to be updated. Therefore step 2 is used.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period has been updated, without reassessing the baseline scenario, based on the latest approved version of the methodology. This update was applied in the context of the sectoral policies and circumstances that is applicable at the time of requesting for renewal of the crediting period. More details for the updated baseline emissions for the second crediting period can be seen in section B.6.

Step 2.2: Update the data and parameters

As mentioned in step 1.4 above, all parameters regarding the grid emission factor calculation is updated for this second crediting period. More details can be seen in section B.6 and B.7.

B.5. Demonstration of additionality

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According to the CDM project standard for project activities (version 01.0), the project participants are not required to reassess the additionality of the project activity and update the section relating to additionality. Therefore, the demonstration if additionally is not updated and copied from the registered PDD.

The following steps are used to demonstrate the additionality of the Project according to the latest version of Tool for the demonstration and assessment of additionality (version 05.2) issued by EB.

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

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

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

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

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

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

3) The Project activity undertaken without being registered as a CDM project activity; and

4) Provision of equivalent amount of annual power supply by the SCPG which the Project is connected with.

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

This section identifies realistic and credible alternatives to the project activity based on all applicable mandatory legal and regulatory requirements.

According to Chinese regulation rules, coal-fired power plants with a capacity of 135 MW or less, if without special permission, are prohibited in large layered grids, such as provincial grids[2]. Generally, the annual operation hours of coal-fired power plants would be 1.5 times of the hydro electric ones. If generating the same annual electricity, the installed capacity of a coal-fired power plant should be much lower than that of a hydropower plant. Therefore, alternative 1) is not feasible, and should be eliminated from further consideration.

Step 2. Investment analysis

This step is used to determine whether the Project activity is not:
1) the most economically or financially attractive; or
2) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

To conduct the investment analysis, the following sub-steps are involved:

Sub-step 2a. Determine appropriate analysis method

Three analysis methods demonstrated in Tool for the demonstration and assessment of additionality (version 5.2) are available to conduct the investment analysis:

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

The simple cost analysis method (Option I) is not appropriate because the proposed project will get the revenues not only from the CDM but also from the electricity sales. The investment comparison

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

analysis is also not applicable, as the baseline scenario of the proposed project is the SCPG rather than a similar investment project alternative, the project owner has no investment options to compare with. So investment comparison analysis method (Option II) is neither appropriate. As a result, Option III- Apply benchmark analysis is chosen to demonstrate and assess the additionality, since the data on the total investment IRR of Chinese power industry is available.

Sub-step 2b Option III. Benchmark Analysis Method

According to Economic evaluation code for small hydropower projects (SL 16-95) published by the Ministry of Water Resources of P.R.China, the benchmark IRR for small scale hydropower project in China (smaller than 50MW) is at 10% (after tax), which is widely used for power project investment evaluation in China. Only those projects whose IRR equals or exceeds the benchmark will be identified to be financially acceptable. Therefore, this benchmark is currently used for financial appraisal of this project.

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

1) Critical techno-economic parameters and assumptions

The critical techno-economic parameters and assumptions of the project for calculation of IRR are presented below. The power price of Bus-bar tariff is used from the Notice on resolving the conflict of Bus-bar tariff of Guangxi Province issued by Commodity Price Bureau of Guangxi Zhuang Autonomous Region on 02/07/2004.

Parameter	Value	Data source
Installed capacity	24 MW	Approved FSR
On-grid power supply	75,830MWh	Approved FSR
Project life time	32 years (construction period of 2 years included)	Approved FSR
Total investment	173.35 million yuan	Approved FSR
Annual O&M cost	2.16 million yuan	Approved FSR
Bus-bar tariff	0.26yuan/kWh[3]	Approved FSR
Value added tax	6%	Approved FSR
Income tax	33%	Approved FSR
Urban Construction and maintenance tax	5%	Approved FSR
Educational surtax	3%	Approved FSR
Depreciation Rate	2% for construction; 5% for equipment instalment and others	Approved FSR

2) Calculation and comparison of IRR of the proposed project activity and the financial benchmark

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

Based on the date above, the IRR without CDM sales revenue are shown in the following table. It is clear that without CDM sales revenue, the IRR of the Project is only 7.71%, lower than the benchmark of 10%. Therefore, the proposed project is not financially attractive.

However, the extra income from CDM will improve the economic competitiveness of the Project if it is registered as a CDM project activity. The IRR with CDM revenue assumed by the floor price of 10US$/CER will be increased to 10.52%, this is higher than the benchmark of 10%, making the Project financially feasible.

[3] The bus-bar tariff (with VAT) is determined in accordance with the Notice on resolving the conflict of Bus-bar tariff of Guangxi Province, issued by Commodity Price Bureau of Guangxi Zhuang Autonomous Region on 02/07/2004.

	Project IRR
Without CDM revenue	7.71%
With CDM revenue	10.52%

Sub-step 2d. Sensitivity analysis

The purpose of this step is to exam whether the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

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

1) Total investment
2) Annual O&M cost;
3) Bus-bar tariff; and
4) Annual output.

Provided that fixed asset investment, annual O&M cost and annual sell revenue change with fluctuation ranging from –10% ~ +10%, the impacts of these indicators on IRR are analysed. The results are shown in Table 2 and Figure 6.

Table 2: Sensitivity analysis of the critical assumptions of Dongsun hydropower project

Range / Parameter	-10%	-7.50%	-5%	-2.50%	0	2.50%	5%	7.50%	10%
Total Investment	8.79%	8.50%	8.21%	7.94%	7.71%	7.44%	7.20%	6.97%	6.76%
O&M cost	7.83%	7.80%	7.77%	7.74%	7.71%	7.68%	7.65%	7.62%	7.59%
Bus-bar tariff	6.68%	6.93%	7.19%	7.44%	7.71%	7.93%	8.18%	8.42%	8.67%
Annual output	6.75%	6.98%	7.22%	7.47%	7.71%	7.96%	8.20%	8.44%	8.68%

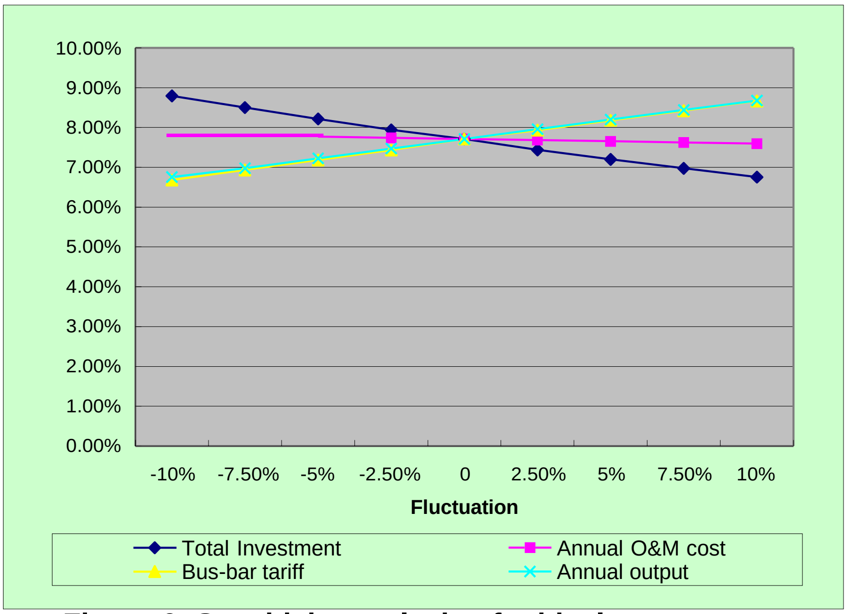

Figure 6: Sensitivity analysis of critical parameters

Table 2 and Figure 6 show that within a realistic range of critical assumptions of the four parameters, the IRR of total investment of the proposed project is still lower than the benchmark.

Total Investment

To reach the benchmark of 10%, the total investment of the project has to be reduced more than 10%. For the investment estimation in FSR is on the basis of national standards, the investment is unlikely to shrink that much. And in recent years, the price is in an upward trend and the actual investment of the project is larger than the investment estimation in FSR. So it can not be occurred that the total investment of the project will be reduced to raise the IRR up to 10%. Furthermore, severe flood accident occurred in October 2006 during the construction caused additional cost of 23,000,000RMB which raised more than 10% of the total investment. The sensitivity analysis demonstrates that this incremental cost made IRR less than 6.76%.

Bus-bar Tariff
As is shown in table 2, when the Bus-bar Tariff is increased by 10%, the IRR is still can not reach the benchmark. In China, as the electricity tariff is regulated by the relevant authorities and once approved it could not significantly fluctuate. Furthermore, the electricity tariff of Guangxi Province has been almost unchanged from the year of 2002 to 2004. Therefore, the IRR of the proposed project will not exceed the range of -10% to 10%.

Annual O&M Cost
As is shown in table 2, the annual O&M cost changes from -10% to 10%, the IRR of the proposed project can not exceed the benchmark 10%. According to the Feasibility Study Report of the proposed project, annual O&M cost is consistent of the sum of the maintenance repairs cost, workers wage and benefit cost, the fee for water resource use, insurance cost and other cost, each of the above cost is decided and calculated by some fixed parameters such as the number of the workers, the installed capacity, the normal standard for utilization of water resource use etc. So annual O&M cost is relatively fixed and its function will not exceed -10% to 10%.

Annual Output
With an increase in the annual output by 23.4%, the project IRR of the project will increase at 10%. And the expected power generation from FSR is a rational result calculated on a strong water resource statistical basis, namely on 65 years of water flow measurements (1937-2001) by the “Baise Hydrological Station”. Therefore, a significant change in average annual power generation of the project during the operating period is not likely to occur.

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

Early consideration of CDM

Perceiving the barriers and obstacles mentioned above, the project owner seriously considered the incentives from the CDM in the decision to proceed with project activity:

From 05/2004 to 06/2004, the project owner finished the required EIA and FSR of the Project, and later acquired the corresponding approvals.

However, a specific applicable bus-bar tariff of 0.26 yuan/kWh (with VAT), determined by Guangxi Price Bureau took effect in 02/07/2004. The document prescribed the newly-launched hydropower plants in Guangxi Province should implement this specific bus-bar tariff.

The document was valid and available at the time that the project owner’s CDM decision began. Then the project owner found that the Project was not financially feasible through exact calculation based on the newly established tariff. On 01/10/2004, the project owner held a board meeting to decide to precede the project as CDM project activity. All the attendants agreed that the company should quicken the study of Kyoto Protocol, get hold of operational procedures and develop the Project in accordance with CDM rules to combat the financial barriers.

Therefore, it strongly demonstrates that the CDM incentives are essential to the successful development of the Project and the project owner seriously and eagerly needs the Project be registered as CDM project activity to alleviate the potential risks.

Table 3 Implementation schedule of the Project

No.	Time	Milestone

1	05/2004	EIA finished;
2	06/2004	EIA approved;
3	06/2004	FSR finished;
4	09/2004	FSR approved;
5	01/10/2004	Board resolution adopted to develop the Project as CDM project.
6	03/2005	CDM consulting contract signed;
7	05/2005	Construction Contract signed;
8	06/2005	The construction activities began;
9	09/2005	Equipment purchase contract signed;
10	05/2006	A memorandum signed with consultation company and the Project owner to terminate the CDM-related Service Agreement;
11	07/2006	CDM consulting contract with current consulting company signed;
12	10/2006	Rubber dam collapsed;
13	20/03/2007	Steal gate construction started ;
14	10/09/2007	On-site interview by Kansai Electric Power ;
15	30/10/2007	MOU signed;
16	18/01/2008	The Project approved by NDRC;
17	03/2008	The Project began test run;
18	17/03/2008	ERPA signed;
19	20/06/2008	The Project officially put into operation.

Step 4. Common practice analysis

All hydropower projects under construction or existing in Guangxi Zhuang Autonomous Region with similar installed capacity (between 20 MW and 60 MW) under similar investment environment after 2002 when China started the electric sector reform are identified in the following table:

No.	Project	Location	Installed capacity (MW)	Starting time	Conducting CDM or not
1	Caotouping hydropower project[4]	Guyihe River Sanjiang County	28	2003	No
2	Shuijingtang Power Plant	Hezhou City	18.9	2005	No
3	Xialiujia Power Plant	Jinxiu County	20	2005	No

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

The existence of the above projects will not bring any negative impact on the additionality of the proposed project:

- Caotouping hydropower project located on the main stream of Guyi River in Sanjiang Dong Autonomous County, where in a mountainous area and is rich in water resource. Caotouping project has the higher output and sales revenue and lower investment. The total electricity generation of Caotouping project is 133GWh and the annual operation hour is calculated to be 4,750h, which is 1,187h higher than that of this proposed project. The total investment is 182.6 million yuan and the fixed asset investment is 169.51 million yuan, the unit investment is 6,054 yuan/kW, 822 yuan/kW lower than that of Dongsun Project. Besides, the bus-bar tariff of Caotouping project is 0.27 yuan/kWh, a little higher than the proposed project;

[4] http://www.ghcb.com.cn/gcyj_content.asp?sub_newid=55&id=502

- Shuijingtang power plant located in Hezhou City, which is the only city in Guangxi Zhuang Autonomous Region was awarded the title of "the first hydropower powered city of China" by Ministry of State Water Conservancy[5]. Situated in an acclaimed city in the hydro power industry, the Shuijingtang Power Plant enjoys many favorable policies from the local authorities. As one of such policies, the Hezhou City Government authorized the electricity generated from the Shuijingtang Hydropowr Plant to be sold to the adjacent Guangdong Power Grid[6]. According to the "Notification on tariff of Hydropower Projects" issued by the Guangdong Provincial Administration of Commodity Prices, the minimum tariff of hydropower projects is fixed as RMB 395.4/MWh (without VAT) [7], which is over 50% higher than the tariff of RMB 260/MWh applied to the Project.

- Xialiujia power plant located in Jinxiu County which offers many favorable policies[8] to attract the investment on hydropower projects from other areas. According to "the small hydropower development policy"[9] published by the Jinxiu County Government in July, 2003, a preferential tariff will be offered to the hydropower investments and only the minimum level of Administrative and Institutional Fees would be levied. Benefiting from the favorable local policy, the Xialiujia Power Plant has an IRR[10] of 11.81%, higher than the 10% benchmark for the small hydropower project, faces no difficulty in terms of investment environment, and does not need the support of CDM revenue.

Compared with the projects analysed above, the proposed project can guarantee annual operation period of 3,563 hours and its unit investment is higher as 6,876 yuan/kW. The Project also does not get the favourable policy supports regarding to financing, income tax or bus-bar tariff. As a result, the benefit return of the Project is so poor that cannot prove its financial feasibility, which has already demonstrated in Step 2 before. Therefore, as a private enterprise, it is difficult for the project owner to raise investment without CDM incentives.

In conclusion, the proposed project is additional, not (part of) the baseline scenario. Without CDM support, the proposed project would unlikely occur.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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1. Project emissions (PE_y)

The project activity is the installation of a new hydropower plant that results in a reservoir. In accordance with ACM0002 (Version 17.0), the power density of the project activity is calculated as follows:

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

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[5] http://gb.cri.cn/1321/2006/08/09/661@1167903.htm

[6] http://www.gx.xinhuanet.com/dtzx/2006-05/08/content_6922454.htm

[7] According to "Notification on tariff of Hydropower Projects [2007] 147" issued on 30/07/2007, the tariff of the projects which electricity being sold to Guangdong Power Grid, should be protected at a minimum price of RMB 395.4/MWh (excl. VAT) http://www.gz.gov.cn/vfs/content/newcontent.jsp?contentId=490002&catId=3923

[8] http://www.lbsdj.com/Article/Print.asp?ArticleID=211

[9] The small hydropower development policy published by the Jinxiu County Government http://www.gxcounty.com/e/DoPrint/?classid=20&id=14866

[10] http://www.chinaccm.com/40/4011/401105/news/20030512/154616.asp

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

Since the created surface area of the reservoir at the flooded water level is identified to be 1 km^2, the power density of the project is calculated to be 24 W/m^2 (24 MW/1 km^2), which is greater than the threshold of 10 W/m^2. In accordance with methodology ACM0002, for hydropower project with power density larger than 10W/m^2, the project emission is zero, so:

$PE_y = 0$.

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

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \qquad (2)$$

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”.

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

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

where:

$EG_{facility,y} = EG_{out,y} - EG_{in,y}$
$EG_{facility,y}$= Quantity of net electricity generation supplied by the project to the grid in year y (MWh/yr).
$EG_{out,y}$= Electricity supplied by the Project activity to SCPG
$EG_{in,y}$ = Electricity purchased from SCPG by the Project for the plant operation

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

Step 1. Identify the relevant electricity system

The Chinese DNA (Office of National Coordination Committee on Climate Change) has published a delineation of the project electricity system and connected electricity systems, which are used for the project, derived from the “*2015 Baseline Emission Factors for Regional Power Grids in China*”, updated by the Chinese DNA on June 06, 2016.

The electricity generated by the project is connected to the SCPG. The SCPG is a larger regional grid, which consists of 5 sub-grids: Yunnan, Guangdong, Guangxi, Guizhou and Hainan grids. Therefore, the project selects the SCPG for the calculation of Operating Margin emission factor.
In addition, there is net imported power to the SCPG from the Central China Power Grid (CCPG) and Eastern China Power Grid (ECPG). Therefore, the CCPG and ECPG are considered as part of the relevant electricity system.
To determine the CO_2 emission factor(s) for net electricity imports from the CCPG and ECPG, the tool provides three options:

a) 0tCO_2e/MWh, or
b) The simple operating margin emission rate of the exporting grid, determined as described in step 4 section 6.4.1, if the conditions for this method, as described in step 3 below, apply to the exporting grid; or
c) The simple adjusted margin emission rate of the exporting grid, determined as described in step 4 section 6.4.2 below; or
d) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 section 6.4.4 below.

The PDD will choose option b).

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.

OptionⅡ: Both grid power plants and off-grid power plants are included in the calculation.

Based on the actual situation of China, Option Ⅰ has been chosen for the calculation (because Option Ⅱ aims to reflect that in some countries, off-grid power generation is significant and can partially be replaced by CDM project activities).

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

The calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$) is based on one of the following methods:

- Simple OM, or
- Simple adjusted OM, or
- Dispatch Data Analysis OM, or
- Average OM.

From 2009 to 2013, in the composition of gross annual generation power for the SCPG, the ratio of power generated by hydropower and other low cost/compulsory resources is as following[11]: 32.35% in 2009, 32.82% in 2010, 31.73% in 2011 , 37.95% in 2012 and 37.73% in 2013, obviously far lower than 50%. Based on these considerations, the OM has been calculated according to the Simple OM. Simple OM is appropriate because low cost/ must run resources that account for far less than 50% of the power generation in the SCPG in the most recent years. The “ex-ante” will be employed for OM calculation of the project.

According to “Tool to calculate the emission factor for an electricity system” (Version 06.0), the Simple OM has been employed to calculate the OM.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- 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.

[11] Detailed information is provided in Table 1 of Appendix 4.

This based on the most recent data available at the time of submission of the CDM-PDD 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 calculating 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 preceding 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.

Project participant employs “ex-ante vintage” for its operation margin calculation.

Step 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power/units. The “Tool to calculate the emission factor for an electricity system” (Version 06.0) offers two options for calculating the Simple OM.
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 (i.e., if Option Ⅰ has been chosen in Step-2).

As the net electricity generation and a CO_2 emission factor of each power unit are not available in China, and the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, at the same time, off-grid power plants are not included in the calculation. So the project uses Option B for calculating the simple OM emission factor, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \qquad (4)$$

Where

$EF_{grid,OMsimplei,y}$ =Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
$FC_{i,y}$ =Amount of fuel type i consumed in the electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$ =Net calorific value (energy content) of fuel type *i* in year y (GJ/mass or volume unit)
$EF_{CO_2i,y}$ =CO_2 emission factor of fuel type *i* in year y (tCO_2/GJ);
EG_y =Net electricity generated and delivered to the grid by all power sources serving the system, not including low-must –run power plants/units, in year *y* (MWh).
i = all fuel types combusted in power sources in the project electricity system in year *y*;
y = the relevant year as per the data vintage chosen in Step 3.

The Operating Margin emission factors for 2011, 2012 and 2013 are calculated. The three-year average is calculated as a 3-year generation-weighted average of the emission factors. The Operating Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the second crediting period of the project activity. The three-year average is calculated as a weighted average of the emission factors. The Operational Margin Emission Factor is **0.8959**tCO_2e/MWh.

Step 5. Calculate the build margin (BM) emission factor

In terms of the vintage 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 *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 crediting period to the DOE. 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 of 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 the information up to the year of registration is not yet available, include those units built up to latest year 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.

Project participants have chosen 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 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});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f). In China, the steps (d), (e) and (f) can be ignored because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago.

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and those that were built most recently. Taking notice of this situation, these are the following deviations in methodology application:

1) Capacity addition from one year to another is used as the basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of the total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above by using plant efficiencies and emission factors of the commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China as a conservative proxy.

According to *"Tool to calculate the emission factor for an electricity system (Version 06.0)"*, 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:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \tag{5}$$

Where

$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2e/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).

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4(a) for the simple OM, using option A2.

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas etc from thermal power based on the present statistical data, the following calculating measures will be taken, the following deviation accepted by EB as step 5:

- First, according to the energy statistical data of most recent one year, determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in COAL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \tag{6}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \tag{7}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} F_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad (8)$$

Where

$FC_{i,m,y}$ =The amount of fuel i (in a mass or volume unit) consumed by power sources m in year(s) y;

$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type *i* in year y (GJ/mass or volume unit);

$EF_{CO_2 i,y}$ =CO_2 emission factor of fossil fuel type *i* in year y (tCO_2/GJ).

Coal, Oil and *Gas* is solid, liquid and gas fuels respectively.

Sub-step 2: Calculate the operating margin emission factor of fuel-based generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (9)$$

Where

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.

The first 20 sets of newly built 600-1000MW coal-fired power plant with lowest coal consumption is assumed to be the commercially available best practice technology in terms of efficiency. The estimated coal consumption is 292.3gce/kWh corresponds to an efficiency of 42.0% for electricity generation.

For gas and oil power plants, a 390MW combined cycle power plant with a specific fuel consumption of 232.3gce/kWh, which corresponds to an efficiency of 52.9% for electricity generation, is selected as the commercially available best practice technology in terms of efficiency[12].

Sub-step 3: Calculate the Building Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (10)$$

Where

CAP_{Total} is the total capacity addition and $CAP_{Thermal}$ is the total thermal (coal, oil and gas) power capacity addition.

As mentioned above, the build margin emission factor of the baseline is calculated ex-ante and will not be renewed in the second crediting period of the project activity. The Build Margin Emission Factor is **0.3648**tCO_2e/MWh.

The data resources for calculating $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are:

- Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
  Source: *China Electric Power Yearbook* (2010-2014); *Compilation of China Electric Power Industry Statistic 2011-2013.*
- Fuel consumption and the net caloric value of thermal power plants
  Source: *China Energy Statistical Yearbook* (2011-2014);

[12] The "2014 Baseline Emission Factors for Regional Power Grids in China", which has been renewed by the Chinese DNA (Director Office of National Climate Change Coordination of NDRC) on May 11, 2015.

- Carbon oxidation factor of each fuel
  Source: *2006 IPCC Guidelines for default values, Table 1.4 of Page 1.23-1.24 in Chapter one, Volume 2 Energy*.

STEP 6. Calculate the combined margin emission factor

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

The PDD will choose option A.

The Baseline Emission Factor is calculated as follow:

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

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year *y* (tCO_2e/MWh);
$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year *y* (tCO_2e/MWh);
w_{OM} : Weighting of operating margin emissions factor (%);
w_{BM} : Weighting of build margin emissions factor (%)The data resources for calculating $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are:

According to the calculation, the operating margin emission factor **(**$EF_{grid,OM,y}$**)** of the SCPG is **0.8959tCO₂e/MWh** and the build margin emission factor **(**$EF_{grid,BM,y}$**)** is **0.3648tCO₂e/MWh.** The defaults weights for hydropower projects during the subsequent crediting periods are used as specified in the "*Tool to calculate the emission factor for an electricity system* (Version 06.0)".

$$w_{OM} = 0.25; w_{BM} = 0.75$$

Using above mentioned values the Combined Baseline Emission Factor of the SCPG corresponds to 0.497575**tCO_2e/MWh.**

3. Leakage (LE_y)

According to ACM0002 (Ver. 17), leakage needs not be considered.

4. Emission Reductions (ER_y)

Emission reductions are calculated as follows:

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

Where:
ERy = Emission reductions in year y (t CO_2e/yr).
BEy = Baseline emissions in year y (t CO_2e/yr).
PEy = Project emissions in year y (t CO_2/yr).
LEy = Leakage emissions in year y (t CO_2/yr).

Since the project does not include any other fossil fuel-fired equipment for backup power, the project emission (PEy) of the Project is zero. The emission reduction (ERy) is presented in the following formula:

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

B.6.2. Data and parameters fixed ex ante

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

Data/Parameter	$EGP_{y,j}$
Data unit	MWh
Description	Provincial level power generation data in the year y (2009-2013, including Yunnan, Guangdong, Guangxi, Guizhou and Hainan)
Source of data	*China Electric Power Yearbook 2010-2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication China electric power yearbook, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate OM
Additional comment	/

Data/Parameter	$GEN_{import,y}$
Data unit	MWh
Description	The Power import from CCPG to the SCPG in the year of *y* (2011-2013)
Source of data	*Compilation of China Electric Power Industry Statistic 2012-2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication Compilation of China Electric Power Industry Statistic, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate the OM
Additional comment	/

Data/Parameter	PR_y
Data unit	%
Description	The rate of electricity consumption of thermal power plants in the years y (2011-2013 including Yunnan, Guangdong, Guangxi, Guizhou and Hainan)
Source of data	*China Electric Power Yearbook 2012-2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication China electric power yearbook, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate the power delivered to the grid
Additional comment	/

Data/Parameter	$FC_{i,m,y}$
Data unit	10^4t/10^8m^3
Description	The Fuel *i* Consumption in the years y (2011-2013, including Yunnan, Guangdong, Guangxi, Guizhou and Hainan)
Source of data	*China Energy Statistical Yearbook 2012-2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication China energy statistics yearbook, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate OM and BM
Additional comment	/

Data/Parameter	$NCV_{i,y}$
Data unit	TJ/ fuel in a mass or volume unit
Description	The NCV_i of Fuel i in a mass or volume unit
Source of data	*China Energy Statistical Yearbook 2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication China energy statistics yearbook, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate OM and BM
Additional comment	/

Data/Parameter	$EF_{CO_2,i,y}$
Data unit	kgCO_2/TJ
Description	The Emission Factor of Fuel i in a mass or volume unit in year y
Source of data	*2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	Regional or national average default values are unavailable, so IPCC default values at the lower limit of the uncertainty at a 95% confidence interval are used, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*.
Purpose of data	To calculate OM and BM
Additional comment	/

Data/Parameter	$\eta_{best,coal}$
Data unit	%
Description	Commercially available coal-fired power plant corresponding to the best practice in terms of efficiency
Source of data	*Chinese DNA: 2015 Baseline Emission Factors for Regional Power Grids in China -the calculation of baseline Build Margin emission factor for the China Regional Grids*
Value(s) applied	42.0%
Choice of data or measurement methods and procedures	The data obtained from the Chinese DNA, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*
Purpose of data	To calculate OM
Additional comment	/

Data/Parameter	$\eta_{best,oil,gas}$
Data unit	%
Description	Commercially available oil and gas power plant corresponding to the best practice in terms of efficiency
Source of data	*Chinese DNA: 2015 Baseline Emission Factors of the China Regional Grids -the calculation of baseline Build Margin emission factor for the China Regional Grids*
Value(s) applied	52.9%
Choice of data or measurement methods and procedures	The data obtained from the Chinese DNA, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*
Purpose of data	To calculate OM
Additional comment	/

Data/Parameter	$CAP_{y,i}$
Data unit	MW
Description	The Installed Capacity of Power Sources j in the years y (2010-2013, including Yunnan, Guangdong, Guangxi, Guizhou and Hainan)
Source of data	*China Electricity Power Yearbook 2011-2014*
Value(s) applied	Provided in Appendix 4
Choice of data or measurement methods and procedures	The data obtained from the official publication China electric power yearbook, satisfying the requirement of latest version of Tool to calculate the emission factor for an electricity system.
Purpose of data	To calculate BM
Additional comment	/

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	The operating margin emission factor of the SCPG
Source of data	*Chinese DNA: 2015 Baseline Emission Factors of the China Regional Grids*
Value(s) applied	0.8959
Choice of data or measurement methods and procedures	The data obtained from the Chinese DNA, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*
Purpose of data	To calculate CM
Additional comment	/

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	The build margin emission factor of the SCPG
Source of data	*Chinese DNA: 2015 Baseline Emission Factors of the China Regional Grids*
Value(s) applied	0.3648
Choice of data or measurement methods and procedures	The data obtained from the Chinese DNA, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*
Purpose of data	To calculate CM
Additional comment	/

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	The combined baseline emission factor of the SCPG
Source of data	*Chinese DNA: 2015 Baseline Emission Factors of the China Regional Grids*
Value(s) applied	0.497575
Choice of data or measurement methods and procedures	The data obtained from the Chinese DNA, satisfying the requirement of *Tool to calculate the emission factor for an electricity system*
Purpose of data	To calculate baseline emission
Additional comment	/

Data/Parameter	CAP_{BL}
Data unit	W
Description	The installed capacity of the hydro power plant before the implementation of the project activity
Source of data	*ACM0002*
Value(s) applied	0
Choice of data or measurement methods and procedures	For new hydro power plants, this value is zero
Purpose of data	To calculate PD
Additional comment	/

Data/Parameter	A_{BL}
Data unit	m^2
Description	The area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full
Source of data	*ACM0002*
Value(s) applied	0
Choice of data or measurement methods and procedures	For new hydro power plants, this value is zero
Purpose of data	To calculate PD
Additional comment	/

B.6.3. Ex ante calculation of emission reductions

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1. $EF_{OM,simple}$ of South China Power Grid

According to the OM calculation of China DNA, the Simple OM emission factor of South China Power Grid is at is 0.8959 tCO_{2e}/MWh (see details in Annex 3).

2. EF_{BM} of South China Power Grid

According to BM calculation of China DNA, based on the formula (9) in B.6.1, the $EF_{thermal\ power}$ of SCPG is at 0.72389 tCO2/MWh（See Annex 3）.

The new capacity addition of thermal power in SCPG accounts for 50.40% of total capacity addition between 2010~2013. Thus, based on formula (9) above, the build margin emission factor is calculated as 0.3648tCO_{2e}/MWh (see details in Annex 3).

3. EF of South China Power Grid

According to equation 10：

The baseline combine emission factor =0.8959*0.25+0.3648*0.75=0.497575tCO_{2e}/MWh.

4. Emission reduction (ER_y*)* by the proposed project activity

According to equations 11~12:

$ER_y=BE_y=EG_{facility,y}\times EF_{Grid,CM,y}=75{,}830\times 0.497575=37{,}731\ tCO_{2e}$

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)**
03/12/2017~02/12/2018	37,731	0	0	37,731
03/12/2018~02/12/2019	37,731	0	0	37,731
03/12/2019~02/12/2020	37,731	0	0	37,731
03/12/2020~02/12/2021	37,731	0	0	37,731
03/12/2021~02/12/2022	37,731	0	0	37,731
03/12/2022~02/12/2023	37,731	0	0	37,731
03/12/2023~02/12/2024	37,731	0	0	37,731
Total	264,117	0	0	264,117
Total number of crediting years	7			

Annual average over the crediting period	37,731	0	0	37,731

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

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

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/y
Description	Quantity of net electricity generation supplied by the Project activity to SCPG in year y.
Source of data	Project activity site.
Value(s) applied	-
Measurement methods and procedures	Calculated based on the difference between (a) the quantity of electricity supplied by the project plant/unit to the grid ($EG_{out,y}$) and (b) electricity supplied by the grid to the project activity ($EG_{in,y}$).
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Electricity supplied by the project activity to SCPG. Double check by receipt of sales.
Purpose of data	Calculation of emission reductions
Additional comment	$EG_{facility,y}$ is determined according to the tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (Version 03.0).

Data/Parameter	TEG_y
Data unit	MWh
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*.
Source of data	Project activity site.
Value(s) applied	-
Measurement methods and procedures	Monthly calculated basing on hourly measurement.
Monitoring frequency	Meter measurement continuously, monthly recording.
QA/QC procedures	Electricity supplied by the project activity to SCPG. Double check by receipt of sales.
Purpose of data	Calculation of emission reductions
Additional comment	-

Data/Parameter	$EG_{out,y}$
Data unit	MWh
Description	Electricity supplied to SCPG by the Project.
Source of data	Project activity site.
Value(s) applied	-
Measurement methods and procedures	Hourly measurement
Monitoring frequency	Meter measurement continuously, monthly recording.
QA/QC procedures	Electricity supplied by the project activity to SCPG. Double check by receipt of sales.
Purpose of data	Calculation of emission reductions
Additional comment	-

Data/Parameter	$EG_{in, y}$
Data unit	MWh
Description	Electricity purchased from SCPG by the Project for the plant operation.
Source of data	Project activity site.
Value(s) applied	-
Measurement methods and procedures	Hourly measurement.
Monitoring frequency	Meter measurement continuously, monthly recording.
QA/QC procedures	Electricity purchased by the project activity from SCPG. Double check by receipt of sales.
Purpose of data	Calculation of emission reductions
Additional comment	-

Data/Parameter	A_{PJ}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site.
Value(s) applied	-
Measurement methods and procedures	Measured from maps.
Monitoring frequency	Once a year.
QA/QC procedures	-
Purpose of data	-
Additional comment	-

Data/Parameter	Cap_{PJ}
Data unit	MW
Description	Installed capacity of the proposed project.
Source of data	Project site.
Value(s) applied	-
Measurement methods and procedures	Determined in accordance with the nameplates supplied by the manufacturer.
Monitoring frequency	Once a year.
QA/QC procedures	-
Purpose of data	-
Additional comment	-

B.7.2. Sampling plan

>>

Not applicable

B.7.3. Other elements of monitoring plan

>>

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

Emission reductions will be achieved through avoided power generation of fossil fuel plant due to the power generated by the Project. Since the baseline emission factor is calculated ex-ante, the main data to be monitored is the quantity of net electricity generation supplied by the Project activity to SCPG in year y ($EG_{facility,y}$), which is calculated based on the difference of the grid-connected power of the proposed project activity ($EG_{out,y}$) and the power supplied by the South Power China Grid to the proposed project ($EG_{in,\ y}$).

Furthermore, surface area at full reservoir level (A_{PJ}) should be monitored based on the topographical surveys and maps supplied by the proposed project.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING
The project owner will assign a Monitoring Team to carry out the whole monitoring process as the Figure 7 below.

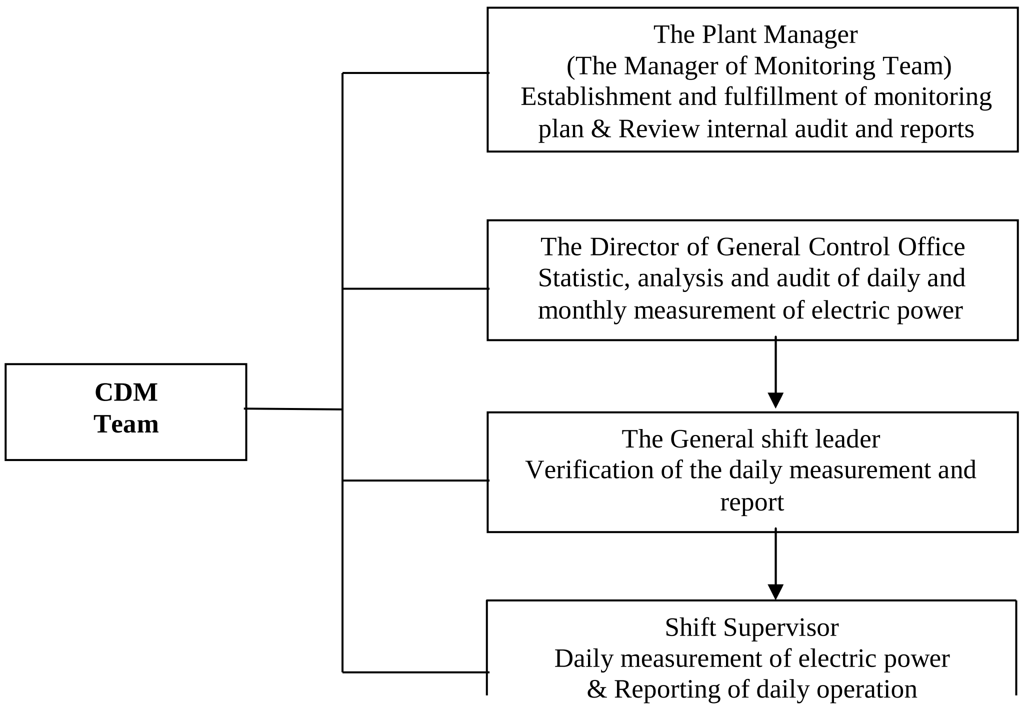

Figure 7 Monitoring and Management Structure

The plant manager will establish the monitoring plan, and hold the overall responsibility for the whole process:

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

The second step is the verification of the daily measurement and report, which will be carried out by the general shift leader;

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

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

Monitoring Plan

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

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

I. Monitoring of $EG_{facility,y}$

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

2. Installation of meters
Meters will be installed for the proposed project. The net on-grid electricity will be monitored by the main Meter M4 (M4A/M4B) installed within 304 exit of Baishui Line, which is the property cut-off point between the project and the grid company, in Dongsun hydropower plant. The meter can measure the bi-directional electricity flows, which include the electricity supplied to the grid by the project ($EG_{out,y}$) and electricity purchased from the grid by the project for plant operation ($EG_{in,y}$). There is also a main meter M5 (M5A/M5B) will be installed at Bailin substation in the Baise Grid for measuring the power delivered to the grid. Under normal circumstances, electricity will be determined by the main Meter M4. When the main Meter is out of order, the readings from the other main Meter M5 will be used for reference. In addition, project owner will install two backup meters (M1 and M2) on generator site to monitor the electricity generation (TEG_y). Another Meter M3 is installed at the project site for measurement of the electricity self-consumed by the proposed project. The project owner will daily record the electric data and calculated the monthly net on-grid electricity by the project to cross check the data measured by the main meters. The location of the meters is shown in Figure 8 below.

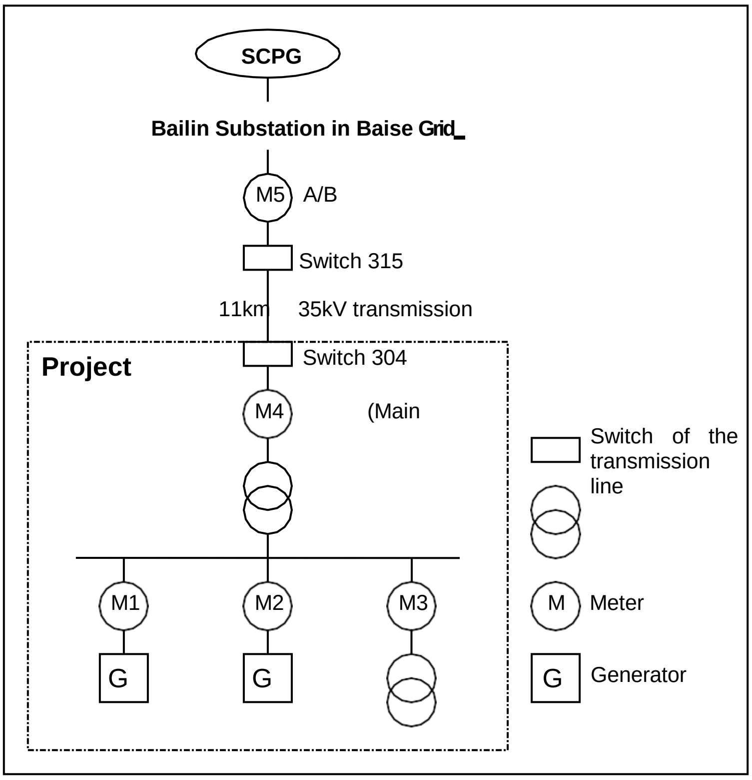

Figure 8 Location of Meters

The metering equipment will be properly configured and checked periodically according to the regulation (JJG596-1999 and .DL/T448-2000).

3. Reporting

The project owner and the Grid Company are responsible for operation monitoring of the backup meter and the main meter and guarantee the measuring equipments are in good operation and completely sealed. The specific steps for data collection and reporting are listed below:

- The project owner reads and verifies the readings of the meters at the project site daily and prepares the monthly data report;
- The grid company reads the readings of the main meters at the project site and in the substation on 25th every month and calculate the monthly on-grid power supply and electric charge;
- The project owner, together with the Grid Company collects the reading cards and check the recorded readings with those from the meters at the project site, and determines the accurate net on-gird power supply;
- The Grid company provides readings to the project owner and provides invoice;
- The project owner prepares and reviews the monitoring report internally and provides DOE with reading cards and copies of sales receipts and other relevant documentations for verification.

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

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

4. Calibration

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

- The metering equipment are calibrated and checked periodically for accuracy;
- All the meters installed shall be tested by a third party within 10 days after:

a) Detection of a difference larger than the allowable error in the readings of both meters;
b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

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

5. Training

All staff shall not participate in the operation of the project until they pass the training. The training plan is made by the project owner and the records will be collected and kept for internal audit.

6. Emergency

In any emergency, such like equipment or transmission line errors, the appropriate process shall be carried out according to the operating standard of the project to maintain security and stability of the project. Once the problem is solved, the operation shall be resumed. And the relevant records will be collected and kept for internal audit.

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

1. As for Cap_{PJ}
Installed capacity of the hydro power plant after the implementation of the project activity will be monitored yearly by checking the rated capacity on the nameplate of the generator, although the capacity will not be changed after construction.

2. As for A_{PJ}
Area of the reservoir after the implementation of the project activity when the reservoir is full will be monitored yearly by checking the calculated results based on relevant maps supplied by qualified parties at the start of the project, although the power density of the project is unlikely to be lower than $10W/m^2$ in the future for the following reasons:

According to the calculation by the designing institute, the whole reservoir area from the project site to Baise Multipurpose Dam at the pool level of 122.5m is $1km^2$ and the power density is calculated as 24 W/m^2. To reach the power density of 10 W/m^2, the water flooded area needs to increase to more than twice, which could not happen even during the flood season, since the backwater distance of the project is settled as to the dam site of Baise Multipurpose Dam and the bottomland area along the river is small. Therefore, the power density of the project is unlikely to be lower than $10W/m^2$.

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

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
17/05/2005 the date of construction contract signed

The date construction contract signed is the earliest date of the real actions (including construction and equipment purchasing) of the project activity during the starting period. The correlative timelines were shown in B5.

C.2. Expected operational lifetime of project activity

>>
30 years.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
A renewable crediting period is used, and this is the second crediting period.

C.3.2. Start date of crediting period

>>
03/12/2017

C.3.3. Duration of crediting period

>>
7 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The project owner delegated Guangxi Environmental Protection Institute (GEPI) to prepare the EIA Report based on the Environmental Impact Assessment Law of People's Republic of China. GEPI is independent from the environmental administrative bureau which is in charge of the assessment of the EIA Report. The EIA Report has been approved by Guangxi Environmental Protection Bureau on June 7th, 2004.

The construction phase
Wastewater
The wastewater generated in the construction phase is mainly composed of the construction wastewater and the construction labours' sewage. In accordance with the Integrated Wastewater Discharge Standard (GB8978-1996) Ⅰ, the wastewater will be diverted for proper disposal and will not be discharged into the river directly. Thus the impact on the water quality will be limited.

Solid wastes
The construction of the project will generate some solid wastes which are mainly waste architectural materials that will be dumped and compacted in the well-selected site. After the construction, the dumping site will be revegetated with plants. Thus the impact of the solid wastes will be limited.

Noise
The noise pollution source in the construction phase mainly originates from the operation of construction machines, vehicles and the construction work at night. In accordance with Noise Limit for Construction Site (GB12523-90) and Standard of Environmental Noise of Urban Area (GB3096-93) Ⅱ, necessary measures will be conducted and since the construction period is temporary, the impact on the local sound environment will be limited.

Ecological environment
The construction of the project will occupy some wastelands without cultivation area, plantation, inhabitants, cultural relic and mineral resources. In order to restore and retain the ecosystem, afforestation projects will be carried out after the construction, which will also contribute to the soil and water conservation.

The operation phase
Sewage
The sewage in the operation phase is mainly produced by the operation staffs, which will be disposed through three grades of the septic tank, then used as manure for irrigation purpose. So the impact of the sewage will be little.

Solid waste
The solid wastes in the operation phase are mainly the living rubbish which will be collected and landfilled, or delivered to the local sanitation sector for zero-harm disposal. Thus the impact of the solid waste will be limited.

Noise
The noise pollution in the operation phase is mainly caused by the power-generating equipments. In accordance with the Standard of Noise at Boundary of Industrial Enterprises (GB 12348-90), to mitigate the negative effect, the sound-absorbing materials will be attached on the inner wall of the power house, and further, the measure of intensifying the obturation of the power house will be conducted. Thus the impact of the noise during the operation phase will be limited.

Ecological environment
To protect the water environment and shoal of Youjiang River basin, certain measures have been implemented. The area within 5km of the lower reaches of Youjiang River has been marked as a forbidden zone for fishing. And it is not allowed to undertake any activity that may pollute the river water, such like large scale cage fish culture and duck breeding. The let- down flow should not be smaller than $100m^3/s$ to avoid the environmental deterioration from the dam of Baise City. And although it is not necessary to set the fishing industry separately, the original fishing industry should be compensated and the project owner should put some fry eating plankton in the reservoir.

To make a brief summary, the proposed project will not result in significant negative impact on the local environment. Thus the construction and operation of the project is feasible from the perspective of environmental protection.

D.2. Environmental impact assessment

>>
The environmental impacts of the proposed project are not considered to be significant due to the mitigation methods demonstrated above.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
When compiling the EIA report of the project, on the basis of the regulation of Environmental Impact Assessment Law, the designing institute has done a public consultation in 2004. No counterviews were received and the EIA showed the environmental impact of Dongsun Hydropower Project will not be significant when the environmental protection measures are taken by the project owner.

In order to better understand local stakeholders' attitudes toward the proposed project and acquire their comments, the project owner conducted two additional investigations in the form of distributing questionnaires to representatives to local residents and relevant entities in local area, respectively in April, 2007 and July to August, 2008, during and after the construction period of the project. The questionnaire for the public is demonstrated as the table below:

Table: Public Consultation Questionnaire for Guangxi Baise Dongsun Hydropower Project

<table>
<tr><th>Name</th><td></td><th>Gender</th><td></td><th>Age</th><td></td></tr>
<tr><th>Education Level</th><td>Elementary School</td><td>High School</td><td>Senior High School</td><td>Secondary Technical School</td><td>College or University</td></tr>
<tr><th>Occupation</th><td>Peasant</td><td>Worker</td><td>Civil Servant</td><td colspan="2">Others</td></tr>
<tr><td colspan="6">Project description:</td></tr>
</table>

The Project, developed by Guangxi Baise Dongsun Hydropower Station, is designed to construct a 24MW (12MW × 2) run-of-river diversion type hydropower station on the upstream of Youjiang River, within Pingxu Village, Yangxu Town, Youjiang District, Baise City, Guangxi Zhuang Autonomous Region, P. R. China. It will provide an annual on-gird electricity of 75,830 MWh. The Project mainly consists of an overflow weir, non-overflow weir, a 24MW (2×12MW) powerhouse, two main transformer and one set of transmission line linked to Baise Bailin 110kV substation in Baise Grid. The project will be finally connected to South China Power Grid (SCPG).

In order to get fully understanding of comments hold by the public, we're distributing these questionnaires to you and begging your opinions and suggestions. Thanks a lot!

1. Are you familiar with the proposed project?	A. Yes	B. No		
2. Do you support the construction of the proposed project?	A. Yes	B. No	C. No idea	
3. Do you think that the proposed project will accelerate the local economic development?	A. Yes	B. No	C. No idea	
4. Do you think that the proposed project will improve the local employment?	A. Yes	B. No	C. No idea	
5. How do you think of the impact of the proposed project on the local environment?	A. Positive	B. Negative	C. No impact	D. No idea
6. How do you think of the impact of the proposed project on the local ecosystem?	A. Positive	B. Negative	C. No impact	D. No idea
7. Do you think that the proposed project will ameliorate local residents' living standard?	A. Yes	B. No	C. No idea	
What other problems do you concern about? Please write down your suggestions, if any:				

E.2. Summary of comments received

>>

During the investigation in April, 2007, 50 copies were distributed and 50 were received, at responding rate of 100%. The following is a summary of the key findings:

- All of the respondents are familiar with the proposed project;
- All of the respondents support the construction of the proposed project;
- 94% of the respondents believe that the proposed project will accelerate the local economic development and the rest have no idea;
- 96% of the respondents consider that the proposed project will improve the local employment and the rest have no idea;
- 92% of the respondents hold that the proposed project will cause positive impact on local environment, 8% consider that there will be no impact and the rest have no idea;
- 94% of the respondents think that the proposed project will benefit local ecosystem, 6% consider that there will be no impact and the rest have no idea;
- All of the respondents believe that the proposed project will improve their living standard.

The result of the investigation in 2008 is similar to the one in 2007. Since no negative comments were received, no action was identified through the process.

In conclusion, the public held a positive attitude toward the proposed project, and most of them believed that the construction and operation of the proposed project would supply clean and reliable electricity to local area. And attribute to the construction and operation of the proposed project, local economy development would be achieved, and their living standard would be promoted. All the respondents are supportive of the construction of the proposed project.

E.3. Consideration of comments received

>>

The local stakeholders are all supportive of the proposed project. With regard to possible impact on local environment, proper mitigation methods have been involved in the EIA report, and therefore there is no need to modify the project due to the comments received.

SECTION F. Approval and authorization

>>

The Letter of Approval is issued by Chinese DNA on January 18, 2008. The Letter of Approval is issued by Japan DNA on July 7, 2009.

Appendix 1. Contact information of project participants

Organization name	Guangxi Baise Dongsun Hydropower Station
Country	People's Republic of China
Address	Pingxu Village, Yangxu Town, Youjiang District, Baise City, Guangxi Province
Telephone	0776-2847211
Fax	0776-2847211
E-mail	HLB1969@sina.com
Website	-
Contact person	Huang Libai

Organization name	The Kansai Electric Power Co., Inc.
Country	Japan
Address	3-6-16, Nakanoshima, Kita-ku, Osaka City
Telephone	+81-6-6441-8821
Fax	/
E-mail	kansaikankyou@a3.kepco.co.jp
Website	http://www.kepco.co.jp/english
Contact person	Masahiro Izumi

Appendix 2. Affirmation regarding public funding

There is no public funding for the Project.

Appendix 3. Applicability of methodologies and standardized baselines

Not applicable.

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

Please refer to the following official websites issued by DNA for the procedure of OM and BM calculation of South China Power Grid:
http://cdm.ccchina.gov.cn/zyDetail.aspx?newsId=61598&TId=161

Table 1–Power Supply data for the SCPG, 2009-2013

	2009	2010	2011	2012	2013
Electricity Generation of Thermal power plant (MWh)	421,100,000	473,300,000	539,900,000	520,300,000	563,000,000
Electricity Generation of Hydro and other power plant (MWh)	201,400,000	231,200,000	250,900,000	318,200,000	341,100,000
Total Electricity Generation of the SCPG (MWh)	622,500,000	704,500,000	790,800,000	838,500,000	904,100,000
the ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation(%)	32.35%	32.82%	31.73%	37.95%	37.73%

Data Source: China Electric Power Yearbook,2010-2014.

Table 2–Power Supply data for the SCPG, 2011

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan
Thermal Power Generation (MWh)	304,600,000	63,700,000	102,200,000	53,600,000	15,800,000
Rate of Electricity Consumption of the Power Plant (%)	5.6	6.6	7.3	7.7	7.8
Power Supplied to the Grid(MWh)	287,542,400	59,495,800	94,739,400	49,472,800	14,567,600
Total Supplied to Grid of the Thermal Power (MWh)	505,818,000				
Net import Power from the Central China Power Grid (MWh)	16,118,680				
The total Power for the SCPG (MWh)	521,936,680				

Data Source: China Electric Power Yearbook 2012, Compilation of China Electric Power Industry Statistic 2011.

Table 3–Power Supply data for the SCPG, 2012

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan
Thermal Power Generation (MWh)	284,800,000	64,700,000	104,600,000	48,000,000	18,200,000
Rate of Electricity Consumption of the Power Plant (%)	5.8	6.7	7.2	7.5	7.6
Power Supplied to the Grid(MWh)	268,281,600	60,365,100	97,068,800	44,400,000	16,816,800
Total Supplied to Grid of the Thermal Power (MWh)	486,932,300				
Net import Power from the Central China Power Grid (MWh)	16,752,770				
The total Power for the SCPG (MWh)	503,685,070				

Data Source: China Electric Power Yearbook 2013, Compilation of China Electric Power Industry Statistic 2012.

Table 4–Power Supply data for the SCPG, 2013

	Guangdong	Guangxi	Guizhou	Yunnan	Hainan
Thermal Power Generation (MWh)	295,500,000	75,500,000	124,000,000	47,900,000	20,100,000
Rate of Electricity Consumption of the Power Plant (%)	5.64	6.22	7.26	6.98	7.82
Power Supplied to the Grid(MWh)	278,833,800	70,803,900	114,997,600	44,556,580	18,528,180
Total Supplied to Grid of the Thermal Power (MWh)	527,720,060				
Net import Power from the Central China Power Grid (MWh)	12,007,880				
Net import Power from the Eastern China Power Grid (MWh)	22,000				
The total Power for the SCPG (MWh)	539,749,940				

Data Source: China Electric Power Yearbook 2014, Compilation of China Electric Power Industry Statistic 2013.

Table 5– Calculation of Simple OM emission factor for the Central China Power Grid from 2011 to 2013

	2011	2012	2013
Total CO_2 emission of the Central China Power Grid (tCO_2e)	573,748,948	519,400,160	574,818,731
The total power supplied to the Central China Power Grid (MWh)	583,862,440	550,413,420	618,696,300
Simple OM emission factor (tCO_2e/ MWh)	0.9827	0.9437	0.9291

Table 6–2011 data for primary fuel input for thermal power supply to the SCPG

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Hainan E	Subtotal =A+B+C+D+E
Raw coal	10^4 Tons	11799.44	2807.29	4266	3520.42	607.41	23000.56
Clean coal	10^4 Tons	0	0.39	0	0	0	0
Other washed coal	10^4 Tons	0	0	1291.29	22.96	0	1314.25
Briquettes	10^4 Tons	182.83	0	0	0	0	182.83
Coke	10^4 Tons	0	0	0	0	0	0
Gangue	10^4 Tons	320.15	0	71.26	36.78	0	428.19
Coke oven gas	10^8 m^3	0	3.05	1.88	2.66	0	7.59
Blast Furnace	10^8 m^3	1.58	44.78	9.16	50.65	0	106.17
Converter Gas	10^8 m^3	0.33	2.71	0	2.38	0	5.42
Other gas	10^8 m^3	0	0	0	0	0	0
Crude oil	10^4 Tons	0	0	0	0	0	0
Gasoline	10^4 Tons	0	0	0	0	0	0
Diesel oil	10^4Tons	2.8	0.58	3.58	1.05	0.03	8.04
Fuel oil	10^4 Tons	24.44	0.07	0	0	0	24.51
Naphtha	10^4 Tons	0	0	0	0	0	0
Lubricants	10^4 Tons	0	0	0	0	0	0
Paraffin Waxes	10^4 Tons	0	0	0	0	0	0
White Spirit	10^4 Tons	0	0	0	0	0	0
Bitumen Asphalt	10^4 Tons	0	0	0	0	0	0
Petroluem Coke	10^4 Tons	16.51	0	0	1.38	0	17.89
LPG	10^4 Tons	0	0	0	0	0	0
Refinery gas	10^4 Tons	0.91	0	0	0	0	0.91

LNG	10^4 Tons	195.1	0	0	0	0	195.1
Natural gas	10^8 m^3	38.19	0	0.76	0	6.83	45.78
Other petroleum products	10^4 Tons	0.53	0	0	0	0	0.53
Other coking products	10^4 Tons	0	0	0	0	0	0
Other E (standard coal)	10^4 Tces	34.53	159.22	0	25.2	0	218.95

Data Source: China Energy Statistical Yearbook 2012.

Table 7- Calculation of the OM Emission Factor for the SCPG in 2011

Fuel	Unit	Fuel Consumption in the CSPG E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) G	CO_2Emission (tCO_2e) I=G*F*E/100000(in mass) I=G*F*E/10000 (in volume)
Raw coal	10^4 Tons	23000.56	87,300	20,908	419,821,954
Clean coal	10^4 Tons	0	87,300	26,344	0
Other washed coal	10^4 Tons	1314.25	87,300	8,363	9,595,207
Briquettes	10^4 Tons	182.83	87,300	20,908	3,337,138
Coke	10^4 Tons	0	95,700	28,435	0
Gangue	10^4 Tons	428.19	87,300	8,363	3,126,172
Coke oven gas	$10^8 m^3$	7.59	37,300	16,726	473,525
Blast Furnace	$10^8 m^3$	106.17	219,000	3,763	8,749,438
Converter Gas	$10^8 m^3$	5.42	145,000	7,945	624,398
Other gas	$10^8 m^3$	0	37,300	5,227	0
Crude oil	10^4 Tons	0	71,100	41,816	0
Gasoline	10^4 Tons	0	67,500	43,070	0
Diesel oil	10^4 Tons	8.04	72,600	42,652	248,961
Fuel oil	10^4 Tons	24.51	75,500	41,816	773,807
Naphtha	10^4 Tons	0	72,600	43,906	0
Lubricants	10^4 Tons	0	71,900	41,398	0
Paraffin Waxes	10^4 Tons	0	72,200	39,934	0
White Spirit	10^4 Tons	0	72,200	42,945	0
Bitumen Asphalt	10^4 Tons	0	69,300	38,931	0
Petroleum Coke	10^4 Tons	17.89	82,900	31,947	473,800
LPG	10^4 Tons	0	61,600	50,179	0
Refinery gas	10^4 Tons	0.91	48,200	46,055	20,201
LNG	$10^8 m^3$	195.1	54,300	51,434	5,448,882
Natural gas	$10^8 m^3$	45.78	54,300	38,931	9,677,678
Other petroleum	10^4 Tons	0.53	72,200	41,816	16,001
Other coking products	10^4 Tons	0	95,700	28,435	0
Other E (standard coal)	10^4 Tons	218.95	0	0	0
Emission of electricity from the Central China Power Grid		0.9827 tCO_2e/MWh×16,118,680 MWh = 15,839,827tCO_2e			
Total Emission (Q)		478,226,638 tCO_2e			
Supply to SCPG (P)		521,936,680 MWh			
OM Emission Factor [= Q/P]		0.9163 tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2012; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy Table 1.4, p. 123-1.24.

Table 8–2012 data for primary fuel input for thermal power supply to the SCPG

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Hainan E	Subtotal =A+B+C+D+E
Raw coal	10^4 Tons	11,112.44	2,765.45	4,033.75	3,083.23	691.39	21,686.26
Clean coal	10^4 Tons	0	0	0	0	0	0
Other washed coal	10^4 Tons	0	0	1358	40.06	0	1398.06
Briquettes	10^4 Tons	167.41	0	0	0	0	167.41
Coke	10^4 Tons	0	0	0	0	0	0
Gangue	10^4 Tons	337.97	0	84.06	30.47	0	452.5
Coke oven gas	10^8 m^3	0	3.69	2.05	2.29	0	8.03
Blast Furnace	10^8 m^3	18.19	52.4	15.63	56.48	0	142.7
Converter Gas	10^8 m^3	1.69	3.46	0	3.59	0	8.74
Other gas	10^8 m^3	0	0	0.8	0	0	0.8
Crude oil	10^4 Tons	0	0	0	0	0	0
Gasoline	10^4 Tons	0	0	0	0	0	0
Diesel oil	10^4Tons	2.63	0.85	1.89	0.87	0.03	6.27
Fuel oil	10^4 Tons	20.63	0.08	0	0	0	20.71
Naphtha	10^4 Tons	0	0	0	0	0	0
Lubricants	10^4 Tons	0	0	0	0	0	0
Paraffin Waxes	10^4 Tons	0	0	0	0	0	0
White Spirit	10^4 Tons	0	0	0	0	0	0
Bitumen Asphalt	10^4 Tons	0	0	0	0	0	0
Petroluem Coke	10^4 Tons	28.37	0	0	1.39	0	29.76
LPG	10^4 Tons	0	0.11	0	0	0	0.11
Refinery gas	10^4 Tons	1.27	0	0	0	0	1.27

LNG	10^4 Tons	178.8	0.11	0	0	0	178.91
Natural gas	10^8 m^3	32.49	0	0	0	6.84	39.33
Other petroleum products	10^4 Tons	0.47	0	0	0	0	0.47
Other coking products	10^4 Tons	0	0	0	0	0	0
Other E (standard coal)	10^4 Tces	283.26	160.43	0	46.52	4.5	494.71

Data Source: China Energy Statistical Yearbook 2013.

Table 9- Calculation of the OM Emission Factor for the SCPG in 2012

Fuel	Unit	Fuel Consumption in the CSPG E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) G	CO_2Emission (tCO_2e) I=G*F*E/100000(in mass) I=G*F*E/10000 (in volume)
Raw coal	10^4 Tons	21,686.26	87,300	20,908	395,832,451
Clean coal	10^4 Tons	0	87,300	26,344	0
Other washed coal	10^4 Tons	1,398.06	87,300	8,363	10,207,095
Briquettes	10^4 Tons	167.41	87,300	20,908	3,055,682
Coke	10^4 Tons	0	95,700	28,435	0
Gangue	10^4 Tons	452.5	87,300	8,363	3,303,657
Coke oven gas	10^8 m^3	8.03	37,300	16,726	500,975
Blast Furnace	10^8 m^3	142.7	219,000	3,763	11,759,864
Converter Gas	10^8 m^3	8.74	145,000	7,945	1,006,870
Other gas	10^8 m^3	0.8	37,300	5,227	15,597
Crude oil	10^4 Tons	0	71,100	41,816	0
Gasoline	10^4 Tons	0	67,500	43,070	0
Diesel oil	10^4 Tons	6.27	72,600	42,652	194,153
Fuel oil	10^4 Tons	20.71	75,500	41,816	653,837
Naphtha	10^4 Tons	0	72,600	43,906	0
Lubricants	10^4 Tons	0	71,900	41,398	0
Paraffin Waxes	10^4 Tons	0	72,200	39,934	0
White Spirit	10^4 Tons	0	72,200	42,945	0
Bitumen Asphalt	10^4 Tons	0	69,300	38,931	0
Petroleum Coke	10^4 Tons	29.76	82,900	31,947	788,166
LPG	10^4 Tons	0.11	61,600	50,179	3,400
Refinery gas	10^4 Tons	1.27	48,200	46,055	28,192
LNG	10^8 m^3	178.91	54,300	51,434	4,996,717
Natural gas	10^8 m^3	39.33	54,300	38,931	8,314,178
Other petroleum	10^4 Tons	0.47	72,200	41,816	14,190
Other coking products	10^4 Tons	0	95,700	28,435	0
Other E (standard coal)	10^4 Tons	494.71	0	0	0
Emission of electricity from the Central China Power Grid	0.9437tCO_2e/MWh×16,752,770 MWh = 15,809,589tCO_2e				
Total Emission (Q)	456,483,853 tCO_2e				
Supply to SCPG (P)	503,685,070 MWh				
OM Emission Factor [= Q/P]	0.9063 tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2013; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy Table 1.4, p. 123-1.24.

Table 10–2013 data for primary fuel input for thermal power supply to the SCPG

Fuel	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Hainan E	Subtotal =A+B+C+D+E
Raw coal	10^4 Tons	11,458.81	3,105.02	4,372.74	2,706.19	794.95	22,437.71
Clean coal	10^4 Tons	0	0	0	1.04	0	1.04
Other washed coal	10^4 Tons	0	1341.3	0	20.13	0	1,361.43
Briquettes	10^4 Tons	171.26	0	0	0	0	171.26
Coke	10^4 Tons	0	0	0	0	0	0
Gangue	10^4 Tons	433.9	0	79.03	26.88	0	539.81
Coke oven gas	10^8 m^3	0	4.65	2.18	1.68	0	8.51
Blast Furnace	10^8 m^3	19.74	58.46	18.54	77.26	0	174
Converter Gas	10^8 m^3	2.13	3.31	0	5.63	0	11.07
Other gas	10^8 m^3	0	0	1.83		0	1.83
Crude oil	10^4 Tons	0.02	0	0	0	0	0.02
Gasoline	10^4 Tons	0	0	0	0	0	0
Diesel oil	10^4Tons	1.99	0.51	2.29	0.79	0.03	5.61
Fuel oil	10^4 Tons	19.72	0.07	0	0	0	19.79
Naphtha	10^4 Tons	0	0	0	0	0	0
Lubricants	10^4 Tons	0	0	0	0	0	0
Paraffin Waxes	10^4 Tons	0	0	0	0	0	0
White Spirit	10^4 Tons	0	0	0	0	0	0
Bitumen Asphalt	10^4 Tons	0	0	0	0	0	0
Petroluem Coke	10^4 Tons	17.27	0	0	0	0	17.27
LPG	10^4 Tons	0	0	0	0	0	0
Refinery gas	10^4 Tons	1.57	0	0	0	0	1.57

LNG	10^4 Tons	168.56	0.12	0	0	0.03	168.71
Natural gas	10^8 m^3	32.09	0.1	0	0	4.23	36.42
Other petroleum products	10^4 Tons	0.65	0	0	0	0	0.65
Other coking products	10^4 Tons	0	0	0	0	0	0
Other E (standard coal)	10^4 Tces	0	100.38	0	44.23	11.54	156.15

Data Source: China Energy Statistical Yearbook 2014.

Table 11- Calculation of the OM Emission Factor for the SCPG in 2013

Fuel	Unit	Fuel Consumption in the CSPG E	Emission Factor ($kgCO_2/TJ$) F	Average NCV ($MJ/t,km^3$) G	CO_2Emission (tCO_2e) I=G*F*E/100000(in mass) I=G*F*E/10000 (in volume)
Raw coal	10^4 Tons	22,437.71	87,300	20,908	409,548,430
Clean coal	10^4 Tons	1.04	87,300	26,344	23,918
Other washed coal	10^4 Tons	1,361.43	87,300	8,363	9,939,663
Briquettes	10^4 Tons	171.26	87,300	20,908	3,125,955
Coke	10^4 Tons	0	95,700	28,435	0
Gangue	10^4 Tons	539.81	87,300	8,363	3,941,098
Coke oven gas	10^8 m^3	8.51	37,300	16,726	530,922
Blast Furnace	10^8 m^3	174	219,000	3,763	14,339,288
Converter Gas	10^8 m^3	11.07	145,000	7,945	1,275,292
Other gas	10^8 m^3	1.83	37,300	5,227	35,679
Crude oil	10^4 Tons	0.02	71,100	41,816	595
Gasoline	10^4 Tons	0	67,500	43,070	0
Diesel oil	10^4 Tons	5.61	72,600	42,652	173,716
Fuel oil	10^4 Tons	19.79	75,500	41,816	624,792
Naphtha	10^4 Tons	0	72,600	43,906	0
Lubricants	10^4 Tons	0	71,900	41,398	0
Paraffin Waxes	10^4 Tons	0	72,200	39,934	0
White Spirit	10^4 Tons	0	72,200	42,945	0
Bitumen Asphalt	10^4 Tons	0	69,300	38,931	0
Petroluem Coke	10^4 Tons	17.27	82,900	31,947	457,380
LPG	10^4 Tons	0	61,600	50,179	0
Refinery gas	10^4 Tons	1.57	48,200	46,055	34,852
LNG	10^4 Tons	168.71	54,300	51,434	4,711,84547
Natural gas	10^8 m^3	36.42	54,300	38,931	7,699,018
Other petroleum	10^4 Tons	0.65	72,200	41,816	19,624
Other coking products	10^4 Tons	0	95,700	28,435	0
Other E (standard coal)	10^4 Tons	156.15	0	0	0
Emission of electricity from the Central China Power Grid		0.9291tCO_2e/MWh×12,007,880 MWh = 11,156,521tCO_2e			
Emission of electricity from the Eastern China Power Grid		0.8222tCO_2e/MWh×22,000 MWh = 18,088tCO_2e			
Total Emission (Q)		467,656,441 tCO_2e			
Supply to SCPG (P)		539,749,940 MWh			
OM Emission Factor [= Q/P]		0.8664 tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2014; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy Table 1.4, p. 123-1.24.

Table 12-Full-wighted Average OM 3 years of the SCPG

Years	2011	2012	2013
Total CO_2 Emission (tCO_2e)	478,226,638	456,483,853	467,656,441
Total supply (MWh)	521,936,680	503,685,070	539,749,940
Full-weighted average OM	= (478,226,638+456,483,853+467,656,441) / (521,936,680+503,685,070+539,749,940) = 0.8959tCO_2e/MWh		

Table13–Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission

Fuel		Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Hainan E	Subtotal F=A+B+C +D+E+F	Average NCV (kJ/kg, kJ/m^3) G	Emission Factor ($kgCO_2$/TJ) H	CO_2 Emission (tCO_2e) J=F×G×H× I/100,000	Ratio %
Coal	Raw coal	10^4tons	11,458.81	3,105.02	4,372.74	2,706.19	794.95	22,437.71	20,908	87,300	409,548,430	-
	Clean coal	10^4tons	0	0	0	1.04	0	1.04	26,344	87,300	23,918	-
	Other washed coal	10^4tons	0	1341.3	0	20.13	0	1,361.43	8,363	87,300	9,939,663	-
	Briquettes	10^4tons	171.26	0	0	0	0	171.26	20,908	87,300	3,125,955	
	Gangue	10^4 Tons	433.9	0	79.03	26.88	0	539.81	8,363	87,300	3,941,098	
	Coke	10^4tons	0	0	0	0	0	0	28,435	95,700	0	-
	Other coking products	10^4tons	0	0	0	0	0	0	28,435	95,700	0	-
	Total	10^4tons	-	-	-	-	-	-	-	-	**426,579,064**	**93.45%**
Oil	Crude oil	10^4tons	0.02	0	0	0	0	0.02	41,816	71,100	595	-
	Gasoline	10^4tons	0	0	0	0	0	0	43,070	67,500	0	-
	Diesel Oil	10^4tons	1.99	0.51	2.29	0.79	0.03	5.61	42,652	72,600	173,716	-
	Fuel oil	10^4tons	19.72	0.07	0	0	0	19.79	41,816	75,500	624,792	-
	Petroleum coke	10^4tons	17.27	0	0	0	0	17.27	31,947	82,900	457,380	-
	Other petroleum products	10^4tons	0.65	0	0	0	0	0.65	41,816	72,200	19,624	-
	Total	-	-	-	-	-	-	-	-	-	**1,276,106**	**0.28%**
Gas	Natural gas	10^7 m^3	32.09	0.1	0	0	4.23	36.42	38,931	54,300	7,699,018	-
	LNG	10^4Tons	168.56	0.12	0	0	0.03	168.71	51,434	54,300	4,711,845	
	Coke oven gas	10^7 m^3	0	4.65	2.18	1.68	0	8.51	16,726	37,300	530,922	
	Blast Furnace	10^7 m^3	19.74	58.46	18.54	77.26	0	174	3,763	219,000	14,339,288	

	Converter Gas	10^7 m^3	2.13	3.31	0	5.63	0	11.07	7,945	145,000	14,339,288	
	Other gas	10^7 m^3	0	0	1.83		0	1.83	5,227	37,300	35,679	-
	LPG	10^4tons	0	0	0	0	0	0	50,179	61,600	0	-
	Refinery gas	10^4tons	1.57	0	0	0	0	1.57	46,055	48,200	34,852	-
	Total	-		-	-	-	-	-	-	-	**28,626,894**	**6.27%**
				-	-	-	-	-	-			
Other Energy		10^4tons	0	100.38	0	44.23	11.54	156.15	0	0	0	
Total											**456,482,065**	**100%**

Data sources: China Energy Statistical Yearbook 2014, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy Table 1.4, p. 123-1.24.

Table14–Calculation of the Emission Factor for Coal-fired, oil-fired and Gas-fired Power

	Variable	Supply Efficiency J	Emission Factor for fuel ($kgCO_2/TJ$) F	Emission Factor (tCO_2e/MWh) =3.6/J/1000000*F
Coal-fired	$EF_{Coal,Adv}$	42.0%	87,300	0.7483
Gas-fired	$EF_{Gas,Adv}$	52.9%	54,300	0.3695
Oil-fired	$EF_{Oil,Adv}$	52.9%	75,500	0.5138

The emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.72389tCO_2e/MWh.$$

Table15–The Installed Capacity of the SCPG 2013

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Subtotal
Thermal power(MW)	64,880	15,420	24,330	13,940	3,750	122,320
Hydro power(MW)	13,190	15,820	19,080	44,090	830	93,010
Nuclear power(MW)	6,120	0	0	0	0	6,120
Wind power and other(MW)	1,784	162	1,350	1,760	389	5,445
Total (MW)	85,974	31,402	44,760	59,790	4,969	226,895

Data Source: China Energy Statistical Yearbook 2014

Table16–The Installed Capacity of the SCPG 2012

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Subtotal
Thermal power(MW)	57,520	14,910	13,850	21,860	3,880	112,020
Hydro power(MW)	13,060	15,360	33,060	17,280	810	79,570
Nuclear power(MW)	6,120	0	0	0	0	6,120
Wind power and other(MW)	1,401	100	1,340	960	320	4,121
Total (MW)	78,101	30,370	48,250	40,100	5,010	201,831

Data Source: China Energy Statistical Yearbook 2013

Table17–The Installed Capacity of the SCPG 2011

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Subtotal
Thermal power(MW)	56,350	11,770	20,300	11,360	3,150	102,930
Hydro power(MW)	13,020	15,260	18,660	28,420	810	76,170
Nuclear power(MW)	6,120	0	0	0	0	6,120
Wind power and other(MW)	748	50	40	690	275	1,803
Total (MW)	76,238	27,080	40,470	39,000	4,235	187,023

Data Source: China Energy Statistical Yearbook 2012.

Table18–The Installed Capacity of the SCPG 2010

Installed Capacity	Guangdong	Guangxi	Guizhou	Yunnan	Hainan	Subtotal
Thermal power(MW)	52,870	10,390	17,530	11,330	2,970	95,090
Hydro power(MW)	12,600	14,940	16,550	24,350	750	69,190
Nuclear power(MW)	5,030	0	0	0	0	5,030
Wind power and other(MW)	620	0	0	360	210	1,190
Total (MW)	71,120	25,330	36,040	34,080	3,930	170,500

Data Source: China Energy Statistical Yearbook 2011.

Table19–The Calculation of BM Emission Factor for the SCPG

	2013	2012	2011	2010	New addition 2010-2013	New addition 2011-2013	New addition 2012-2013	The Ratio in new addition
Thermal power(MW)	122,320	112,020	102,930	95,090	29,334	21,180	11,182	50.40%
Hydro power(MW)	93,010,	79,570	76,170	69,190	23,520	16,840	13,440	40.41%
Nuclear power(MW)	6,120	6,120	6,120	5,030	1,090	0	0	1.87%
Wind power (MW)	5,445	4,121	1,803	1,190	4,255	3,642	1,324	7.31%
Total(MW)	226,895	201,831	187,023	170,500	58,199	41,662	25,946	100%
Ratio of installed capacity in 2008	-	-	-		25.65%	18.36%	11.44%	

$EF_{grid,BM,y}$=0.72389×50.40%=0.3648tCO_2/MWh

The baseline emission factor was calculated as the weighted average of the OM Emission Factor (0.8959tCO_2e/MWh) and the BM Emission Factor (0.3648tCO_2e/MWh). According to the "*Tool to calculate the emission factor for an electricity system" Version 06.0* the defaults weights of OM Emission Factor and the BM Emission Factor during the second crediting period for the hydropower projects are used as 0.25 and 0.75 respectively. So the Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) is 0.497575tCO_2e/MWh.

Appendix 5. Further background information on monitoring plan

See Section B.7.3.

Appendix 6. Summary report of comments received from local stakeholders

See Section E.2.

Appendix 7. Summary of post-registration changes

Not applicable.