Project design document form for CDM project activities

(Version 08.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Sichuan Baishuijiang Duonuo Hydropower Project
Version number of the PDD	3.0
Completion date of the PDD	30/10/2016
Project participant(s)	Jiuzaigou Hydropower Development Co. LTD Deutsche Bank AG, London Branch
Host Party	People's Republic of China
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 12.3.0)
Sectoral scope(s) linked to the applied methodology(ies)	Sectoral Scope 1: energy industries (renewable-/non-renewable sources)
Estimated amount of annual average GHG emission reductions	284,491 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Sichuan Baishuijiang Duonuo Hydropower Project (hereinafter referred to as the "Project") is invested and developed by Jiuzaigou Hydropower Development Co.LTD ("PP").

The project is a diversion type of hydropower project with a yearly regulation reservoir located on the Baishui river, one of the upbranches of Bailong river in the Jiuzhaigou County, A Ba Autonomous Prefecture of Sichuan Province, P. R. China. It has an installed capacity of 100 MW and is expected to supply an annual average of 392,727MWh electricity to the Central China Power Grid ("CCPG") which is dominated by thermal power. Within the project activities, two sets of water turbine and generating units, which are made and supplied by a domestic manufacturer, will be installed at the site with a total generation capacity of 100MW (2*50MW). Therefore, the scenario of electricity supply by the CCPG without the project is the scenario existing prior to the start of the implementation of the project activity, and is also the baseline scenario to the project activity.

The purpose of the project is to produce electricity with clean and renewable water sources and to displace part of the electricity from fossil fuel-fired plants connected to the CCPG. There is no greenhouse gases ("GHG") identified in the project activity since the power density of the project is 56.82W/m^2, greater than 10W/m^2. Thus, GHG emission reductions can be achieved. The estimated annual GHG emission reductions are 284,491tCO_2 equivalents by the project activity and a total 1,991,437tCO_2e in the first 7-year renewable crediting period.

The proposed project will contribute to sustainable development to the local society with the following aspects.

- Supply clean electricity to the grid and reduce GHG emissions.
- Create job opportunities over the project construction and operation period.
- Support underprivileged and the poverty-stricken region and increase local incomes.
- Reduce emissions of environmental pollutants, such as the CO_2, CO, SO_2 and dust derived from thermal power plants.

A.2. Location of project activity

A.2.1. Host Party

>>
People's Republic of China

A.2.2. Region/State/Province etc.

>>
Sichuan Province

A.2.3. City/Town/Community etc.

>>
Jiuzhaigou County, A Ba Autonomous Prefecture

A.2.4. Physical/Geographical location

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The project is located on Baishui river, an upstream branch of the Bailong river. The geographical coordinate of the dam is 103.7808°E and 33.6131°N and the powerhouse is 103.9206°E and 33.5603°N.

The geographical location of the project is shown in the following figure:

Figure A.2.1. Location of Sichuan Baishuijiang Duonuo Hydropower Project

A.3. Technologies and/or measures

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Prior to the implementation of the project activity, electricity was supplied by the CCPG which is dominated by thermal power. This is the baseline scenario to the project activity.

The project is a diversion type of hydropower station with the power density 56.82W/m^2. The technology to be employed by the project is the state-of-the-art francis turbine manufactured by a

domestic company. The installed two sets of turbines and generators are designed to run 3947 hours annually. The plant load factor (PLF) of the project is 45.06%.

The project will consist of a reservoir, headrace tunnel, power house, booster station, and so on. The project will be connected to the CCPG by a transmission line. The monitoring equipment involved in the project activity installed at the substation of Heihetang hydropower station and the project site, detailed information of the meters is described in section B.3 and B.7.2.

The specific technical data of the project are listed in the table below.

Table A.3.-1 Technical Data

Parameter	Unit	Data
Power density	W/m^2	56.82
Turbine		
Units		2
Model		HL(EF)-LJ-220
Rated head	m	305
Rated flow	m^3/s	18.43
Rated speed	r/min	500
Generator		
Units		2
Model		SF-J50-12/4450
Rated power	MW	50
Rated voltage	kV	13.8
Operational lifetime	year	30

According to the applicable methodology, since the power density of the project is 56.82 W/m^2, greater than 10 W/m^2, CH_4 are negligible, and no other GHG is involved in the project activity. The electricity generated by the project will be delivered to the CCPG except a small quantity which will be utilized on-site for the operation and maintenance of equipments, or during shut down periods etc.

The project will use domestic modern equipment and technology. There is no overseas technology introduced for the project.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Jiuzaigou Hydropower Development Co.LTD	No
United Kingdom of Great Britain and Northern Ireland	Deutsche Bank AG, London Branch	No

A.5. Public funding of project activity

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There is no public fund from parties included in Annex I of the UNFCCC involved in this project activity.

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

B.1. Reference of methodology and standardized baseline

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- ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 12.3.0)
- Tool for the demonstration and assessment of additionality (version 06.1.0)
- Tool to calculate the emission factor for an electricity system (version 02.2.1)

Above methodologies and Tools are available at
http://cdm.unfccc.int/methodologies/PAmethodologies/approved

B.2. Applicability of methodology and standardized baseline

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The project meets all the applicability criteria as set out in the methodologies.

- It is a new 100MW grid-connected hydropower plant.
- The project is a hydropower plant that results in a new reservoir, and the power density of the project is 56.82W/m^2, greater than 10W/m^2.
- It is not an activity that involves switching from fossil fuels to renewable energy at the project site.
- The geographic and system boundaries for the CCPG can be clearly identified and information on the characteristics of the grid is available.

The project activity corresponds to the criteria described above and is therefore applicable to ACM0002.

B.3. Project boundary

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The project will generate electricity by water source and will be associated with the CCPG. As a result, the project boundary includes the project activity and all power plants connected to the CCPG, covering Henan, Hubei, Hunan, Jiangxi, Sichuan and Chongqing provincial grids.

Table B.3.-1: Sources and gases included in the project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Electricity supply by the Central China Power Grid	CO_2	Yes	Main GHG emission sources
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project scenario	The project activity	CO_2	No	Not produced by renewable energy
		CH_4	No	The power density of the project is 56.82W/m^2, greater than 10W/m^2. Therefore, it is negligible.
		N_2O	No	Not produced by renewable energy

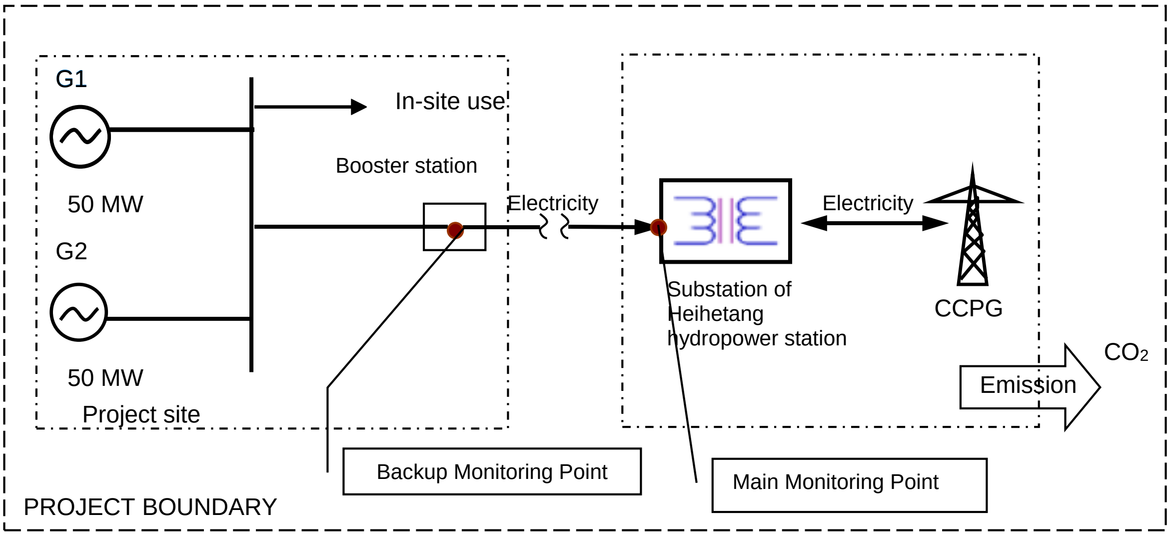

Figure B.3. Diagram of project boundary

B.4. Establishment and description of baseline scenario

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According to ACM0002 (version 12.3.0), the proposed project activity is the installation of a new grid-connected renewable power plant/unit, therefore the baseline scenario is as following:

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

The proposed project will be connected to the CCPG. In this case, the only realistic and reasonable baseline scenario is to provide the same amount of electricity by the CCPG.

B.5. Demonstration of additionality

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Prior consideration of CDM development of the project

A timeline of the main events involved in the implementation of the proposed project is described in Table B.5.-1.

Table B.5.-1 Milestone of the Project

Date	Main Events

March 2006	The Preliminary Design Report (PDR) was completed by Chengdu Hydroelectric Investigation & Design Institute.
May 2006	The Environmental Impact Assessment (EIA) was completed by Chengdu Hydroelectric Investigation & Design Institute.
July 19th, 2006	The EIA was approved by Sichuan Provincial Environment Protection Bureau.
July 21st, 2006	The board meeting was held for the pending of the project's implementation due to its financial barriers and the considering the CDM.
August 1st, 2006	The PDR was approved by Sichuan Development and Reform Commission (SDRC).
June 4th, 2007	The board meeting was held for deciding the investment of this new project and the application for the CDM.
March 2nd, 2009	The PP informed the NDRC as China's DNA in writing of the commencement of the project activity and of their intention to seek CDM status in accordance with *Guidance on the demonstration and assessment of prior consideration of the CDM* (version 01) issued at EB41 which requires the PP inform a Host Party DNA and/or the UNFCCC secretariat.
July 6th, 2009	The construction contract was signed between the PP and the construction company. This is determined as the starting date of the project activity.
September 3rd, 2009	The construction works of the project started.
July 28th, 2010	The equipment purchase contract was signed.
November 2nd, 2010	According to the version 02 of *Guidance on the demonstration and assessment of prior consideration of the CDM* issued at EB48, the PP additionally informed the UNFCCC secretariat in writing of the prior consideration of the CDM.
March 14th, 2011	An intention letter of the project CERs sales and purchase was signed between the PP and a buyer candidate.
March 7th, 2012	The ERPA was finally signed between the PP and Deutsche Bank.
April 28th, 2012	The PDD was publicly available on the UNFCCC CDM website.

The events outlined in above timeline clearly demonstrate that the project owner took the CDM support into serious consideration in the decision to implement the project activity. And the project owner took successive actions to secure the CDM application in parallel with the construction works of the project. The project will be put into operation in December 2012.

The following steps from the "Tool for the *demonstration and assessment of additionality* (version 06.1.0)" are taken to demonstrate the additionality of the project.

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

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

According to ACM0002 (version 12.3.0), the proposed project activity is the installation of a new grid-connected renewable power plant/unit. For providing the same amount of electricity, the baseline scenario of the project can be selected from the following four alternatives:

- Alternative 1: Implementing the proposed project, but not as a CDM project;
- Alternative 2: Adding a new thermal plant providing the same annual electricity output;
- Alternative 3: Adding a new renewable power plant other than hydropower providing the same annual electricity output;
- Alternative 4: Providing the same amount of electricity by the CCPG.

Where the project is located is lacking of other renewable sources except water source. According

to the analysis on the wind power source in China, Sichuan province is one of the regions where available wind power is limited[1]. Moreover, solar energy and biomass based power generation cost is too high to gain investment attraction. Therefore, Alternative 3 is not the alternative to the proposed project activity.

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

According to Chinese power regulations, thermal power plants of less than 135MW are prohibited for construction in the areas covered by regional grids. Therefore, Alternative 2 is not in compliance with Chinese regulations on construction of a thermal plant and is not the baseline scenario to the project.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

The proposed project will have proceeds from power sales as well as from emission reduction credits, so Option I-Simple Cost Analysis stated in *Tool for the demonstration and assessment of additionality* (version 06.1.0) is not applicable.

Furthermore, the alternative of providing the same amount of electricity by the CCPG is not a specific investment project. Therefore, Option II-Investment Comparison Analysis is not applicable.

As a result, Option III-Benchmark Analysis must be used, where the project IRR of total investment is compared with the benchmark IRR of total investment applicable to the power industry sector in China. Here, the benchmark analysis is selected.

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

With reference to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*[2], the financial benchmark IRR of the total investment in Chinese power industries is 8% (after tax).

Therefore, the benchmark IRR of total investment of 8% (after tax) is selected for financial analysis of the project.

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

The following parameters and values are applied for the calculation and comparison of financial indicators, IRR.

Table B.5.-2 Parameters to determine the project IRR

Item	Value	Unit	Source
Capacity	100	MW	PDR
Total static investment	1,053.8646	million CNY	PDR
Operational and maintenance costs per year	19.11	million CNY	PDR
Annual output to the grid	392,727	MWh	PDR
Tariff (without VAT)	0.246	CNY/kWh	National policies
Value Added Tax (VAT)	17	%	PDR
City construction and maintenance tax	5	%	PDR
Educational surcharge	3	%	PDR
Income tax	15	%	PDR
Depreciation rate	4	%	PDR

[1] http://wenku.baidu.com/view/611b4688d0d233d4b14e698a.html
[2] China Electric Power Press, 2003

Depreciation year	25	year	PDR
Residual rate	0	%	PDR
Project operational lifetime	30	year	PDR

The financial analysis for the proposed project is shown in the table below, with and without CERs taken into account. The calculated IRR value of the project without CERs would be 5.49% which is far below the financial benchmark 8%. Thus without CERs revenue, it is evident that this project will face substantial financial hurdles and cannot be implemented.

After taking CERs revenue into consideration, the project's IRR of total investment can reach 8.36%, greater than the benchmark 8%. Therefore, this project is feasible and can be implemented.

Table B.5.-3 Financial analysis results of the proposed project

	IRR (%)
Without CERs	5.49
With CERs	8.36

Sub-step 2d: Sensitivity analysis:

A sensitivity analysis is conducted by altering the parameters: investment, operation & maintenance costs, electricity sales, and electricity tariff.

The above parameters are selected as being most likely to fluctuate over time. Financial analysis is performed altering each of these parameters by 10%, and assessing the impact on the project IRR as shown in Figure B.5.-1 below.

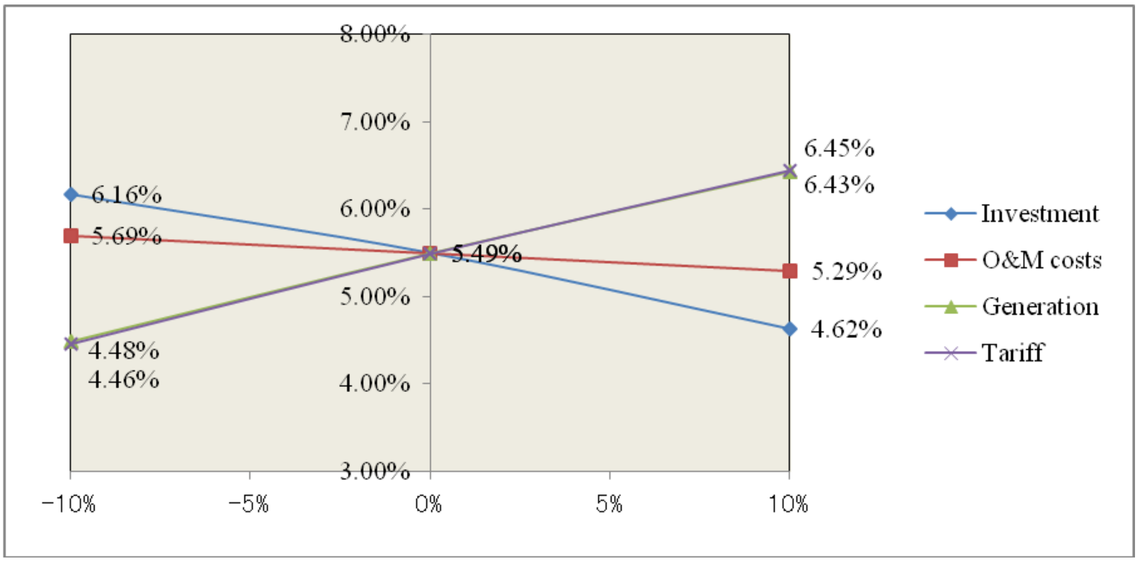

Figure B.5.-1 Sensitivity analysis of the project

Figure B.5.-1. shows that in the case of the fluctuation in investment, O&M costs, net electricity generation, and electricity tariff by 10%, the project IRR is still lower than the 8% benchmark. In addition, Figure B.5.-1 also shows that no matter by altering electricity sales or electricity tariff, their impacts on the project are sensitively the same.

Alternatively, when the project IRR is equal to the benchmark, the changes of critical parameters are shown in Table B.5.-4 below.

Table B.5.-4 Parameter variation when project IRR is equal to the benchmark

Change of parameters	Investment	O&M costs	Electricity	Electricity

			generation	tariff
Project IRR = Benchmark	-23.4%	-140.5%	28.9%	28.6%

It shows that when the project IRR is equal to the benchmark, the investment or O&M costs need to be decreased by 23.4% and 140.5%, respectively, or electricity generation increased by 28.9%, or electricity tariff increased by 28.6%, all of which are unlikely to occur.

Until now, the amount summarized from the signed contracts of the project has already reached 112% against the estimate in the PDR, it is therefore impossible for the decrease of the total investment by 23.4%.

As for the decrease of O&M costs by 140.5%, it is unlikely to occur due to the continuous increase in material and labor costs etc. in the host country of the proposed project. According to the National Bureau of Statistics of China, the procurement price index for material, fuel and power was increased by 8.3%[3], 6.0%[4], 4.4%[5], 10.5%[6] and 9.6%[7] nationwide, and by 9.3%[8], 4.3%[9], 5.7%[10], 12.4%[11] and 6.1%[12] in Sichuan province during 2005, 2006, 2007, 2008 and 2010, respectively. Although it was decreased by 7.9%[13] and 4.7%[14] in 2009, it shows an increasing trend as a whole.

As for the net electricity generation which was calculated based on the water resource data collected during the past 40 years (1966~2006)[15], the amount of electricity generation is most unlikely to be increased in the project activity in normal condition. All water data which were used for the design of the project capacity came from the hydrometrical station.

As for the electricity tariff, if it increases by 28.6%, that is 0.370 CNY/kWh (incl. VAT), the project IRR would be equal to the benchmark 8%. According to the "Information note on the highest tariffs applied by the Executive Board in its decisions on registration of projects in the People's Republic of China" (Version 02), published by the CDM EB on June 3rd, 2011, the highest applicable tariff in Sichuan province for reservoir type hydro projects with a capacity equal to or more than 50MW is 0.288 CNY/kWh (incl. VAT)[16]. In addition, the grid price after the project operation is regulated by the government, and Chinese government will make the grid price steady since it is related tightly to the national economy and livelihood of people. Therefore, the increase in the project electricity tariff by 28.6% is unlikely to occur and the proposed project is firmly lacking of financial attractiveness within the reasonable range of tariff.

In sum, the above sensitivity analysis by altering four critical parameters clearly demonstrates that without CDM support, the proposed project cannot be implemented.

Step 3: Barriers analysis

The proposed project is additional in terms of financial attractiveness and is applicable to Step 2. Therefore, Step 3 is not developed.

[3] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm
[4] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20070228_402387821.htm
[5] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20080228_402464933.htm
[6] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20090226_402540710.htm
[7] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20110228_402705692.htm
[8] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[9] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[10] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[11] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[12] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[13] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20100225_402622945.htm
[14] http://www.sc.stats.gov.cn/sctj/Default.htm?status=Main&menu=4&sub=5,false
[15] Capacity Expansion Report
[16] http://cdm.unfccc.int/Reference/Notes/reg_note07.pdf

Step 4: Common practice analysis

Sub-step 4.1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity;

The capacity ranging from 50MW to 150MW (+/-50% of the installed capacity of the proposed project as 100MW) is selected for the proposed project activity.

Sub-step 4.2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in above Sub-step 4.1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and undergoing validation shall not be included in this step:

The applicable geographical area as Sichuan province was selected instead of the host country China which was set to be default i according to paragraph 5 in the *Tool for the demonstration and assessment of additionality* (version 06.1.0) because the investment climate[17,18], subsidies or other financial flows[19,] tariff[20] and promotional policies[21,22,23] are quite different among provinces.

Therefore, two categories of projects are identified in this step:

Category 1: Hydropower projects between 50MW~150MW in Sichuan Province. Note their number N_{C1}.

Category 2: Power generation projects other than hydropower projects in Sichuan province. Note their number N_{C2}.

For Category 1 projects, 17 hydropower projects in Sichuan province are identified with the installed capacity between 50 MW and 150 MW and starting commercial operation before July 6th, 2009 (the starting date of the proposed project) as recorded in the Yearbook of China Water Resources (only version 2003~2011 being sourced because China's power industry started a reform in 2002 which changed the investment climate), which is authoritative data source publicly accessible for the PP. So, N_{C1}=17. The information of the hydropower projects identified is shown in Table B.5.-5 below.

Table B.5.-5 Hydropower projects with the installed capacity of 50MW~150MW starting commercial operation before July 6th, 2009 in Sichuan province

No.	Name of Hydropower Station	Installed Capacity (MW)[24]	Commercial Operation Starting Year
1	Hongyanzi Hydropower Station[25]	90	2001
2	Mahui Hydropower Station[26]	66.1	1979
3	Chengdong Hydropower Station[27]	84	2000
4	Caoyutan Hydropower Station[28]	75	1994
5	Xuanjianghankou Hydropower Station[29]	51	1990

17 http://www.hydrochina.com.cn/zgsd/zgsd_gh.jsp
18 http://www.hydrochina.com.cn/zgsd/zgsd_zy.jsp
19 http://news.xinhuanet.com/energy/2011-10/22/c_122186257.htm
20 http://www.sdpc.gov.cn/zcfb/zcfbtz/2011tz/t20110602_416528.htm
21 http://www.gov.cn/gzdt/2008-11/25/content_1159116.htm
22 http://www.envir.gov.cn/info/2002/11/117693.htm
23 http://www.chinabaike.com/law/zy/xz/bgt/1336813.html
24 China Water Resource Yearbook, 2003 -2010
25 http://www.people.com.cn/GB/paper39/3091/411923.html
26 http://www.wccdaily.com.cn/0010/09/xbs10.html
27 http://www.cdt-sc.com/comprofile.asp?PID=4I3N8M8I11007424374I30A&nav=4
28 http://www.msxh.com/content/2008-4/3/200843163059.htm
29 http://www.dzrbs.com/2008/0814/83629.html

6	Yucheng Hydropower Station [30]	60	1995
7	Tongtou Hydropower Station [31]	80	1996
8	Tongzhong Hydropower Station [32]	57	2001
9	Daqiaoshuiku Hydropower Station [33]	100	2000
10	Yangcun Hydropower Station[34]	66	2001
11	Jiangsheba Hydropower Station [35]	128	2005
12	Huilongqiao Hydropower Station [36]	50	2004
13	Kehe Hydropower Station [37]	72	2006
14	Wanbahe II Hydropower Station [38]	66	2006
15	Zhugeduo Hydropower Station [39]	80	2007
16	Jinkang Hydropower Station [40]	150	2006
17	Hongba Hydropower Station [41]	100	2005

As analyzed above, the number of projects which meet the requirements is $N_{all}= N_{C1}+ N_{C2}=17+ N_{C2}$.

Sub-step 4.3: Within plants identified in Sub-step 4.2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

The power industry in China underwent a significant suit of reforms in 2002[42]. First of all, under the reform, the China State Power Corporation was diversified into five separate region grids in 2002[43]. Secondly, there were changes to the existing electricity tariff mechanisms[44]. As a result, the investment environment of power production projects in China changed significantly in 2002. Therefore, those projects started construction before 2002 should also be seemed as those applying different technology from the proposed project.

Accordingly, the hydropower projects with installed capacity of 50MW ~150MW which have started operation since 2002 and before July 6th, 2009 are further selected below:

Table B.5.-6 Hydropower projects with the installed capacity of 50MW~150MW starting operation between 2002 and July 6th, 2009 in Sichuan province

[30] http://baike.baidu.com/view/4390006.htm
[31] http://www.dam.com.cn/damView/view.jsp?id=1124
[32] http://baike.baidu.com/view/4390967.htm
[33] http://power.in-en.com/html/power-0759075996223205.html
[34] http://finance2.ce.cn/finance/stock/gongsigaikuang/getBulletin.action?id=200203
[35] http://www.cqvip.com/Read/Read.aspx?id=20877304
[36] http://baike.baidu.com/view/3325397.htm
[37] http://baike.baidu.com/view/5263178.htm
[38] http://baike.baidu.com/view/1970532.htm
[39] http://www.zsyzw.cn/news/12/193/886/list/167209.htm
[40] http://xhjy.xhu.edu.cn/news.asp?id=5787
[41] http://baike.baidu.com/view/4390935.htm
[42] See "Electric Power Reform", 2003 Yearbook of China Electric Power, Page 10-14.
[43] The first reform consisted of the reorganisation of the power companies in order to break the monopoly of the China State Power Corporation and ensure fair competition, and to separate generation from transmission. The second one consisted in the bureaucratic centralisation of the power sector through the inclusion of the State Economic and Trade Commission in the National Development and Reform Commission (NDRC), which then opened a renewable energy department under the Energy Bureau, thereby enabling the creation of coherent policies in the power sector. Source: Lemaa, A and Rubyb K. (2007) Between fragmented authoritarianism and policy coordination: Creating a Chinese market for wind energy, Energy Policy, 35, 3879-3890. Also see:
http://english.people.com.cn/200204/12/eng20020412_93913.shtml
[44] Electricity tariff was made up according to local demands and grid structure and is divided into tariff of electricity to grid, transmission tariff, distribution tariff and sales tariff. Sections 17-22, 2003 Yearbook of China Electric Power, Page 11-12.

No.	Name of Hydropower Station	Installed Capacity (MW)[45]	Commercial Operation Starting Year	Operating Hours (h)	Unit Investment Cost (CNY/KW)
1	Jiangsheba Hydropower Station [46]	128	2005	6090	5625
2	Huilongqiao Hydropower Station [47]	50	2004	5021	5360
3	Kehe Hydropower Station [48]	72	2006	5200	4723
4	Wanbahe II Hydropower Station [49]	66	2006	4833	5379
5	Zhugeduo Hydropower Station [50]	80	2007	5013	5183
6	Jinkang Hydropower Station [51]	150	2006	5230	6480
7	Hongba Hydropower Station [52]	100	2005	5122	4679

Jiangsheba Hydropower Station is located on main stream of Minjiang which has better water resources and development conditions. The proposed project is located on Baishui river, which is merely a branch of the Bailong river, and is categorized presumably to more difficult to develop for a hydropower project. The annual operating hour of Jiangsheba Hydropower Station is 6090h which is higher than that of the proposed project.

The operation hour for Huilongqiao Hydropower Station, Kehe Hydropower Station, Wanbahe II Hydropower Station, Zhugeduo Hydropower Station, Jinkang Hydropower Station, and Hongba Hydropower Station are 5021h, 5200h, 4833h, 5013h, 5230h and 5122h, respectively, which are much longer than 3947h of the proposed project. The operating hours of the project was determined depending on the historical mean river flow of 17.7 m^3/s collected during the past 40 years (1966~2006). Compared with two other operated hydropower stations which are Shuanghe Hydropower Station [53] and Qinglong Hydropower Station [54] along the Baishuijiang River, the operating hours of proposed project activity is reasonable for the reason that the proposed project is the first cascading hydropower station and will increase the electricity of downstream hydropower stations. Consequently, less electricity will be generated by the proposed project, which makes the project less financially attractive and more financial risks than the above projects. The differences are much more than the specified differentiation thresholds of 20%.

In addition, the unit investment costs of the projects listed in Table B.5.-6 are less than 10,539CNY/KW of the proposed project activity. This is because the project is a diversion type of hydropower station with a long headrace tunnel about 14.8km and a large reservoir area about 1,760,000m^2. The differences of investment are much more than the specified differentiation thresholds of 20%.

For Category 1 projects (hydropower), 17 projects described above within the range were found, so $N_{diff,C1}$=17.
$N_{diff,C1}$ is the number of Category 1 projects (hydropower) which apply technologies different from the proposed project technology.

For Category 2 projects (power generation projects other than hydropower) in Sichuan province, they are considered as different technologies since they are using different energy source/fuel to the project activity. So, $N_{diff,C2}$= N_{C2}.

45 China Water Resource Yearbook, 2003 -2010
46 http://www.cqvip.com/Read/Read.aspx?id=20877304
47 http://baike.baidu.com/view/3325397.htm
48 http://baike.baidu.com/view/5263178.htm
49 http://baike.baidu.com/view/1970532.htm
50 http://www.zsyzw.cn/news/12/193/886/list/167209.htm
51 http://xhjy.xhu.edu.cn/news.asp?id=5787
52 http://baike.baidu.com/view/4390935.htm
53 http://cdm.unfccc.int/Projects/DB/DNV-CUK1218627734.64/view. The operating hour of Sichuan Baishuijiang Shuanghe Hydro Power Project is 4,340h.
54 http://cdm.unfccc.int/Projects/DB/JCI1255667358.44/view. The operating hour of Sichuan Baishuijiang Qinglong Hydropower Project is 4,101h.

$N_{diff,C2}$ is the number of Category 2 projects (power generation projects other than hydropower) which apply technologies different from the proposed project technology.

Therefore, $N_{diff} = N_{diff,C1} + N_{diff,C2} = 17 + N_{C2}$ according to the above analysis.

Sub-step 4.4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

The factor $F=1-N_{diff}/N_{all}= 1- (17 +N_{C2})/ (17+ N_{C2}) = 0<0.2$
The share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same capacity as the proposed project activity is 0 which is less than 0.2.

Meanwhile, $N_{all}-N_{diff}=17+N_{C2}-(17+N_{C2}) =0<3$.

It is concluded that the proposed project is not common practice.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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According to the approved consolidated baseline methodology ACM0002 (version 12.3.0), and the *Tool to calculate the emission factor for an electricity system (version 02.2.1),* the emission reductions of the proposed project are calculated as follows:

1. Project Emissions (PE_y)

For most renewable power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for by using the following equation:

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

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

As the project is a new hydropower project, the project emissions from fossil fuel consumption ($PE_{FF,y}$) and the operation of geothermal power plants due to the release of non-condensable gases ($PE_{GP,y}$) should not be considered. For hydropower project activities that result in new single or multiple reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir ($PE_{HP,y}$), estimated as follows.

(a) If the power density of single or multiple reservoirs (*PD*) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000} \quad (2)$$

Where:
$PE_{HP,y}$ = Project emission from reservoirs of hydro power plants in year *y* (tCO_2e)
EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants

(kgCO_2e/MWh), and the default value as per EB23 is 90 kgCO_2e /MWh

TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2:

$$PE_{HP,y} = 0 \quad (3)$$

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (4)$$

Where:

PD = Power density of the project activity (W/m^2).

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plant, this value is zero.

A_{PJ} = Area of the single or multiple reservoirs 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 single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

2. Baseline Emissions (BE_y)

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (5)$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2).

$EG_{PJ,y}$ = 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).

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "*Tool to calculated the emission factor for an electricity system*"(tCO_2/MWh).

Calculation of $EG_{PJ,y}$

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \quad (6)$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh).

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh).

※ Calculation of $EF_{grid,CM,y}$ for the CCPG based on the latest *Tool to calculate the emission factor for an electricity system*

The electricity generated by the project activity will be delivered to the CCPG. The generation capacity installed will be 100MW throughout the crediting period. Data from the China Electric Power Yearbooks and China Energy Statistical Yearbooks are publicly available to calculate the Emission

Factor of the CCPG. The default values of calorific values for fuel types come from the *China Energy Statistical Yearbook 2010*, and the potential emission factor and fuel oxidation come from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Moreover, the Chinese DNA publishes the emission factor of the CCPG on its website[55].

Step 1: Identify the relevant electricity systems

The project will be connected to the CCPG, which covers Jiangxi, Henan, Hubei, Hunan, Chongqing and Sichuan provincial grids. Therefore, the CCPG is identified as the relevant electric power system. In addition, the CCPG imported electricity from the North China Power Grid ("NCPG") and the Northwest China Power Grid ("NWCPG") so the NCPG and the NWCPG will be taken into account for the calculation of the emission factor of the CCPG.

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

The ***Option I****: Only grid power plants are included in the calculation* is chosen.

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

For the recent years (2005-2009) where data is available, the low-cost/must run resources constituted less than 50% of total power generation of the CCPG and the relevant ratios are respectively 38.60%, 35.12%, 35.46%, 39.50% and 37.87% for the years 2005, 2006, 2007, 2008 and 2009[56]. In this case, method (a) Simple OM is adopted for the project.

Under method (a), ex ante option is selected, the emission factor is determined once at the validation stage, thus no monitoring and recalculate the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

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_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants. It may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system

The project adopts Option B due to the following reasons,

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)

Where Option B is used, the simple OM emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_y} \qquad (7)$$

[55] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

[56] China Electric Power Yearbook (2006-2010)

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh).
$FC_{i,y}$	= Amount of fossil fuel type i consumed in the project electricity system in year *y* (mass or volume unit).
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel i in year *y* (GJ/ mass or volume unit).
$EF_{CO2,i,y}$	= CO_2 emission factor of fossil fuel type i in year *y* (tCO_2/GJ).
EG_y	= Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh).
i	= All fossil fuel types combusted in power sources in the project electricity system in year *y*.
y	= The relevant year as per data vintage chosen in Step 3.

According to the above steps and the emission factor of the CCPG published by the Chinese DNA on its website, a 3-year average Simple OM emission factor of the CCPG is:

$EF_{grid,OMsimple,y}$ = 1.0297 tCO_2/MWh (See Annex 3 for details)

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

In terms of vintage of data, two options can be used. Here we choose ***Option 1*** for this project. 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 the emission factor during the crediting period.

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 ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, 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 ($AEG_{SET-\geq 20\%}$, in MWh);

(c) From $SET_{5-units}$ 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. In this case ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation

of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

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

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (8)$$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year *y* (tCO_2/MWh).
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh).
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year *y* (tCO_2/MWh).
m	= Power units included in the build margin.
y	= Most recent historical year for which power generation data is available.

In China, data on either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system's annual electricity generation are classified as business confidential and are not publicly available. Therefore, EB accepted the following deviations[57]:

- Use of capacity additions during last 1~3 years for estimating the build margin emission factor for grid electricity.
- Use of weights estimated using installed capacity in place of annual electricity generation.

EB also suggests using the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

According to the data published by Chinese DNA[58], the generating systems with a capacity of over 600MW represent the most advanced technology commercially used in domestic coal-fired plants. The power plants capacity additions in the electricity system comprise more than 20% of the system generation. The combined cycle technology with a capacity of 200MW stands for the most advanced technology used in thermal plants fired by gas or oil in China. Therefore, the BM emission factor of the CCPG is calculated using the data from 2007~2009, based on the above best technology

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

[58] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

commercially available at the time of this PDD submission.

The calculation procedures are shown below.

$$\lambda_{Coal,y}=\frac{\sum_{i\in COAL,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}}{\sum_{i,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}} \tag{9}$$

$$\lambda_{Oil,y}=\frac{\sum_{i\in OIL,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}}{\sum_{i,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}} \tag{10}$$

$$\lambda_{Gas,y}=\frac{\sum_{i\in GAS,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}}{\sum_{i,j}F_{i,j,y}\times NCV_{i,y}\times EF_{CO_2,i,j,y}} \tag{11}$$

Where:

λ_{coal}, λ_{oil} and λ_{gas}	= The proportion of CO_2 emission of the solid, liquid and gas fuel in the total emission, respectively.
$F_{i,j,y}$	= The amount of fuel i consumed by relevant power sources *j* in year *y* (mass or volume, tonnes for solid and liquid fuel, and m^3 for gas fuel).
$NCV_{i,y}$	= The net calorific value of a fuel i in year *y* (GJ/t for solid and liquid fuel, and GJ/m^3 for gas fuel).
$EF_{CO2,i,j,y}$	= The CO_2 emission factor of fuel *i* (tCO_2/GJ).
COAL, OIL and GAS	= The mark aggregation of solid fuel, liquid fuel and gas fuel, respectively.

$$EF_{Thermal,y}=\lambda_{Coal,y}\times EF_{Coal,Adv,y}+\lambda_{Oil,y}\times EF_{Oil,Adv,y}+\lambda_{Gas,y}\times EF_{Gas,Adv,y} \tag{12}$$

$EF_{Thermal,y}$ is the emission factor of thermal power plant. $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ represent the CO_2 emission factor of the most advanced technology commercially used in coal-, oil- and gas-fired plants in China, respectively.

$$EF_{grid,BM,y}=\frac{CAP_{Thermal,y}}{CAP_{Total,y}}\times EF_{Thermal,y} \tag{13}$$

Where:

$CAP_{Total,y}$	= Total newly capacity addition exceeds 20% on different power sources connected to the CCPG.
$CAP_{Thermal,y}$	= Newly capacity addition on thermal power sources connected to the CCPG.

According to the above steps and the emission factor of the CCPG published by Chinese DNA on its website, the BM emission factor of the CCPG is calculated as follow:

$EF_{gird,BM,y}$=0.4191tCO_2/MWh (See Annex 3 for details)

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

The weighted average CM method is applied as the preferred option as per the *Tool to calculate the emission factor for an electricity system*. $EF_{grid,CM,y}$ as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$) is expressed as:

$$EF_{CO_2} = EF_{\text{grid,CM,y}} = EF_{\text{grid,OM,y}} \times w_{OM} + EF_{\text{grid,BM,y}} \times w_{BM} \quad (14)$$

Where:

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

For hydropower project the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$) during the first crediting period. $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are calculated as described in above and are expressed in tCO_2/MWh.

The baseline emission of the project is

$$BE_y = EG_{PJ,y} \times EF_{\text{grid,CM, y}} \quad (15)$$

$EG_{PJ,y}$ is the net electricity supplied by the grid of the project (MWh). Since the project activity is the installation of a new grid-connected renewable power plant/unit, then $EG_{PJ,y} = EG_{facility,y}$。

3. Leakage Emissions (L_y)

According to ACM0002 (Version 12.3.0), leakage emissions (L_y) of the project is zero.

4. Emission reduction (ER_y)

Therefore, the emission reduction of the project is

$$ER_y = BE_y - PE_y \quad (16)$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e)
BE_y = Baseline emissions in year *y* (tCO_2)
PE_y = Project emissions in year *y* (tCO_2e)

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**$F_{i,j,y}$**
Unit	Tonnes or m^3
Description	The amount of fuel *i* consumed by relevant power sources *j* in year *y* (mass or volume, tonnes for solid and liquid fuel, and m^3 for gas fuel)
Source of data	*China Energy Statistical Yearbook (2008~2010)*
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Energy Statistical Yearbook is an authoritative publication.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$FC_{i,y}$**
Unit	Tonnes or m^3
Description	The quantity of fuel *i* (in a mass or volume unit) consumed in CCPG for power generation in year y.
Source of data	*China Energy Statistical Yearbook (2008~2010)*
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Energy Statistical Yearbook is an authoritative publication.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$NCV_{i,y}$**
Unit	GJ/t or GJ/m^3
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	*China Energy Statistical Yearbook (2008~2010)*
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Energy Statistical Yearbook is an authoritative publication.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**$EF_{CO2,i,y}$**
Unit	tCO_2/GJ
Description	CO_2 emission factor of fossil fuel type i used in power unit m in year y
Source of data	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*, volume 2, page 1.23
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	Using *2006 IPCC Guidelines for National Greenhouse Gas Inventories* value.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**Electricity Generation**
Unit	MWh
Description	Electricity generated by power plant/unit connected to the CCPG in year y
Source of data	*China Electric Power Yearbook (2008~2010)*
Value(s) applied	See Appendix 4

Choice of data or Measurement methods and procedures	China Electric Power Yearbook is an authoritative publication. The parameters of Electricity Generation and Auxiliary Power Ratio are used to calculate EG_y.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**Auxiliary Power Ratio**
Unit	%
Description	Average on-site electricity usage by all power plants connected to the provincial grids covered by the CCPG
Source of data	*China Electric Power Yearbook (2008~2010)*
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Electric Power Yearbook is an authoritative publication
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$, $EF_{Gas,Adv,y}$
Unit	tCO_2/MWh
Description	The CO_2 emission factor of the most advanced technology commercially used in coal-, oil- and gas-fired plants in China, respectively.
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value(s) applied	Coal: 0.7967; Oil: 0.3776; Gas: 0.5250 (As in Appendix 4)
Choice of data or Measurement methods and procedures	Official data from Chinese DNA
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{Total,y}$
Unit	MW
Description	Total newly capacity addition exceeds 20% on different power sources connected to the CCPG
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Electric Power Yearbook is an authoritative publication.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$CAP_{Thermal,y}$
Unit	MW
Description	Newly capacity addition on thermal power sources connected to the CCPG
Source of data	2011 Baseline Emission Factors for Regional Power Grids in China http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value(s) applied	See Appendix 4
Choice of data or Measurement methods and procedures	China Electric Power Yearbook is an authoritative publication.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	EF_{Res}
Unit	$kgCO_2e/MWh$
Description	Default emission factor for emissions from reservoirs of hydro power plants.
Source of data	Decision by EB23
Value(s) applied	90 $kgCO_2e/MWh$
Choice of data or Measurement methods and procedures	Official publication of CDM EB
Purpose of data	Calculation of project activity emissions
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero.
Source of data	Project site
Value(s) applied	0
Choice of data or Measurement methods and procedures	Since the project is a new hydro power plant, the value of zero is determined as per ACM0002 (version 12.3.0).
Purpose of data	Calculation of project activity emissions
Additional comment	-

Data / Parameter	A_{BL}
Unit	W
Description	Area of the single or multiple reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoir, this value is zero.
Source of data	Project site

Value(s) applied	0
Choice of data or Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data	Calculation of project activity emissions
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

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1. Baseline Emissions (BE_y)

The baseline emission factor is:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times 0.5 + EF_{grid,BM,y} \times 0.5$$

= 0.5×1.0297 +0.5×0.4191 = 0.7244tCO_2/MWh

Hence, the baseline emission is:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ = 392,727× 0.7244= 284,491tCO_2/year

2. Project Emissions (PE_y)

The power density of the proposed project is:

$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$ = 100,000,000/1,760,000= 56.82W/m^2

The power density of the proposed project is 56.82W/m^2, which is greater than 10W/m^2. Therefore, the project emissions are:

$PE_y = PE_{HP,y}$ = 0 tCO_2e/year

3. Leakage Emissions (L_y)

According to ACM0002, the leakage emission (L_y) of the project is zero.

4. Emission reductions (ER_y)

The emission reductions of the project are:

$ER_y = BE_y - PE_y - L_y$ = 284,491-0-0= 284,491tCO_2e/year

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)
01/01/2013-31/12/2013	284,491	0	0	284,491
01/01/2014-31/12/2014	284,491	0	0	284,491
01/01/2015-31/12/2015	284,491	0	0	284,491
01/01/2016-31/12/2016	284,491	0	0	284,491
01/01/2017-31/12/2017	284,491	0	0	284,491
01/01/2018-31/12/2018	284,491	0	0	284,491

01/01/2019-31/12/2019	284,491	0	0	284,491
Total	1,991,437	0	0	1,991,437
Total number of crediting years	7			
Annual average over the crediting period	284,491	0	0	284,491

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Based on ACM0002, the following data and parameters will be monitored during the project crediting period.

Data / Parameter	$EG_{facility\ to\ CCPG,y}$
Unit	MWh
Description	Quantity of electricity exported to the grid in year *y*
Source of data	Metering system readings
Value(s) applied	392,727 MWh/yr is only used for calculation of emission reduction in the PDD. The actual value will be monitored by meters *ex post*. The metering system will be bidirectional and capable of metering the imported and exported electricity of the project.
Measurement methods and procedures	Directly measured by main metering device installed at the substation of Heihetang hydropower station. In addition, a backup metering device is installed at the project site in case of main meter device failure. The recording frequency will be continuously measured and daily recorded, and monthly aggregated. The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of sales. The metering devices will be calibrated yearly and the accuracy of the meter will reach 0.5s or above.
Monitoring frequency	Continuous measurement and record monthly
QA/QC procedures	Sales records to the grid. Furthermore, the receipt of electricity sales by the project from the grid company will be available to double check this parameter.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{CCPG\ to\ facility,y}$
Unit	MWh
Description	Quantity of electricity imported from the grid in year *y*
Source of data	Metering system readings
Value(s) applied	0 MWh/yr is only used for calculation of emission reduction in the PDD. The actual value will be monitored by meters *ex post*. The metering system will be bidirectional and capable of metering the imported and exported electricity by the project.
Measurement methods and procedures	Directly measured by main metering device installed at the substation of Heihetang hydropower station. In addition, a backup metering device is installed at the project site in case of main metering device failure. The recording frequency will be continuously measured and at least monthly recorded and aggregated. The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of purchase if any. The metering devices will be calibrated yearly and the accuracy of the meter will reach 0.5s or above.

Monitoring frequency	Continuous measurement and record monthly
QA/QC procedures	Electricity purchase records.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$\mathbf{EG_{facility,y}}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Calculated
Value(s) applied	392,727 MWh/yr is only used for calculation of emission reduction in the PDD. The actual value will be monitored by meters *ex post*. The data is the difference between power exported to grid and imported from grid, calculated as ($EG_{facility\ to\ CCPG,y}$ - $EG_{CCPG\ to\ facility,y}$) The metering system will be bidirectional and capable of metering the imported and exported electricity by the project.
Measurement methods and procedures	Measured by main metering device installed at the substation of Heihetang hydropower station and then calculated. In addition, a backup metering device is installed at the project site in case of main metering device failure. The recording frequency will be continuously measured and daily recorded, and monthly aggregated. The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of sales and purchase. The metering devices will be calibrated yearly and the accuracy of the meter will reach 0.5s or above.
Monitoring frequency	Continuous measurement and record monthly
QA/QC procedures	The receipt of electricity sales and purchase by the project will be available to double check this parameter.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$\mathbf{Cap_{PJ}}$
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data	Project site.
Value(s) applied	100,000,000
Measurement methods and procedures	Determination of the installed capacity according to the nameplate and yearly monitoring.
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project activity emissions
Additional comment	-

Data / Parameter	$\mathbf{A_{PJ}}$
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site.

Value(s) applied	1,760,000 m^2
Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project activity emissions
Additional comment	-

All monitored data will be archived electronically and be kept during entire crediting period and at least two years after.

B.7.2. Sampling plan

>>
Not applicable.

B.7.3. Other elements of monitoring plan

>>
The objective of the monitoring plan is to assure the complete, consistent, clear, and accurate monitoring and calculation of the project emission reductions during the whole crediting period. The project owner is responsible for the implementation of the monitoring plan, and the grid company cooperates with the project owner.

1. Management organization

To ensure all data are reliable and transparent, the project owner will also establish Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading, recording, auditing as well as archiving data and all relevant documents. This monitoring plan will be carried out by a CDM team, designated by the project owner, which will consist of a team leader, an assistant and operators who are responsible for recording the metering readings (Figure B.7.2.-1).

The team leader will have the overall responsibility for the monitoring and verification process, training and managing all CDM team members, and will act as the main contact for the DOE, DNA, etc.

The assistant will help the team leader to supervise the operation of the project, including data monitoring, negotiations with the grid company, and to collect the receipts of electricity sales and purchase if any.

The operators will be responsible for inspecting and maintaining the equipments, measuring and recording relevant readings, collecting, checking, archiving and managing data, and making summary according to the CDM project's requirements in a regular basis, and so on.

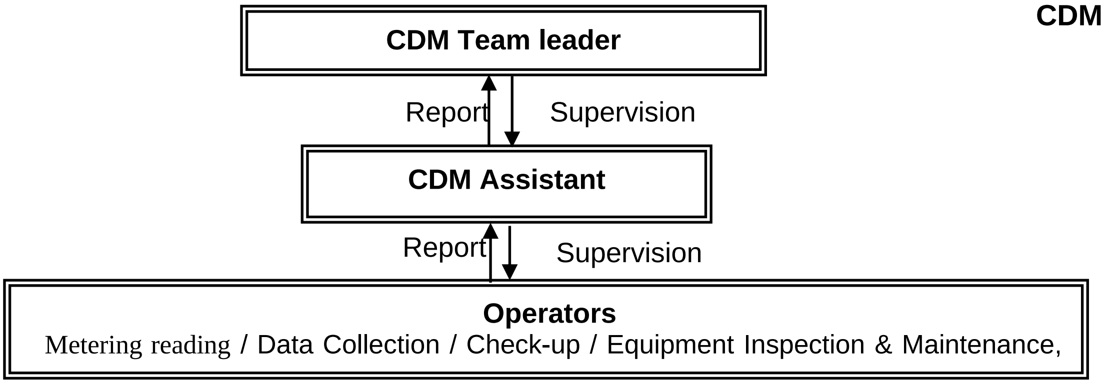

Figure B.7.2.-1. Organization Chart for Project Monitoring

2. Data to be Monitored

- Electricity delivered to/imported from the CCPG by the project ($EG_{facility\ to\ CCPG,y}$, $EG_{CCPG\ to\ facility,y}$)

Electricity delivered to/imported from the CCPG will be monitored by main metering device installed at the substation of Heihetang hydropower station. In addition, a backup monitoring meter is installed at the project site in case of main meter failure. The electricity settlement receipts will be provided by the grid company for the project owner's double check of the amount of net electricity delivered and accepted by the CCPG.

- Installed generation capacity

The installed generation capacity of the project will be monitored yearly in accordance with the nameplate of each generator.

- Surface area of the reservoir

The surface area of the reservoir determined according to the water level will be yearly monitored to check the power density of the project plant.

3. Installation of Metering Devices

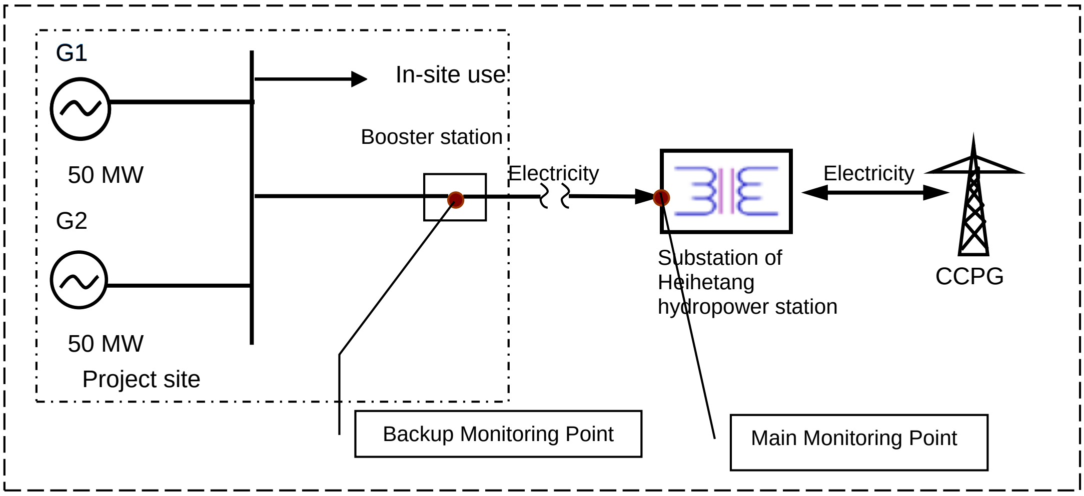

Figure B.7.2.-2. Diagram of Project Monitoring

Two sets of metering systems will be equipped at the substation of Heihetang hydropower station and the project site respectively. They are classified as main and backup metering systems respectively. The net electricity generation will be monitored by the main metering systems installed at the substation of Heihetang hydropower station. The relevant backup metering system is installed at the project site. Both systems are bidirectional and capable of metering the imported and exported electricity by the project.

The meters will be configured to meet the industrial regulation requirements of "Technical administration code of electric energy metering" (DL/T448-2000) and the subsequent industrial standards. These meters to be installed will reach accuracy of 0.5s or above.

The metering equipment will be properly calibrated yearly for accuracy. The calibration will be carried out according to the methodology and relevant industrial standards if industrial standards are available by an accredited third party or the grid company. Detailed monitoring procedures to measure electricity supplied to the CCPG by the project will be established later between the project owner and the grid company in line with the Power Purchase Agreement.

4. Data Reading

- Electricity delivered to/imported from the CCPG by the project ($EG_{facility\ to\ CCPG,y}$, $EG_{CCPG\ to\ facility,y}$)

The data will be measured continuously by the main meter at the substation of Heihetang hydropower station. In addition, the representatives of the grid company and the project will jointly read the main meter monthly. The recorded data will be confirmed by both parties, which is used for monthly electricity settlement. Electricity settlement receipts from the grid company will be available to check the net electricity supplied to the CCPG monthly.

- Installed generation capacity

Before verification, the operators will confirm and record the amount of generator facilities and the installed capacity of each generator in the hydropower station.

- Area of the reservoir

The water level will be monitored and recorded every day. The surface area will be yearly determined as per topographical surveys, maps, satellite pictures, etc.

5. Data Management System

Data of net electricity supplied to the CCPG will be archived in electronic spreadsheet by the end of each month. In addition, the electronic files will be stored on hard copy or other media periodically.

The data records of the installed capacity and the surface area of the reservoir related with the monitoring of the water levels will be archived in written document.

Hard copy documentation such as paper maps and diagrams will be collected in a central place, together with this monitoring plan. All hard copy information will be stored by the project owner with at least one copy.

All data records will be kept for 2 years after the end of the crediting period.

6. Abnormity handling

If the reading precision of the main meter system is beyond the allowable errors or the main meter malfunctions during previous months, the grid-connected electricity generated by the project will be determined by:

- Firstly, the reading of the backup meter;
- If the backup system is beyond the acceptable limits of accuracy or it performs improperly, a correct reading will be jointly prepared and approved by both the project owner and the power company.

The electricity recorded by the main metering system alone will be sufficient for the purpose of billing and emission reduction verification as long as the main meter system is under normal condition.

If any data error occurs during the crediting period, especially if the data of electricity sales is accidently damaged during the crediting period, the project owner and the grid company will deal

with it as emergency. Meanwhile, the CDM team should be informed about the accidents occurred at the power station in time. The CDM team leader and assistant will analyze the rationality of the data according to conservative rules of CDM projects. The data will be recorded and archived.

7. Verification of monitoring results

The project owner will check and approve the monitoring reports periodically, which contain instrument maintenance, verification records, monitoring records and CER calculations and so on. The owner will also provide the report to the DOE when verifying for the accuracy and rationality of the data.

8. Training

Specialized worker and graduates who studied related majors will be employed. In order to operate/maintain the hydropower station smoothly, the training in the station will be conducted periodically. Operation/maintenance manual will be compiled and accessible to the staff.

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

>>
Name of entity/persons determining the baseline and the monitoring plan:
Marukyu Shanghai Environment Co., Ltd.
Address: Room 1102, 480 Wulumuqi Road (N), Shanghai, China
Zip Code: 200040
Tel: +86-21-32525665
Fax: +86-21-32525670
Email: oyy@shjec.cn

None of the entity/ responsible persons mentioned above is project participant.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
06/07/2009
(This is the date when the construction contract was signed.)

C.1.2. Expected operational lifetime of project activity

>>
30 years and 0 month.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewable crediting period

C.2.2. Start date of crediting period

>>
01/01/2013 or the date on which the DOE submitted a complete request for registration, whichever comes later.

C.2.3. Length of crediting period

>>
7 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
An Environmental Impact Assessment (EIA) report was completed in May 2006 which was conducted to ensure that the project complies with national, regional and local environmental regulations during its construction and operation period. This EIA, prepared by Chengdu Hydroelectric Investigation & Design Institute which is a certified organization, was approved by Sichuan Provincial Environmental Protection Bureau on July 19th, 2006.

The following is the summary of the EIA.

Potential environmental impacts and the mitigation measures

<u>In Construction Stage</u>

Water Wastewater and sewage generated by site construction activities will be treated in the sedimentation tank after collection and then discharged; wastewater with oil will be treated by oil separator before discharged; and wastewater generated by construction workers will be treated using wastewater treatment equipment and then discharged.

Air The main air pollutant is particulates (dust) which is released from construction activities and transportation and the emission from vehicles and construction machinery. Measures will be taken to mitigate this pollutant, such as spraying water at construction sites and on dusty roads, transporting material in covered vehicles or in closed containers, installing and using a wheel washing system, controlling vehicle speeds and operating with proper maintenance and in compliance with relevant emission standards.

Noise Vehicles, construction machinery and explosion of dynamite will generate noise pollution. The mitigation measures to control this form of pollution include: installing in-situ sound barriers, selecting suitable equipment, correct operation and maintenance; limiting the speed of vehicles, and carrying out explosion activities strictly in compliance with safety regulations for explosion.

Solid waste The main solid waste from this project includes: refuse generated on construction site and waste generated by construction workers. These solid wastes will be handled in local landfill.

Ecology Measures for water and soil conservation are prepared and complied by the project owner for minimize the adverse impact on the ecological environment during the project construction. Rehabilitation of vegetation will be conducted after the construction work.

Social The occupation of land for the project construction will lead to the relocation of local residents. The project owner prepared the resettlement plan and allocated special funds for compensation in accordance with national regulations related to resettlement and compensation, to ensure that the long-term livelihood of the affected people will be well protected.

In Operation Stage

Water Sewage water will be treated in the treatment plant and then discharged.

Air There is no air pollution caused by hydropower plant during operation stage.

Noise Noise is generated mainly by machine during operations. The mitigation measures are: selecting low noise machines, locating noisy equipment in close workshop.

Solid waste The main solid waste during operation period is waste generated by construction workers. These solid wastes will be handled in local landfill.

The project has no great adverse impact on the local people and environment.

D.2. Environmental impact assessment

>>
The EIA of the Project was approved by Sichuan Provincial Environmental Protection Bureau on July 19th, 2006. Strict environmental monitoring and mitigation measures will be carried out during the construction and operation phases of the project. No significant environmental impacts are identified for the project.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>
The project owner, together with Chengdu Hydroelectric Investigation & Design Institute, carried out information bulletin and the public consultation for the social, economic and environmental impacts of the project before its implementation. The invited stakeholders include correlative working people of county government and departments, the mass and local inhabitant, and experts in research and design institute on April 27th, 2006.

During the period of information bulletin, no relevant units and individuals sent comments to project owner and Chengdu Hydroelectric Investigation & Design Institute.

During this survey, a total of 100 questionnaires were sent out, 83 of which were completed, 83% participation was noted.

The characteristics of the participants are summarized in the table below:

Table E.1.1 Consultation Participants

<table>
<tr><td rowspan="2">Age</td><td>Below 30</td><td colspan="2">30-40</td><td>40-50</td><td colspan="2">Above 50</td></tr>
<tr><td>29%</td><td colspan="2">47%</td><td>18%</td><td colspan="2">6%</td></tr>
<tr><td rowspan="2">Race</td><td colspan="3">Tibetan</td><td colspan="3">Han</td></tr>
<tr><td colspan="3">72%</td><td colspan="3">28%</td></tr>
<tr><td>Education</td><td colspan="2">Above Middle School</td><td colspan="3">Middle school</td><td>Primary School and Below</td></tr>
</table>

	7%	73%		20%
Occupation	Farmer	Worker	Others	Cadre
	61%	22%	8%	9%

Questions of the investigation are as follows:

1. Will the project provide more job opportunities and increase the local incomes?
2. What impact do you think the project has on the local economy?
3. What impact do you think the project has on the local wild animals?
4. What impact do you think the project has on local vegetation?
5. What level do you think the project causes of the water and soil loss at the construction area?
6. Will the project deteriorate the water and soil loss?
7. What impact do you think the project has on the fish in the river?
8. What impact do you think the project has on Jiuzhaigou tourism?
9. What impact do you think the project has on local traffic by the project
10. What impact do you think the project has on local residents in reservoir area?
11. What impact do you think the project has on resettled minorities due to reservoir inundation?
12. What impact do you think the project has on daily water use along the reduced water section of the river?
13. What impact do you think the project has on local residents in construction area due to construction noise?
14. What is the most serious environmental impact by the project?
15. What greatest benefit do you think the project has?
16. What general trend of impact do you think the project has on the local ecological environment?

E.2. Summary of comments received

>>

The results of this survey are as follows:

1. 96% of the participants think the project will provide more job opportunities and increase local income and the remaining think not.
2. 92% of the participants think the project will promote the economy and the remaining think not.
3. 86% of the participants think the project has no serious impact on the local wild animals, 10% think the impact was serious, and 4% think the project has no impact.
4. 59% of the participants think the project has a little impact on local vegetation, 21% think the impact was severe, and 20% think the impact was not serious.
5. 83% of the participants think the level of the water and soil loss of construction area caused by the project will be slight, 16% think it won't be serious, and 1% thinks it will be severe.
6. 65% of the participants think the project will not deteriorate the water and soil loss, 35% think it will.
7. 58% of the participants think the project will think the impact was not serious, 35% think the impact was severe, and 7% think the project has a little impact on fish by the project .
8. 69% of the participants think the project has positive impact on Jiuzhaigou Valley by the project, and the remaining think the project has negative impact
9. 90% of the participants think the project has positive impact on local traffic by the project, and the remaining think the project has negative impact
10. 77% of the participants think the project has a little impact on local residents in reservoir area by the project by the project, 23% of the participants think the impact was severe.
11. 64% of the participants think the project will think the impact was not serious, 27% think the impact was severe, 9% think the project has no impact on resettled minorities by reservoir submerge by the project.
12. 56% of the participants think the project will think the impact was not serious, 38% think the impact was severe, and 6% think the project has no impact on daily water use along reduced water reach by the project.
13. 80% of the participants think the project will think the impact was not serious, 20% think the project has a little impact on local residents in construction area by the project.

14. 45% of the participants think influencing reservoir inundation and resettlement is the worst impact, 29% think influencing daily water use along reduced water reach by the project is the worst impact, 16% think influencing aquatic environment is the worst impact, and the rest think influencing wildlife inhabitation is the worst impact, 8% think destroying natural vegetation and increasing water and soil loss by excavation and explosion activities are the worst impacts by the project.
15. 36% of the participants think the project will promote local tourism and agriculture, 28% think the project will make full utilization of local natural resource, 24% think the project will improve local transportation, and 12% think the project will offer more job opportunities.
16. 56% of the participants think there will be some negative impact on local environment and mitigation measures should be taken to control and mitigate the impact, 23% think the project will improve local environment, and the remaining think there will be no impact.

E.3. Report on consideration of comments received

>>

The project owner takes the stakeholders' comments and feedbacks seriously and takes the prompt and proper action, especially on the protection of ecological environment during the construction and operation periods.

The survey shows that the local residents are very supportive for the project, thinking that the implementation of the project is reasonable utilization of local water resource and will boost local economy. Meanwhile, as per the stakeholder's comments, the project owner analyzed the issues which focus on water and soil loss to be caused by the project, aquatic animals, and immigration and compensation. For water and soil loss, the project owner prepared Scheme of Water and Soil Conservation for Sichuan Baishuijiang Duonuo Hydropower Project which has already been approved by Water Resources Bureau of Sichuan. As for the impact on aquatic animals, project owner also takes measures including releasing an ecological flow downstream of the dam to sustain the aquatic ecosystem, adjusting the ecological flow release scheme according to the breeding habits of the fish species and releasing more flow during the breeding season, and establishing a reproduction centre for the protected fish species, and release fry (young fish) into the Baishui River. In terms of immigration and compensation, 19 people (4 households) will be resettled in the areas including Batun Village and Xiangzha Village. The compensation for the land and crops is in compliance with the relevant national and provincial policies and satisfies the need of immigration and reproduction.

Accordingly, the project owner will take proper and effective measures to prevent the loss of water and soil, and protect the environment. For instance, barricade and other protective facilities will be built during and after the construction works; the temporary occupied land during the construction will be rehabilitated by soil covering, trees planting and other greening measures.

SECTION F. Approval and authorization

>>

Yes.

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

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Jiuzaigou Hydropower Development Co.LTD
Street/P.O. Box	Yongle Town, Jiuzhaigou County
Building	-
City	A Ba Autonomous Prefecture
State/Region	Sichuan Province
Postcode	-
Country	People's Republic of China
Telephone	+86-28-87329783
Fax	+86-28-87326357
E-mail	JHDCly1@126.com
Website	-
Contact person	Yan Liu
Title	Director
Salutation	Ms.
Last name	Liu
Middle name	-
First name	Yan
Department	-
Mobile	-
Direct fax	+86-28-87326357
Direct tel.	+86-28-87329783
Personal e-mail	JHDCly1@126.com

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Deutsche Bank AG, London Branch
Street/P.O. Box	1 Great Winchester Street, Floor 2
Building	Winchester House
City	London
State/Region	
Postcode	EC2N 2DB
Country	United Kingdom
Telephone	+44 (20) 754-73347
Fax	+44 (20) 3320-0785
E-mail	brett.orlando@db.com
Website	
Contact person	Brett Orlando
Title	Director
Salutation	Mr.
Last name	Orlando
Middle name	-
First name	Brett
Department	Environmental Financial Products
Mobile	
Direct fax	+44 (20) 3320-0785
Direct tel.	+44 (20) 754-73347
Personal e-mail	brett.orlando@db.com

Appendix 2. Affirmation regarding public funding

There is no public fund involved in this project activity.

Appendix 3. Applicability of methodology and standardized baseline

Please refer to Section B.

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

Emission Factor of Central China Power Grid[59,60,61,62]

I. Operating Margin

Table 1. Fuel consumed by the CCPG in year 2007

Fuel Type	Unit(10^4)	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Emission factor	Oxidation	LHV	Calorific Value	CO_2 Emission（tCO_2e）
									（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,m3）	K=F×I×J/100000（mass）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	K=F×I×J/10000 (volume)
Raw coal	t	2200.57	9357	3479.81	2683.81	1547.7	3239	**22507.89**	25.8	100	87,300	20,908	410,829,404
Cleaned coal	t		3.07			3.8		**6.87**	25.8	100	87,300	26,344	157,998
Other washed coal	t	0.04	87.16		2.06	96.42		**185.68**	25.8	100	87,300	8,363	1,355,631
moulded coal	t						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke oven	t							**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^4m^3	0.08	2.61	0.25	0.31	0.91		**4.16**	12.1	100	37,300	16,726	259,534
Other gas	10^4m^3	29.17	25.79		24.69		23.98	**103.63**	12.1	100	37,300	5,227	2,020,444
Crude oil	t		0.43					**0.43**	20	100	71,100	41,816	12,784
Gasoline	t				0.04	0.01		**0.05**	18.9	100	67,500	43,070	1,454
Diesel oil	t	0.98	3.21	2.51	2.83	1.93		**11.46**	20.2	100	72,600	42,652	354,863
Fuel oil	t	0.42	1.25	1.33	0.63	0.64	1.74	**6.01**	21.1	100	75,500	41,816	189,742
PLO	t							**0**	17.2	100	61,600	50,179	0
Refinery gas	t	1.43	10.01	0.97	0.7			**13.11**	15.7	100	48,200	46,055	291,022
Natural gas	10^4m^3		0.12	0.18		0.2	1.87	**2.37**	15.3	100	54,300	38,931	501,007
Other petroleum product	t							**0**	20	100	72,200	41,816	0
Other coking product	t							**0**	25.8	100	95,700	28,435	0
Other energy	tce	23.43	63.65	35.95	29.46	23.21		**175.7**	0	0	0	0	0
												Sub-total	415,974,066

《China Energy Statistical Yearbook 2008》

59 China Energy Statistical Yearbook 2008~2010
60 China Electric Power Yearbook 2008~2010
61 2006 IPCC Guidelines for National Greenhouse Gas Inventories
62 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

Table 2. Electricity generation and supply by the CCPG in year 2007

Province	Generation (MWh)	On-site use (%)	Supply (MWh)
Jiangxi	42,100,000	7.72	38,849,880
Henan	177,300,000	7.55	163,913,850
Hubei	60,900,000	6.69	56,825,790
Hunan	54,200,000	7.18	50,308,440
Chongqing	28,800,000	9.2	26,150,400
Sichuan	45,100,000	8.68	41,185,320
Total			377,233,680

《China Electric Power Yearbook 2008》

Table 3. Fuel consumed by the CCPG in year 2008

Fuel Type	Unit(10^4)	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Emission factor	Oxidation	LHV	Calorific Value	CO_2 Emission (tCO_2e)
									(tc/TJ)	(%)	($kgCO_2$/TJ)	(MJ/t,m3)	K=F×I×J/100000 (mass)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	K=F×I×J/10000 (volume)
Raw coal	t	2137.08	9480.74	2852.29	2620.44	1421.42	2727.61	**21239.58**	25.8	100	87,300	20,908	387,679,342
Cleaned coal	t		1.68			3.27		**4.95**	25.8	100	87,300	26,344	113,842
Other washed coal	t	0.04	80.54		2.06	101.75		**184.39**	25.8	100	87,300	8,363	1,346,213
moulded coal	t				6.12		0.01	**6.13**	26.6	100	87,300	20,908	111,889
Coke oven	t		0.78		0.92			**1.7**	29.2	100	95,700	28,435	46,261
Coke oven gas	10^4m^3	0.1	4.19	0.37	0.24	6.66	0.01	**11.57**	12.1	100	37,300	16,726	721,829
Other gas	10^4m^3	23.67	41.36		3.31	0.37	0.01	**68.72**	12.1	100	37,300	5,227	1,339,814
Crude oil	t		0.17					**0.17**	20	100	71,100	41,816	5,054
Gasoline	t							**0**	18.9	100	67,500	43,070	0
Diesel oil	t	0.88	7.02	2.82	3.41	1.59		**15.72**	20.2	100	72,600	42,652	486,775
Fuel oil	t	0.07	1.45		1.29		3.14	**5.95**	21.1	100	75,500	41,816	187,848
PLO	t							**0**	17.2	100	61,600	50,179	0
Refinery gas	t	0.21	3.91	2.78	0.71		0.01	**7.62**	15.7	100	48,200	46,055	169,153
Natural gas	10^4m^3		4.02	0.16		0.05	12.92	**17.15**	15.3	100	54,300	38,931	3,625,430
Other petroleum product	t			0.59				**0.59**	20	100	72,200	41,816	17,813
Other coking product	t						0.01	**0.01**	25.8	100	95,700	28,435	272
Other energy	tce	18.16	68.11	62.35	11.42	64.87		**224.91**	0	0	0	0	0
												Sub-total	395,851,534

《China Energy Statistical Yearbook 2009》

Table 4. Electricity generation and supply by the CCPG in year 2008

Province	Generation (MWh)	On-site use (%)	Supply (MWh)
Jiangxi	40,500,000	6.5	37,867,500
Henan	189,000,000	7.22	175,354,200
Hubei	55,300,000	6.62	51,639,140
Hunan	53,700,000	6.46	50,230,980
Chongqing	28,600,000		28,600,000
Sichuan	40,100,000	10.21	36,005,790
Total			379,697,610

《China Electric Power Yearbook 2009》

Table 5. Fuel consumed by the CCPG in year 2009

Fuel Type	Unit(10^4)	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Emission factor	Oxidation	LHV	Calorific Value	CO_2 Emission（tCO_2e）
									（tc/TJ）	（%）	($kgCO_2/TJ$)	（MJ/t,m3）	K=F×I×J/100000（mass）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	K=F×I×J/10000 (volume)
Raw coal	t	2184.31	9339.64	2888.29	2810.69	1413.64	2817.31	**21453.88**	25.8	100	87,300	20,908	391,590,892
Cleaned coal	t		3.35					**3.35**	25.8	100	87,300	26,344	77,044
Other washed coal	t		59.93			136.75	97.94	**294.62**	25.8	100	87,300	8,363	2,150,991
moulded coal	t				2.63			**2.63**	26.6	100	87,300	20,908	48,005
Coke oven	t		1.08	0.06	0.09			**1.23**	29.2	100	95,700	28,435	33,471
Coke oven gas	10^4m^3	0.09	6.04	1.2		1.03		**8.36**	12.1	100	37,300	16,726	521,564
Other gas	10^4m^3	30.76	56.64		4.23	7.57		**99.2**	12.1	100	37,300	5,227	1,934,074
Crude oil	t		0.1					**0.1**	20	100	71,100	41,816	2,973
Gasoline	t							**0**	18.9	100	67,500	43,070	0
Diesel oil	t	0.69	4.28	1.23	1.55	1.19		**8.94**	20.2	100	72,600	42,652	276,830
Fuel oil	t	0.02	1.44	0.48	1.27	0.06	4	**7.27**	21.1	100	75,500	41,816	229,522
PLO	t							**0**	17.2	100	61,600	50,179	0
Refinery gas	t	0.25	2.18	0.82	1.91			**5.16**	15.7	100	48,200	46,055	114,544
Natural gas	10^4m^3		7.69	0.27		0.14	21.84	**29.94**	15.3	100	54,300	38,931	6,329,176
Other petroleum product	t			0.29				**0.29**	20	100	72,200	41,816	8,755
Other coking product	t							**0**	25.8	100	95,700	28,435	0
Other energy	tce	12.47	76.3	26.69	14.96	84.8		**215.22**	0	0	0	0	0
												Sub-total	403,317,841

《China Energy Statistical Yearbook 2010》

Table 6. Electricity generation and supply by the CCPG in year 2009

Province	Generation	On-site use	Supply
	(MWh)	(%)	(MWh)
Jiangxi	44,500,000	5.8	41,919,000
Henan	198,500,000	6.62	185,359,300
Hubei	63,000,000	6.21	59,087,700
Hunan	63,400,000	6.39	59,348,740
Chongqing	30,600,000		30,600,000
Sichuan	50,400,000	7.92	46,408,320
Total			422,723,060

《China Electric Power Yearbook 2010》

In addition, during 2007 ~ 2009，the CCPG imported electricity from North China Power Grid and Northwest China Power Grid. The imported electricity amount and emissions are shown below.

Table 7. Electricity and emission imported by the CCPG

		2007	**2008**	**2009**
1.1	Imported generation from North China Power Grid (MWh)	0	33,200	2,233,290
1.2	Emission factor of North China Power Grid (tCO_2/MWh)	0	1.00495	0.96418
1.3	Imported emissions from North China Power Grid (tCO_2)	0	33,367	2,153,294
2.1	Imported generation from Northwest China Power Grid (MWh)	3,005,400	3,144,070	3,262,010
2.2	Emission factor of Northwest China Power Grid Grid (tCO_2/MWh)	1.01129	0.98254	1.00759
2.3	Imported emissions from Northwest China Power Grid Grid (tCO_2)	3,039,329	3,089,177	3,286,768
3.1	Power supply from CCPG (MWh)	377,233,680	379,697,610	422,723,060
3.2	Emission from CCPG (tCO_2)	415,974,066	395,851,534	403,317,841
1.1+2.1+3.1	Total generation (MWh), Σ GEN	380,239,080	382,874,880	428,218,360
1.3+2.3+3.2	Total emissions (tCO_2), $\Sigma F_{i,m,y} * COEF_{i,m}$	419,013,395	398,974,078	408,757,903

Therefore, OM emission factor of the CCPG is the average value of 2007 ~ 2009.

$EF_{OM} = \mathbf{\Sigma F_{i,m,y} * COEF_{i,m} / \Sigma GEN}$ = (419,013,395 + 398,974,078+408,757,903) / (380,239,080 + 382,874,880+428,218,360) = 1.0297 tCO_2/MWh

II. Build Margin

The weighted value based on the lowest coal consumption by 30 sets of 600MW generating units installed in 2009 is calculated as 311.5gce/kWh, which also means the power supply efficiency of these plants is weighted as 39.45%.

The combined cycle technology with a capacity of 200MW stands for the most advanced technology used in thermal plants fired by gas or oil in China. Based on the statistics in 2009, the thermal plant with the maximum power supply efficiency 51.77% consumed the equivalent fuel of 237.4 gce/kWh.

Table 8. Emission factor of most advanced technology commercially used in China's domestic thermal power plants

	Parameters	Power supply efficiency(%)	EF of fuel ($kgCO_2$/TJ)	Oxidation	Emission Fator (tCO_2/MWh)
		A	B	C	D=3.6/A/10,000×B×C
Coal fire plant	$EF_{Coal,Adv,y}$	39.45	87,300	1	0.7967
Gas fire plant	$EF_{Oil,Adv,y}$	51.77	75,500	1	0.5250
Oil fire plant	$EF_{Gas,Adv,y}$	51.77	54,300	1	0.3776

Table 9. Fuel consumption and emission by the CCPG in 2009

Fuel-Type	Unit (10^4)	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Sub-total	Calorific value	Emission Factor	Oxidation	Emission
		A	B	C	D	E	F	G=A+…+F	H	I	J	K=G×H×I×J/100,000
Raw-coal	t	2,184.31	9,339.64	2,888.29	2,810.69	1,413.64	2,817.31	21,453.88	20,908	87,300	1	391,590,892
Washed-coal	t	0	3.35	0	0	0	0	3.35	26,344	87,300	1	77,044
Other-washed coal	t	0	59.93	0	0	136.75	97.94	294.62	8,363	87,300	1	2,150,991
Moulded coal	t	0	0	0	2.63	0	0	2.63	20,908	87,300	1	48,005
Coke-coal	t	0	1.08	0.06	0.09	0	0	1.23	28,435	95,700	1	33,471
Other coking product	t	0	0	0	0	0	0	0.00	28,435	95,700	1	0
Sub-total								0.00				393,900,403
Crude-oil	t	0	0.1	0	0	0	0	0.1	41,816	71,100	1	2,973
Gasoline	t	0	0	0	0	0	0	0	43,070	67,500	1	0
Diesel oil	t	0.69	4.28	1.23	1.55	1.19	0	8.94	42,652	72,600	1	276,830
Fuel oil	t	0.02	1.44	0.48	1.27	0.06	4	7.27	41,816	75,500	1	229,522
Other petroleum product	t	0	0	0.29	0	0	0	0.29	41,816	72,200	1	8,755
Sub-total								0				518,081
Natural gas	10^3m^3	0	76.9	2.7	0	1.4	218.4	299.4	38,931	54,300	1	6,329,176
Coke oven gas	10^3m^3	0.9	60.4	12	0	10.3	0	83.6	16,726	37,300	1	521,564
Liquefied	10^3m^3	307.6	566.4	0	42.3	75.7	0	992	5,227	37,300	1	1,934,074
Petroleum gas	t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	t	0.25	2.18	0.82	1.91	0	0	5.16	46,055	48,200	1	114,544
Sub-total												8,899,358
Total												403,317,841

《China Energy Statistical Yearbook 2010》

$$\lambda_{coal,y} = \frac{\sum_{i \in COAL, j} F_{i.j,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_{i,j} F_{i.j.y} * NCV_{i,y} * EF_{CO2,i,y}} \qquad \lambda_{oil,y} = \frac{\sum_{i \in OIL, j} F_{i.j,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_{i,j} F_{i.j.y} * NCV_{i,y} * EF_{CO2,i,y}} \qquad \lambda_{gas,y} = \frac{\sum_{i \in GAS, j} F_{i.j,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_{i,j} F_{i.j.y} * NCV_{i,y} * EF_{CO2,i,y}}$$

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

$EF_{thermal,y} = \lambda_{coal,y} \times EF_{coal,Adv,y} + \lambda_{oil,y} \times EF_{oil,Adv,y} + \lambda_{gas,y} \times EF_{gas,Adv,y}$ = 0.7871 tCO_2/MWh

Additional capacity during the 2007～2009 on the CCPG

Table 10. Generation capacity of the CCPG installed in year 2009

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

《China Electric Power Yearbook 2010》

Table 11. Generation capacity of the CCPG installed in year 2008

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

《China Electric Power Yearbook 2009》

Table 12. Generation capacity of the CCPG installed in year 2007

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

《China Electric Power Yearbook 2008》

Therefore, the Build Margin of Central China Power Grid is calculated as the table below.

Table 13. Capacity addition of the CCPG during 2007~2009

	2007	2008	2009	2007-2009 Capacity Addition	2008-2009 Capacity Addition	Share in the capacity addition
	A	B	C	D	E	F
Thermal(MW)	92,580	100,090	105,240	20,280.4	10,467.5	53.25%
Hydro(MW)	61,650	72,730	79,230	17,726.9	6,500	46.54%
Nuclear(MW)	0	0	0	0	0	0.00%
Other(MW)	51	70	132	81	62	0.21%
Total(MW)	**154,281**	**172,890**	**184,602**	**38,088.3**	**17,029.5**	**100.00%**
Share in the capacity of 2009				20.63%	9.23%	

$EF_{BM,y}$=0.7871×53.25%=0.4191 tCO_2/MWh

Taking the default value of weights w_{OM} and w_{BM}, 50% respectively, the emission factor of Central China Power Grid is calculated as follows.

For more details of the basic data, please refer to http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf on which all data are published by Chinese DNA.

	OM (tCO_2/MWh)	**BM (tCO_2/MWh)**	**EF (tCO_2/MWh)**
Central China Power Grid	1.0297	0.4191	0.7244

Appendix 5. Further background information on monitoring plan

No.

Appendix 6. Summary of post registration changes

The main monitoring electricity meter is actually installed at the substation of Heihetang hydropower station instead of the project site in accordance with the PPA signed by the project owner and the Grid Company. This is a minor change of the project activity and leads to the conservative amount of emission reductions by deducting electricity loss via the transmission line connected between the project and Heihetang hydropower station.