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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Project title: Sichuan Shimian Xieluo Wanba River Hydropower Station
PDD Version: 3.0
Completion date: 17/07/2008

Revision History of the PDD

Version	Date	Comments
Version 1.0	06/02/2007	Complete version of the PDD, prepared for the host country approval process
Version 2.0	13/07/2007	Revised draft PDD; prepared for validation
Version 3.0	17/07/2008	Revised PDD, prepared on the basis of corrective action requests of TUV SUD

A.2. Description of the project activity:

Summary:

Sichuan Shimian Xieluo Wanba River Hydropower Station (hereafter referred to as "the project") project activity involves the construction and operation of the diversion type of run-of-river hydropower station at Wanba River in Xieluo Tibetan Town, Shimian County, Ya'an City, Sichuan Province, People's Republic of China. The project with a total installed capacity of 69MW is constructed and operated by Sichuan Liyuan Electricity Development Co., Ltd. On the average, the project activity is expected to operate 5,161 hours per year, which corresponds to an average annual generation of 356,090MWh, considering the absorption ability of local grid, the "effective coefficient"[1] is only 75%, after deducting the plant consumption and transmission loss, the net electricity supplied to the grid is 260,420MWh. The power generated is connected to the Shimian Grid through Lijibao transformer station, then to the Sichuan Grid, and finally, to the Central China Grid.

The project will utilize renewable resources for power generation and supply power for the Grid, and will replace the electricity generated by the thermal plant which dominates the Central China Grid, thereby reducing Greenhouse Gas emissions amount to 233,792tCO_2e annually.

The hydropower is a renewable clean energy project without exhausting the fossil fuel. The development of this project is in accordance with the developing object for energy industry; contributes greatly to the sustainability for energy industry, especially for electricity industry:

- Reducing reliance on exhaustible fossil fuel;
- Reducing local air pollution by burning fossil fuel;
- Providing sufficient electricity power for life and manufacture of local residents;
- Improving the local situation for communication and transportation;
- Increasing the employment opportunities and incomes for local residents and improve the life quality for local residents.

[1] The "effective coefficient" is calculated according to the absorption ability of local grid. The project was located at poor mountain areas, and the load of local grid is relatively lower, which results in an effective coefficient of only 75% under full load of the project.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant（Yes/No）
China (host)	Sichuan Liyuan Electricity Development Co., Ltd (as the project owner)	No
Italy	Edison Spa (as the CER buyer)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Peoples' Republic of China

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

Sichuan Province

A.4.1.3. City/Town/Community etc:

Xieluo Tibetan Town, Shimian County, Ya'an City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project is located in Xieluo Tibetan Town, Shimian County, Ya'an City, Sichuan Province, China. The dam site is 150m from the upstream of Baishui River junction; the plant site is 400m from the downstream of Jizhong Bridge, which is 32km from the Shimian County Seat, and 392km from Chengdu City. The distance between the dam and plant is 8km. The exact location of the dam is at the latitude of 29°09'18″N and the longitude of 102°08'24″E, and the exact location of the power plant is at the latitude of 29°12'16″N and the longitude of 102°10'05″E.

The Location map of the project seeing figure A.1:

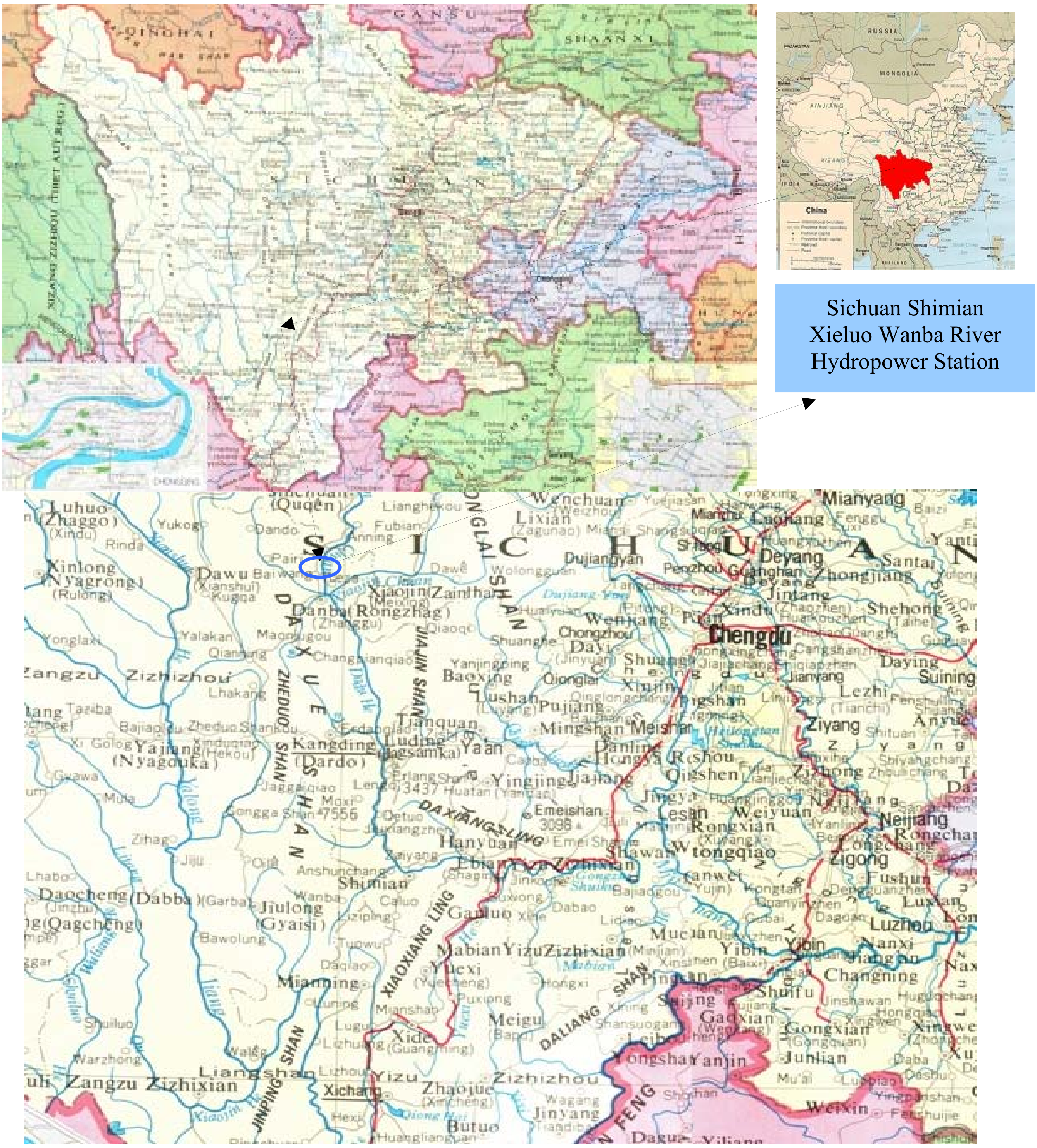

Fig A.1 the Location of Sichuan Shimian Xieluo Wanba River Hydropower Station

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

The project activity falls under the category described under CDM as "Sectoral Scope Number 1: Energy Industries – Renewable Sources".

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

The construction of the power station mainly consists of barrage, water gap, diversion tunnels, plant house, and switch station etc. The total length of the diversion tunnel is 6,324m.

The project is a diversion type of run-of-river hydropower station with an installed capacity of 69MW. The project employs three units of HLD307c-LJ-145 turbines, and three units of SF23-10/3250 generators matched with the turbines. The specific technical data is listed in Table A.1.

Table A.1 Technical data of the turbine/generator units

<table>
<tr><th colspan="2">The Main Technical Data</th><th colspan="2">Value</th></tr>
<tr><td rowspan="7">Turbines</td><td>Unit</td><td colspan="2">3</td></tr>
<tr><td>Type</td><td colspan="2">HLD307c-LJ-145</td></tr>
<tr><td>Manufacturer</td><td colspan="2">East Electric Machine Co. Ltd.</td></tr>
<tr><td>Rated Water Head</td><td colspan="2">188.5m</td></tr>
<tr><td>Rated Flow</td><td colspan="2">13.67m^3/s</td></tr>
<tr><td>Rated Rotational Speed</td><td colspan="2">600r/min</td></tr>
<tr><td>Rated Efficiency</td><td colspan="2">93.8%</td></tr>
<tr><td rowspan="7">Generators</td><td>Unit</td><td colspan="2">3</td></tr>
<tr><td>Type</td><td colspan="2">SF23-10/3250</td></tr>
<tr><td>Manufacturer</td><td colspan="2">East Electric Machine Co. Ltd</td></tr>
<tr><td>Rated Power</td><td colspan="2">23MW</td></tr>
<tr><td>Rated Voltage</td><td colspan="2">10.5kV</td></tr>
<tr><td>Rated Electrical Current</td><td colspan="2">1,580A</td></tr>
<tr><td>Rated Rotational Speed</td><td colspan="2">600r/min</td></tr>
<tr><td rowspan="4">Main Transformer</td><td>Unit</td><td>1</td><td>1</td></tr>
<tr><td>Manufacturer</td><td colspan="2">Special Transformer Electric Industry Co., Ltd
Xinjiang Transformer Factory</td></tr>
<tr><td>Type</td><td>SF9-31500/110GY</td><td>SF9-63000/110GY</td></tr>
<tr><td>Rated Capacity</td><td>31,500kVA</td><td>63,000kVA</td></tr>
</table>

The main electricity connection is expansible unit connection; one unit is composed of two generators and one transformer, the other unit is one generator and one transformer. The electricity will be connected to the Lijibao transformer station via one 110kV transmission line, then to the Shimian County Grid, then to the Sichuan Grid, and finally to the Central China Grid.

The technology utilized is a clean technology with a minimal impact on environment. There is no technology transfer since all the technology employed is domestic.

The workers were trained before the operation. Furthermore, the project owner set a series of regulations for guaranteeing the safe operating and maintenance of hydropower stations, such as, management standard for employees, safety management standard, safety production emergency plan, technology management standard, operation skill standard, and so on.

With CDM monitoring, a monitoring officer (Zhou Zhongjian) will receive training on monitoring

methodologies, procedures and archiving by Beijing Tianqing Power International CDM Consulting Co. Ltd.(hereafter referred to as "Tianqing") Then, the monitoring officer will train project staffs in charge for CDM monitoring.

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

The project uses the renewable crediting period, and the estimation of the emission reductions in the crediting period (from November 2008 to October 2015) is presented in Table A.3. Estimated Emission Reductions of the first crediting period are 1,636,544tCO_2e.

Table A.3 the Estimation of the Emission Reductions in the Crediting Period

Years	Annual estimation of emission reductions in tones of CO_2e
01/11/2008-31/10/2009	233,792
01/11/2009-31/10/2010	233,792
01/11/2010-31/10/2011	233,792
01/11/2011-31/10/2012	233,792
01/11/2012-31/10/2013	233,792
01/11/2013-31/10/2014	233,792
01/11/2014-31/10/2015	233,792
Total Estimated Reductions (tCO_2e) of the First Crediting Period	1,636,544
Total Number of the First Crediting Period (Year)	7
Annual Average Reductions over the First Crediting Period (tCO_2e/year)	233,792

A.4.5. Public funding of the project activity:

There is no public funding from Annex Ⅰ parties available for the project.

SECTION B. Application of a baseline and monitoring methodology:

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

Baseline methodology:

Approved consolidated baseline methodology ACM0002 (Version 06): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

The methodology draws upon Version 04 of the "Tool for the demonstration and assessment of additionality"

Monitoring methodology:

Approved consolidated monitoring methodology ACM0002 (Version 06): "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

Reference: UNFCCC website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

This project satisfies the applicable conditions of ACM0002 methodology, that is:
1. The project activity is connected to the Central China Grid, and electricity capacity additions from renewable sources with a run-of-river diversion type hydropower station;
2. The project activity does not involve fuel switching from fossil fuels to renewable energy at the site of the project activity.
3. The geographic and system boundaries for the Central China Grid can be clearly identified.

Therefore, the baseline methodology is applicable to this project activity.

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

According to the definition of project boundary by ACM0002, the project boundary includes the project site and the electricity system where the project is connected to.

In this specific case, the station is connected to the Shimian grid, and then to the Sichuan Grid, and finally to the Central China Grid. The Central China Grid is a larger regional grid, which consists of six sub-grids: Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan Grids. According to the guidance given above, it is justifiable to determine the Central China Grid as the right project boundary for this specific project, considering the substantial power exchange in the Central China Grid.

Table B.1 Description of How the Sources and Gases Included in the Project Boundary

	Source	Gas	Included ?	Justification / Explanation
Baseline	Thermal power plants	CO_2	Included	According to ACM0002 methodology, it is only

	in the Central China Grid			necessary to account for CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.
		CH_4	Excluded	According to ACM0002 methodology, it is not necessary to account for CH_4 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.
		N_2O	Excluded	According to ACM0002 methodology, it is not necessary to account for N_2O emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.
Project Activity	Sichuan Shimian Xieluo Wanba River Hydropower Station	CO_2	Excluded	The project is grid-connected electricity generation from renewable sources, According to methodology ACM0002, without CO_2 emission.
		CH_4	Excluded	The new hydropower project is a run of river diversion type station. According to methodology ACM0002, without CH_4 emission.
		N_2O	Excluded	The project is grid-connected electricity generation from renewable sources, According to methodology ACM0002, without N_2O emission.

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

There are only a few baseline scenarios that are prima facie realistic and credible in the context of the Central China Grid:

1. The hydropower activity undertaken without being registered as a CDM project activity;
2. Thermal power generation with equivalent annual power generation;
3. Other renewable energy power generation with equivalent annual power generation;
4. The equivalent annual electricity is supplied by the Central China Grid.

First scenario, the hydropower activity undertaken without being registered as a CDM project activity

The first scenario is in compliance with the Chinese relevant laws and regulations, but not a mandatory project, and we will furthermore review the project's economic feasibility in order to provide a more in economic analysis of the first scenario (provided in section B.5). The results show that the project IRR is 6.67% without CDM revenue which is lower than the benchmark rate of 8%[2]; therefore, the project faces significant economic and financial barriers without CDM revenue, so the first scenario is not feasible.

Second scenario, thermal power generation with equivalent annual power generation,

There is a large difference between thermal power and hydropower in their annual operating hours and the stability of their operation. However, an alternative fossil fuel power plant that can provide the equivalent generation of the hydropower plant would be one with an installed capacity less than 69MW. However, according to Chinese regulations, thermal power plants of less than 135MW are prohibited to construct

[2] The Economical Assessment Temporary Regulation on Electrical Technology Improvement Project, published by China Electric Power Press, March 2003. It is the same as indicated in FSR.

[3].Therefore, the second alternative does not comply with Chinese relevant laws and regulations; thus it is not a feasible scenario.

Third scenario, other renewable energy power generation with equivalent annual power generation

There is potential neither for wave or tidal energy nor for geothermal energy in the project's area. No biomass based power plant with a similar scale to the project has previously been built in the region. Moreover, other renewable energy alternatives, such as solar PV is considered to be too cost intensive for generating the equivalent annual output. The region where the project is located is poor in terms of wind resources with very low wind energy potential[4]. Thus there are no favorable conditions for the construction of power plants based on other renewable sources. Therefore, this scenario is not a feasible scenario.

Fourth scenario, the equivalent annual electricity is supplied by the Central China Grid

The fourth scenario option is in compliance with Chinese relevant laws and regulations, and without financial barrier and other barriers.

Conclusion:

From the above analysis we can conclude that the fourth scenario is the only feasible scenario. Therefore, the baseline scenario of this project is:

The equivalent annual electricity is supplied by the Central China Grid without the project.

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

The additionality of the project activity is demonstrated using the steps described in *the Tool for the Demonstration and Assessment of Additionality (version 4)* as developed by the EB. We will argue and demonstrate that:

Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Sub-Step1a. Define alternatives to the project activity

This methodological step requires a number of sub-steps, the first of which is the identification of realistic and credible alternatives to the project activity. There are only a few alternatives that are prima facie realistic and credible in the context of the Central China Grid:

1. The hydropower activity undertaken without being registered as a CDM project activity;
2. Thermal power generation with equivalent annual power generation;
3. Other renewable energy power generation with equivalent annual power generation;
4. The equivalent electricity is supplied by the Central China Grid.

Sub-Step1b.Consistency with mandatory Laws and Regulations

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[3] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.
[4] http://www.newenergy.org.cn/html/0062/2006217_7650.html

As discussed in section B.4, the first, third and fourth alternatives are in compliance with Chinese relevant laws and regulations. However, the second alternative is not in compliance with Chinese relevant laws and regulations, so it isn't a feasible alternative.

Therefore, the project activity is not the only alternative consistent with Chinese current laws and regulations, it has additionality.

<u>Step 2 Investment Analysis</u>

Sub-step 2a. Determine appropriate analysis method

The additionality tool provides three investment analysis options which are: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since this specific project has the revenues from the sales of electricity and the fourth alternative isn't a specific project, we choose option Ⅲ, i.e. benchmark analysis to this specific project.

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

According to *the Economical Assessment Temporary Regulation on Electrical Technology Improvement Project* the IRR of an electric power project should not be lower than the threshold of 8%. The regulation can be applicable to all electrical projects. Since the proposed project is hydropower project, the regulation is applicable to the project.

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

We have investment analysis basically using the Feasibility Study Report (here after referred to as "FSR") as the data source. In the FSR, the IRR was calculated with a grid price of 0.216 Yuan RMB/kWh (which was calculated according to loan payback period). While in June 2003, the project owner signed the grid connection agreement with the local grid company. In the agreement, the approved grid price was only 0.15 Yuan RMB/kWh. So the real project IRR was 6.67% much lower than the benchmark. The project owner knew about CDM in early 2003. They soon decided to apply for CDM project activities to overcome the poor financing problem after investigation.

The project IRR without CERs revenue is below the benchmark. To illustrate it, we performed a benchmark analysis.

The basic parameters for calculating key financial indexes are provided in Table B.2:

Table B.2 Basic parameters for calculation of the Project IRR

Parameters	Value	Source
Installed capacity (MW)	69	FSR
Annual Electricity supplied to Grid (MWh)	260,420	FSR
Total Static Investment (10,000 Yuan RMB)	31,405.49	FSR
Grid Price (Yuan RMB/kWh, without VAT)	0.15	The grid connection agreement[5]
VAT (%)	17	FSR
Income Tax (%)	33	FSR
Operation Period (years)	30	FSR
Annual Operating Costs (10,000 Yuan RMB)	943	IRR calculation sheet[6]

[5] The grid connection agreement, June 16th, 2003

[6] The data used for calculation of annual operating cost are from FSR

According to calculation, the project IRR is 6.67% without CDM revenue which is lower than the benchmark rate of 8%. Based on the benchmark revenue rate in financial evaluation of Chinese power system, the IRR should not be lower than the threshold of 8%. Hence, the project faces obvious financial barriers without CDM revenue.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

The sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. We have used as critical assumptions:

- Total static investment
- Annual operating cost
- Electricity sale
- Electricity supplied to the grid

Variations of ±10%, which were indicated in FSR, have been considered in the critical assumptions. Table B.3 summarizes the results of the sensitivity analysis, while Figure B.1 provides a graphic depiction.

Table B.3 Impact of Variations in Critical Assumptions on IRR

	-10%	-5%	0%	5%	10%
Electricity sale	5.78%	6.22%	6.67%	7.11%	7.55%
Total static investment	7.55%	7.09%	6.67%	6.28%	5.94%
Annual operating cost	6.88%	6.77%	6.67%	6.56%	6.45%
Electricity supplied to the grid	5.78%	6.22%	6.67%	7.11%	7.55%

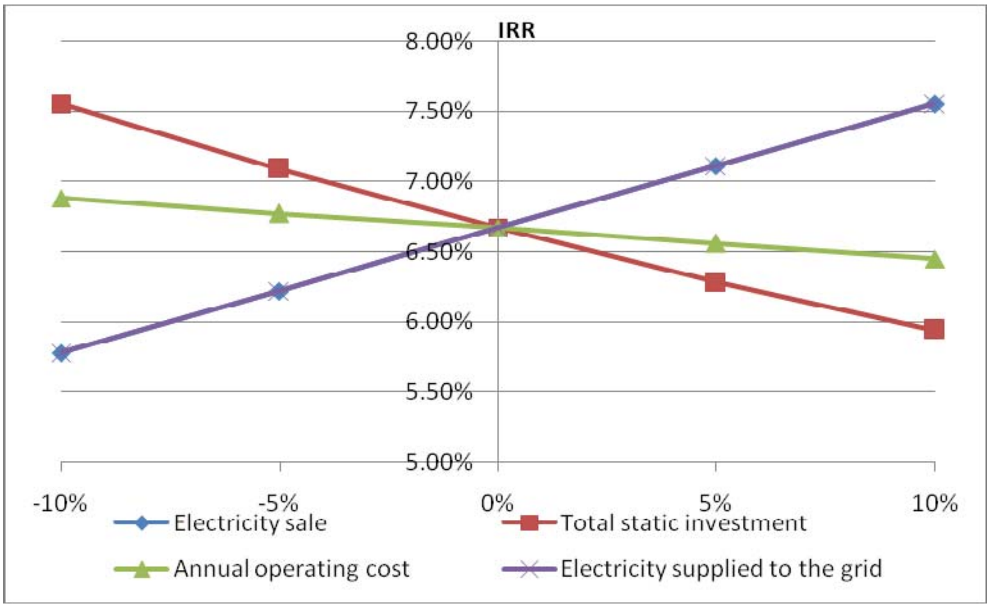

Fig B.1 the IRR Sensitivity Analysis with changes of Total static investment, Annual operating cost, Electricity sale and Electricity supplied to the grid

The sensitivity analysis showed that the IRR of this project without CDM revenues, 6.67%, is substantially below the benchmark rate of 8%. Changes in annual operating cost have little impact on the IRR; if the annual operating cost falls by 10%, the IRR reaches only 6.88%, under the benchmark rate. Changes in the electricity sale, electricity supplied to the grid and the investment amount have a little impact on the IRR:

with a 10% increase in the electricity sale, electricity supplied to the grid or a decrease in investment costs of 10%, the IRR all increase to 7.55% respectively. These values, however, are still below the benchmark rate.

Besides, the total static investment in FSR was estimated as price level in the end of 2002. But with the rapid development of economy, the price level is increasing rapidly. Also, the geographic conditions of the construction area were very complicate, and additional transmission project cost caused investment addition, which pulls IRR down.

The electricity sale depends on the grid price and the electricity supplied to the grid. However, the grid price was usually approved by Grid Company[7] or local government and rarely changed greatly. As we know, the electricity supplied to the grid of the project is limited by natural water resources, and was estimated as historical average value of a long-term natural river flow. Therefore, large changes of electricity supplied to the grid in the whole crediting period will rarely happen. Therefore, it is impossible for the project to become commercially attractive through an adjustment of the electricity sale.

The influence of annual operational cost to IRR is very little. Considering annual operational cost from the other side, the factors referred to, eg. Numbers of employees, annual income per employee, maintenance fee, etc., are also rarely possible to decrease dramatically.

Therefore, we use the range ±10% for sensitivity, and the results of the sensitivity analysis confirm that the project faces significant economic and financial barriers without CDM revenue, so the first alternative lacks economic attraction.

On the contrary, the project IRR will increase significantly when the project has access to CER income; it will rise to 8.94% (CER price of 8€/tCO_2e[8],1€=10Yuan), thus passing the critical barrier of 8%, leading to a positive decision to invest in the project. It is obvious that the benefit came from CDM will help to eliminate the financing barriers which will influence the project activity. It is obvious that the expected benefits from CDM will help to make the project commercially attractive and help to eliminate the financing barriers of the project activity and make the project commercially attractive.

The project owner got CDM information very early in 2003. In March 2003, the FSR was finished by Sichuan Qingyuan Engineering Consulting Co., Ltd, in which the grid price was calculated reversely based on acceptable loan payback period. The grid connection agreement was signed later, and the real grid price was much lower, therefore the IRR was much lower than the one in FSR. Based on this point, the project owner knew the project IRR was very low. Soon they made a decision to apply CDM project activity. Afterwards, they signed the CDM cooperation agreement with Ya'an Water Conservancy Association. But then in China, the CDM market was only in the beginning, the CDM progress of the project is very slow. In early 2005, the project owner contacted with Tianqing and signed cooperation agreement. The application work started from then on. The project was in hand of the buyer very early, but in 2005 and 2006, the CDM market was not as popular as now. Compared with some other renewable energy projects(e.g. wind farms), it was not easy to accept these projects in CDM market. Hence, the buyer was really careful to sign an ERPA although the buyer paid much attaintion on the project before. They signed Emission Reduction Purchase Agreement (here after referred to as "ERPA") after a long term investigation and due diligence to make sure they can pursue CERs from this project. They arranged the validation only after signed ERPA in 2007.

[7] Although the grid price in the Power Purchase Agreement is 0.1709 Yuan/kWh, the actual investment is also increased dramatically, which also cause a low project IRR.
[8] The Emission Reduction Purchase Agreement, June 2007

Below we provide a summarized implementation schedule of the project, illustrating the main events.

Table B.4: Time schedule of the implementation of the project

Date	Key Event
03-03-2003	The stockholders of project owner knew information about CDM from Ya'an Water Conservancy Association[9] and began to negotiate cooperation on CDM application
03-2003	The FSR was finished
16-06-2003	Grid connection agreement was signed.
20-06-2003	Directorate decision for applying green fund[10]
16-07-2003	CDM cooperation agreement with Ya'an Water Conservancy Association[11]
20-08-2003	Approval of FSR by Sichuan Development and Plan Committee[12]
04-2004	The Preliminary Design Report was finished
05-08-2004	Directorate decision for speeding up CDM process[13]
08-09-2004	The main equipment purchase agreement was signed
25-10-2004	The local government was asked for CDM application support
02-11-2004	Received a CDM application support letter from Shimian County Government[14]
23-02-2005	Got the construction permit, the construction started[15]
30-05-2005	CDM cooperation agreement with Tianqing[16]
08-2006	The first generator was in operation
12-2006	The second generator was in operation
05-2007	All generators were in operation
06-2007	Signed ERPA

<u>Step 3 Barrier analysis</u>

The investment analysis can fully demonstrate and explain the additionality of the proposed project, so the Barriers analysis is not needed.

<u>Step 4 Common Practice Analyses</u>

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

According to the *Tool for the Demonstration and Assessment of Additionally*, projects are considered "similar" in case they are located in the "same county/region", are of "similar scale",

[9] CDM information of Ya'an Water Conservancy Association, March 2003

[10] Directorate decision for applying green fund, June 2003

[11] CDM cooperation agreement with Ya'an Water Conservancy Association, July 2003

[12] Approval of FSR, August 2003

[13] Directorate decision for speeding up CDM process, August 2004

[14] CDM application support letter from Shimian County Government, November 2004

[15] The Construction permit, February 2005

[16] CDM cooperation agreement with Tianqing, May 2005

and “take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc”.

Sichuan Province with an area of 48.5 ten thousand km^2, is comparatively and considerably larger than many countries. According to the requirements of common practice, the projects with similar conditions, such as investment conditions and natural conditions (including geographical conditions, climate conditions, development conditions and so on), are necessary to be analyzed. Projects located in different provinces of the Central China Grid do not have the similar investment conditions [17] and natural conditions[18,19,20]. Therefore, the PDD selects geographical area, i.e. Sichuan Province, as a common practice region. We selected the projects with an installed capacity of between 50MW and 300MW as “similar scale” because Chinese government classifies hydropower stations between 50MW and 300MW as medium scale projects[21].

For the common practice analysis, we have analyzed hydropower projects located in Sichuan Province between 50MW and 300MW in Table B.4.

[17] Yearbook of China Water Resources 2006

[18] http://www.checc.cn/zgsd/zgsd_zy.jsp

[19]http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=19

[20] http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=20

[21] Almanac of China’s Water Power (2005), page 141.

Table B.4 Some Hydropower Stations of Sichuan similar to the Project
(Source: Yearbook of China Water Resources 2006.)

Name	Capacity (MW)	Year of Operation	Location	Project Operation Owner
Mahui Station	86.1	1990s[22,23]	Peng'an County	State owned
Jiangkou Station	51	1992[24]	Xuanhan County	State owned
Caoyutan Station	75	1995[25]	Hongya County	State owned
Yucheng Station	60	1995[26]	Lushan County	Sichuan Huaneng Xingbaohe Electricity Co., Ltd.
Tongtou Station	80	1995[27]	Lushan County	Sichuan Huaneng Xingbaohe Electricity Co., Ltd.
Dongxiguan Station	180	1995[28]	Wusheng County	Huaneng Group
Chengdong Station	84	2000[29]	Hongya County	Sichuan Province Government[30]
Daqiao Reservoir Station	100	2000[31]	Mianning County	Daqiao Hydropower Development Co., Ltd.
Tongzhong Station	57	2001[32]	Mao County	Sichuan Minjiang Hydropower Co., Ltd.
Hongyanzi Station	90	2001[33]	Nanbu County	Nanbu Hongyanzi Electricity Co., Ltd.
Yangcun Station	66	2004[34]	E'bian County	Sichuan Daduhe Electricity Co., Ltd. [35]
Tianlonghu Station	180	2004	Mao County	Sichuan Huanglong Electricity Co., Ltd.
Huilongqiao Station	50	2005	Li County	Sichuan Li County Huilong Hydropower Co., Ltd.
Jiangsheba Station	128	2005	Mao County	Minjiang Electricity Group Co., Ltd. [36]
Kehe Station	72	2005	Huidong County	Xichang Electric Bureau [37, 38, 39]

22 http://www.leadge.com/djnews/news/20079201003.htm

23 http://www.leadge.com/djnews/news/20079201003-2.htm

24 http://www.dzrbs.com/Html/xhxw/2007-9/12/114453296.html

25 http://www.gzbzl.cn/news_show.asp?id=35

26 http://www.powerfoo.com/article/html/1183356416640.html

27 http://www.chinapower.com.cn/yearbook/article/1995/30801004.html

28 http://www.chinesepower.com.cn/web/ml1.asp?ProID=699

29 Yearbook of China Water Resources 2000,2001

30 http://cdm.unfccc.int/UserManagement/FileStorage/0L5P6QLJ1K5HLXV1MQGHSISZ0PYL08, page13:

31 http://www.lsjc.gov.cn/ad/dqsd/index1.htm

32 http://baike.baidu.com/view/734468.html

33 http://218.6.246.125/Show_News.asp?NewsId=4637

34 Yearbook of China Water Resources 2004,2005

35 http://www.jrj.com.cn/NewsRead/Detail.asp?NewsID=494477

36 http://stock.finance.qq.com/sstock/ggzw/600131_190814.shtml?718157

37 http://www.anhesc.com/main/CoProfile.asp?Action=Profile

38 http://www.sc-dlzx.com/qyzc_dlqy/200321391837.asp

39 http://www.sepc.com.cn/outer/main/link.jsp?id=0682d210e601d2867ba6&typeID=212

Mahui Station, Jiangkou Station, Caoyutan Station, Yucheng Station, Tongtou Station, Dongxiguan Station, Chengdong Station, Daqiao Reservoir Station, Tongzhong Station, and Hongyanzi Station were operated before 2002. These stations were developed under a power system environment that is substantially different from the current power system environment, the first Power System Reform Blue Print has been published by State Council in February 2002, and the relevant content mainly include: Power plants separating from the power grid, reforming enterprises for power plants and power grids; bidding to power grid, building a competitive and open power market initially; changing the current situation of all power purchased by the state owned grid enterprises.[40] Therefore, they are quite different with the project.

In addition, other projects with a similar scale which were under construction or operation in Sichuan Province are applying for CDM project status[41].

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

Among the remaining projects, Jiangsheba station, and Kehe Station are developed by the state or state owned company, Yangcun station is developed by a public company, their larger capital reserves and operational capacities ensure they can finance easily. Furthermore, all their power generated can be supplied to the Provincial Grid directly. Besides, the grid prices (0.288Yuan RMB/kWh[42,43]) of Yangcun station and the Kehe station, Jiangsheba station(0.21Yuan RMB/kWh[44]), are much higher than the project of 0.15Yuan RMB/kWh（without VAT, 0.1755 Yuan RMB/kWh with VAT）. The grid price is the most sensitive parameter, and the difference of 0.1Yuan RMB/kWh caused much higher profit for these projects. Therefore, these projects did not face the financing barrier like the project.

Tianlonghu station and Huilongqiao station were developed by large companies, and had unit investments of 4,416 Yuan RMB/kW[45] and 4,281 Yuan RMB/kW[46] (total investment)respectively, fewer than the project of 4,787 Yuan RMB/kW(total investment), furthermore they enjoyed much higher grid price of 0.288Yuan RMB/kWh than the project of 0.15Yuan RMB/kWh. Considering the lower unit investment and higher grid price, they were more economic attractive than the project.

In general, the project faces several barriers which would prevent from the implementation of the project activity without CDM. CDM revenues will help to overcome these barriers. If the project is not implemented, the power will be supplied by the Central China Grid dominated by thermal power. Hence, the project activity is not baseline scenario, and is additional.

It is clear from the investment and the barrier analysis that the project does not benefit from the same economic advantages as the projects listed in Table B.4. Therefore, the project is additional.

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[40] Power System Reform Blue Print, published by State Council, February 10, 2002.

[41] http://cdm.unfccc.int/Projects/Validation/index.html and
Chinese DNA web site: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1774.pdf

[42] http://www.scpi.gov.cn/zcfg/zcfg-content.asp?id=1057

[43] The approval of grid price of Kehe Station

[44] The Sichuan Local Electricity Statistic Yearbook 2006

[45] http://www.scpi.gov.cn/zcfg/zcfg-content.asp?id=1057

[46] The Sichuan Local Electricity Statistic Yearbook 2006

To summarize, the project faces several barriers which would prevent the implementation of the project activity without CDM. CDM helps to overcome these barriers. Hence, we conclude that the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The electricity generated by the project is connected to the Sichuan Grid and then to the Central China Grid. The Central China Grid includes the Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan Grids. So this project selects baseline emission factor for the Central China Grid.

Baseline

According to methodology ACM0002, Baseline emissions are equal to the power supplied to the grid multiplied by the baseline emission factor EF_y. The baseline emission factor is equal to the combined margins: the equally weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$).

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA on 09 August 2007. We will refer to these emission factors as the ‘published emission factors’.

For more information on the published OM and BM emission factors, please refer to:

- Calculation result of the baseline emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
- Calculation process of the baseline OM emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
- Calculation process of the baseline BM emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

We calculate the OM and BM Emission Factors on the basis of the published emission factors but deviate at some points by using data published in the China Energy Statistical Yearbook and China Electric Power Yearbook which results in a slightly lower emission factor and is therefore more conservative. Additionally, since the published emission factors were issued, new editions of the above-mentioned statistical yearbooks (*China Energy Statistical Yearbook 2006* and *China Electric Power Yearbook 2006*) and *2006 IPCC Guidelines for National Greenhouse Gas Inventories* have been published, we have used the latest available data for the calculation of the emission factors. The description below focuses on the key elements in the calculation of the published emission factors and the subsequent calculation of emission reductions. The full process of the calculation of the emission factors and all underlying data are presented in Annex 3 to this PDD.

STEP 1 Calculate the Operating Margin emission factor ($EF_{OM,y}$)

ACM0002 (version 06) offer four options for the calculation of the Operating Margin emission factor(s) ($EF_{OM,y}$):

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

As the methodology "Dispatch Data Analysis" should be the first methodological choice. However, the method is not selected for OM emission factor calculation, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

From 2001 to 2005, in the composition of gross annual generation power for Central China Grid, the ratio of power generated by hydropower and other low cost/compulsory resources is as following: 36.76% in 2001,35.95% in 2002, 34.43% in 2003, 38.54% in 2004, 38.18% in 2005, obviously far lower than 50%. Based on these considerations, the OM has been calculated according to the Simple OM. Simple OM is appropriate, because low cost/ must run resources account for far less than 50% of the power generation in the Central China Grid in most recent years.The "ex-ante vintage" will be employed for OM calculation of the project.

According to the ACM0002 (version 06), the Simple OM has been employed to calculate the OM. The calculation equation is as follows:

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

Where

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y; j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid;

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel(coal, oil and gas) in year(s) y; and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by relevant power sources j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \qquad \text{Equation (B.2)}$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i, from National fixed value;

$OXID_i$ is the oxidation factor of the fuel , 2006 IPCC Guidelines for National Greenhouse Gas Inventories for default values;

$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i, 2006 IPCC Guidelines for National Greenhouse Gas Inventories for default values.

In addition, there is no net imported power to the Central China Grid.

The average operating margin emission factor can be calculated using the full power supplied-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

The operating margin emission factor of the baseline is calculated ex-ante and will not be renewed in the crediting period of the project activity.

STEP 2 Calculate the Build Margin emission factor ($EF_{BM,y}$)

According to ACM0002, the Build Margin Emission Factor is calculated as the generation weighted average emission factor (measured in tCO_2e/MWh) of a sample of *m* power plants. The calculation equation is as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad \text{Equation (B.3)}$$

Where

$F_{i,m,y}$, is the amount of fuel i (in a mass or volume unit) consumed by power plants *m* in year(s) *y*,

$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants *m* and the percent oxidation of the fuel(coal, oil and gas) in year(s) *y*; and

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by power plants *m*.

The methodology supplied the following two options:

Option 1: Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the most recent four years information available on plants already built for sample group m at the time of PDD submission.

Option 2: For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1 above.

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

The sample group m consists of

(1) The five power plants that have been built most recently, or

(2) The power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.[47]

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

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[48] the following

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

[48] This is in accordance with the "Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at:

deviation in methodology application:

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

Since there is no way to separate the different generation technology capacities as coal, oil or gas fuel etc from thermal power based on the present statistical data, the following calculation measures will be taken:

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

Sub-step 1
Calculate the proportion of CO_2 emissions of the solid, liquid and gas fuels used to generate power in the total CO_2 emissions of three fuels.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{Equation (B.4)}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{Equation (B.5)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{Equation (B.6)}$$

Where,

$F_{i,j,y}$, is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y,

$COEF_{i,j,m}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants m and the oxidation percentage of the fuel(coal, oil and gas) in year(s) y,

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

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

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http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

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

Where,

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

A coal-fired power plant with a total installed capacity of 600MW is assumed to be the commercially available best practice technology in terms of efficiency. The estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 343.33gce/kWh, which corresponds to an efficiency of 35.82% for electricity generation.

For gas and oil power plants a 200MW combined cycle power plant with a specific fuel consumption of 258gce/kWh, which corresponds to an efficiency of 47.67% for electricity generation, is selected as commercially available best practice technology in terms of efficiency.

Sub-step 3: Calculate the Build Margin emission factor

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

Where,

CAP_{Total} is the total capacity addition, $CAP_{Thermal}$ is the total thermal power capacity addition.

As mentioned above, the build margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity.

The data resources for calculating OM and BM are:

- Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
  Source: *China Electric Power Yearbook* (2002-2006)
- Fuel consumption and the net caloric value of thermal power plants
  Source: *China Energy Statistical Yearbook* (2004-2006),
- Carbon emission factor and carbon oxidation factor of each fuel
  Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy*, Table 1.3 and 1.4 of Page 1.21-1.24 in Chapter one.

STEP 3 Calculate the Electricity Baseline Emission Factor (EF_y)

The Baseline Emission Factor is calculated as a Combined Margin, using the weighted average of the Operating Margin and Build Margin.

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \qquad \text{Equation (B.9)}$$

We calculate the result as follows: the operating margin emission factor (EF_{OM}) of the Central China Grid is 1.2909tCO_2e/MWh and the build margin emission factor (EF_{BM}) is 0.5046tCO_2e/MWh. The defaults weights for hydropower projects are used as specified in the ACM0002 (version 06).

$w_{OM} = 0.5$; $w_{BM} = 0.5$

We calculate a Baseline Emission Factor of 0.89775tCO_2e/MWh.

Emission Reductions (ER_y **)**

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y$$ Equation (B.10)

where the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) calculated in Step 3, times the electricity supplied by the project activity to the grid (EG_y in MWh), as follows:

$$BE_y = EG_y \times EF_y$$ Equation (B.11)

$$EG_y = EG_{s,y} - PR_{g,y}$$ Equation (B.12)

Of which: $EG_{s,y}$ is the gross power supplied to the grid.

$PR_{g,y}$ is the electricity use of power plant supplied by the grid.

The project is a new run of river hydropower project, according to ACM0002, the project emission is: $PE_y = 0$

Based on ACM0002, project participant does not need to consider leakage in applying ACM0002 methodology, i.e. L_y=0.

So, the emission reduction by the project activity is equal to the baseline emissions,

$$ER_y = BE_y = EG_y \times EF_y = (EG_{s,y} - PR_{g,y}) \times EF_y$$ Equation (B.13)

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

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Power Generation of Sources j in the years y (2001-2005, including Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan)
Source of data used:	*China Electric Power Yearbook 2002-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data

Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$PR_{m,y}$
Data unit:	%
Description:	The rate of electricity consumption of thermal power plants of Province m in the years y (2003-2005 including Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan)
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	$F_{i,j,y}$
Data unit:	$10^4t/10^8m^3$
Description:	The Fuel i Consumption of Power Sources j in the years y (2003-2005, including Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan)
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	NCV_i
Data unit:	TJ/ fuel in a mass or volume unit
Description:	The NCV_i *of* Fuel i in a mass or volume unit
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ
Description:	The *Emission Factor of* Fuel i in a mass or volume unit
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually	IPCC Default Value

applied :	
Any comment:	To calculate OM and BM

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	The Oxidation Rate of Fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

Data / Parameter:	$GENE_{best,coal}$
Data unit:	%
Description:	Commercially available coal-fired power plant corresponding to the best practice in terms of efficiency
Source of data used:	*Chinese DNA: Bulletin on Baseline Emission Factors of the Chin Grid-the calculation of baseline Build Margin emission factor for the China Grid*
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	%
Description:	Commercially available oil and gas power plant corresponding to the best practice in terms of efficiency
Source of data used:	*Chinese DNA: Bulletin on Baseline Emission Factors of the China Grid -the calculation of baseline Build Margin emission factor for the China Grid*
Value applied:	47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The Installed Capacity of Power Sources j in the years y (2003-2005, including Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan)
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of	Official Statistical Data

measurement methods and procedures actually applied :	
Any comment:	To calculate BM

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

According to Annex 3, the baseline emission factor of the project is 0.89775tCO_2e/MWh during the first crediting period. And the net annual electric power supplied to the grid by the project is 255,225.1MWh. Therefore, BE_y in the first crediting period is to be calculated as follows:

$$ER_y = BE_y = EG_y \times EF_y = (EG_{s,y} - PR_{g,y}) \times EF_y = 233{,}792tCO_2e$$

According to B.6.1, the emission reduction by the project activity is equal to the baseline emissions. Therefore, in the first crediting period, the annual emission reductions are 233,792tCO_2e

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

The total emission reductions of the project are 1,636,544tCO_2e during the first crediting period.

Table B.5 Estimate of Emission Reductions Due to the Project

years	Project Emissions (tCO_2e)	Baseline Emissions (tCO_2e)	Leakage (tCO_2e)	Emission Reductions (tCO_2e)
01/11/2008-31/10/2009	0	233,792	0	233,792
01/11/2009-31/10/2010	0	233,792	0	233,792
01/11/2010-31/10/2011	0	233,792	0	233,792
01/11/2011-31/10/2012	0	233,792	0	233,792
01/11/2012-31/10/2013	0	233,792	0	233,792
01/11/2013-31/10/2014	0	233,792	0	233,792
01/11/2014-31/10/2015	0	233,792	0	233,792
Total(tCO_2e)	0	1,636,544	0	1,636,544

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

B.7.1. Data and parameters monitored:

In order to calculate emission of baseline, we need to monitor the gross electricity supplied to the grid ($EG_{s,y}$) and the electricity use of power plant supplied by the grid ($PR_{g,y}$), and according to the two data, the net power supplied to the grid (EG_y) will be calculated ($EG_y = EG_{s,y} - PR_{g,y}$).

Table B.6 Data and parameters monitored ($EG_{s,y}$)

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Gross electricity supplied to the grid by the project
Source of data to be used:	Directly measured, by meter
Value of data applied for the purpose of calculating expected	The electricity supplied by the project is 260,680MWh

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis.
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standard and regulations; Power supplied to the grid is double checked according to electricity sales invoices.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Table B.7 Data and parameters monitored ($PR_{g,y}$)

Data / Parameter:	$PR_{g,y}$
Data unit:	MWh
Description:	The electricity use of power plant supplied by the grid in year
Source of data to be used:	Directly measured, by meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The electricity supplied to the project by grid company is estimated to be 260MWh (about 1‰ of the power supplied to the grid)
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis.
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standard and regulations; Power supplied to the project is double checked according to electricity sales invoices.
Any comment:	Refer to B.7.2. Description of the monitoring plan

B.7.2. Description of the monitoring plan:

The objective of the monitoring plan is to insure the complete, consistent, clear, and accurate monitoring and calculation of the emissions 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 entity.

1. Monitoring Objective

The main monitoring data are the gross electricity supplied to the grid ($EG_{s,y}$), and the electricity use of power plant supplied by the grid ($PR_{g,y}$) needed to calculate the net electricity supplied to the grid, as discussed above in B.7.1. The baseline emission factor is fixed by ex-ante calculation.

2. Monitoring Organization

A chief monitoring officer will be appointed by the project owner, who will supervise and verify metering and recording, collect data (meters' data reading, sales / billing invoices), calculate emission reductions and prepare monitoring reports.

The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting Co., Ltd. in his responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and data archiving;
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions;
- Continuous advice to the monitoring officer as required;
- Review of monitoring reports.

The organizing structure as following figure B.2

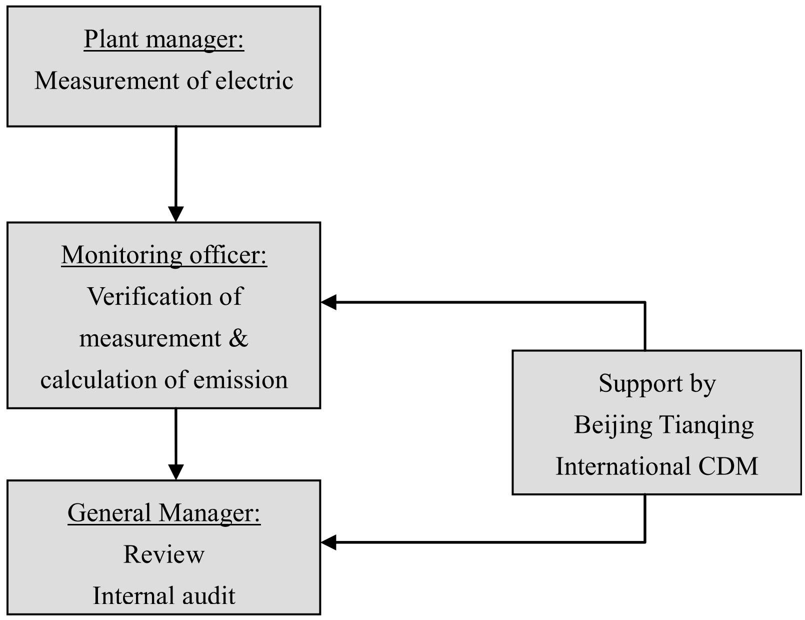

Figure B.2 Management structure in order to monitor emission reductions

3. Monitoring Equipment and Program

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448－2000),* the electric energy metering equipment will be properly configured, and the metering equipment will be checked by both the project owner and the grid company before the project starts operation. The following diagram indicates the electrical grid connection of the project.

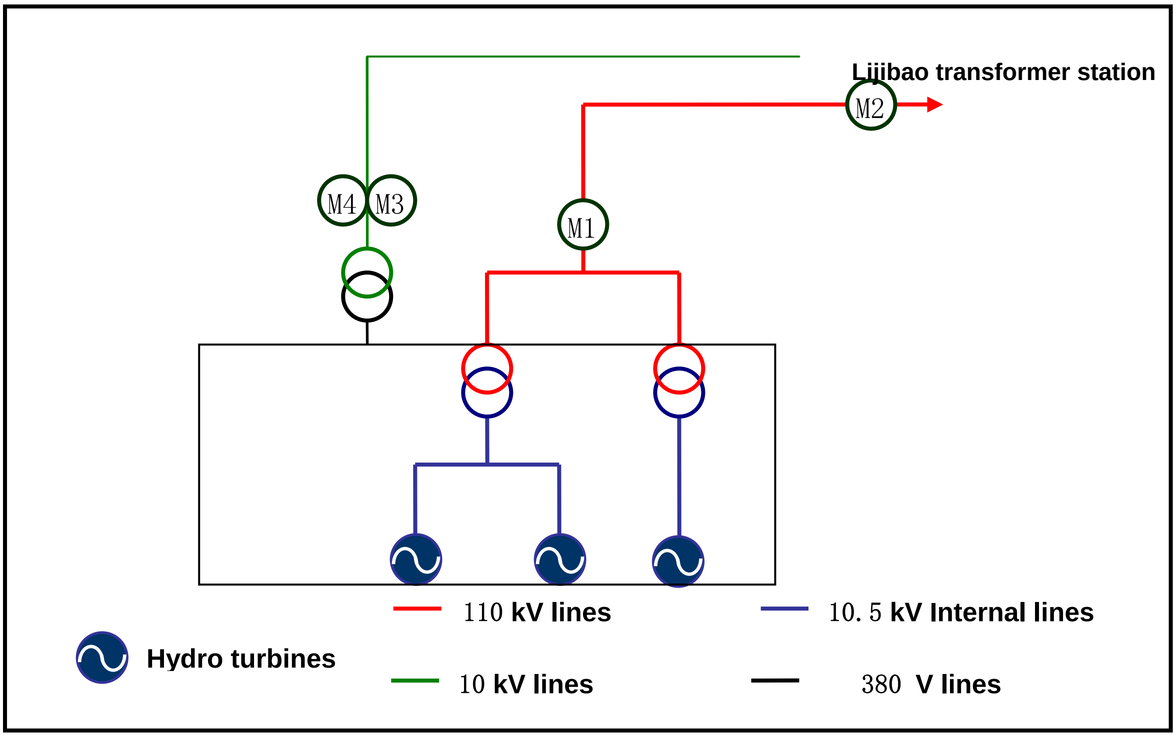

Figure B.3. Simplified electrical grid connection diagram

Four meters will be required, of which, the first meter (backup meterM1, 1.0S) at the exit of the project station is employed to measure output electricity and power supplied to the project from the Grid Company (with the transmission line loss), and the second meter (main meterM2, 0.5S) measures the net power supplied to the grid and power supplied to the project from the grid company (except the transmission line loss) at the Lijibao transformer station of the Grid Company. In emergency, the backup power comes from the Lijibao transformer station of the grid company, and the other two meters (M3, M4; one is main meter, 0.5S) at the outside of the power plant are employed to measure the power imported to the plant from the grid. The net power supplied to the grid will be calculated as M2-M3. In case, the main meters meet some malfunctions, the project owner should employ the data monitored by the backup meters.

The detailed information of the meters is listed in the following table.

Table B.8 Details of metering instruments

Meter	Recorded by	Electronic measurement	Manual measurement	Recording	Calibration	Accuracy	Measuring	Documentation
M1	Project owner	Hourly	Daily (optional)	Monthly	Qualified Body (Annually)	Accuracy Class 1.0S	Electricity generated by the project	Print out of electronic record and optional paper log
M2	Grid Company	-	-	Monthly	Qualified Body (Annually)	Accuracy Class 0.5S	Electricity generated by the project	Monthly sales invoices for power delivered to grid
M3	Grid Company	-	-	Monthly or Seasonally (optional)	Qualified Body (Annually)	Accuracy Class 0.5S	Internal power consumption by the project	Annually sales invoice for power delivered to plant
M4	Project owner	-	-	Annually or Seasonally (optional)	Qualified Body (Annually)	Accuracy Class 0.5S	Internal power consumption by the project	Annually sales invoice for power delivered to plant

Another 110kVtransmission line of Wanba- Hanyuan Wanli will be built in the following years. After this project finished, the electricity of the project will be transmitted through this line to Wanli Transformer Station, also finally to the Central China Grid. The electrical grid connection of the project will be as follows. The main meter M2' will be equipped according to national regulation, and the accuracy will not be less than 0.5S. All the monitoring and measuring procedure will be the same as above.

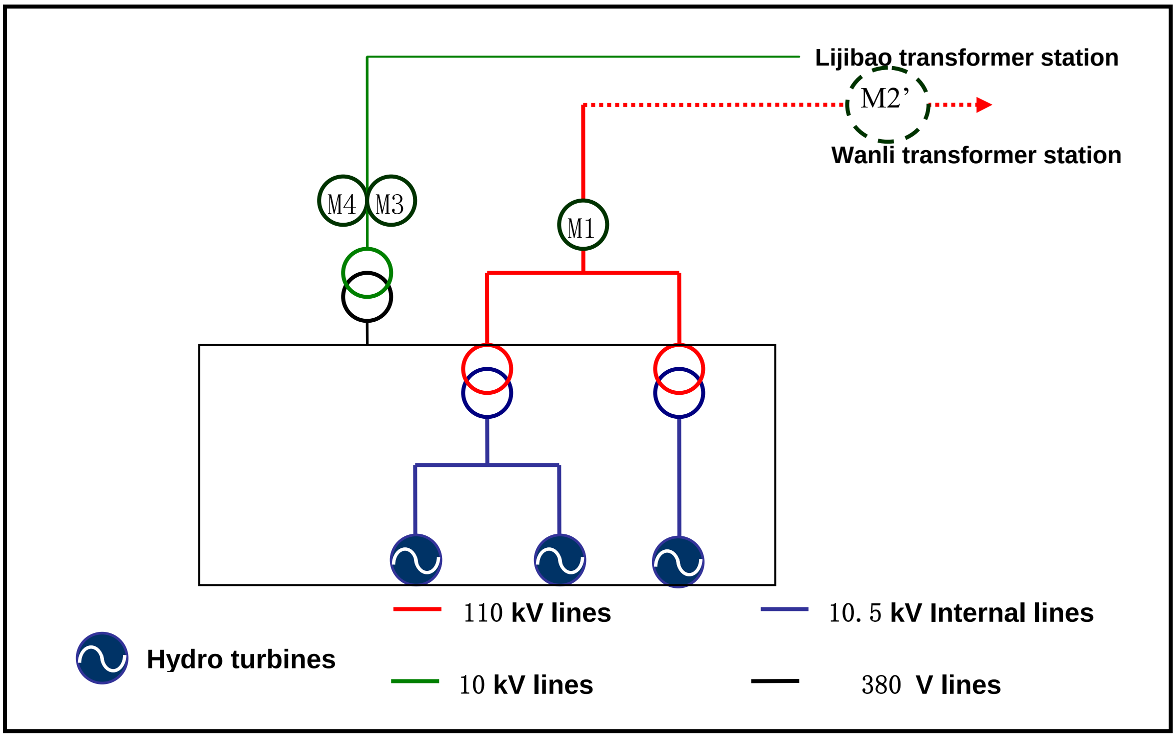

Figure B.4. Simplified electrical grid connection diagram after Wanba- Hanyuan Wanli Transmission Line is finished

4. Data Collection:

The project owner and the Grid Company are responsible for monitoring of the backup meters and the main meters, and guarantee the measuring equipments are in good operation and with complete seal.

The electricity recorded by the main meters alone will suffice for the purpose of billing and emission reduction verification as long as the accuracy of the main meters is within the permissible tolerance. The main monitoring process is as follows:

- i The project owner and Grid Company read and check the backup meters and the main meters, and records the data on the specific day of every month;
- ii The Grid Company supplies the electricity to the project owner;
- iii The project owner provides electricity sales invoices to the Grid Company. Copies of the invoices are stored by the project owner, together with records of the payment by the grid company.
- iv About the electricity consumed by the plant, the Grid Company provides electricity sales invoices to the project owner and the invoices are stored by the project owner.
- v The project owner records the net electricity supplied to the grid;
- vi The project owner keeps and safeguards the records of the meters' data readings for verification by the DOE.

If inaccuracy of the reading data from the main meters has exceeded the allowable tolerance or otherwise

the meter malfunctioned will operate in one certain month, or any other unexpected problems, the grid-connected electricity generated by the project shall be followed by:

i Reading the backup meters (after taking into account line losses) to obtain electricity supplied to the grid, unless a test by either party reveals it is inaccurate;

ii If the backup system is not within the acceptable tolerance limit or otherwise performed improperly, the project owner and the Grid Company shall jointly prepare a new agreement for the correct reading; and

iii If the project owner and the Grid Company fail to agree on the correct reading, the matter will be referred to arbitration according to agreed procedures.

The meters' reading will be readily accessible for the DOE. Calibration test records will be maintained for verification.

5. Calibration

The calibration of electric energy meter should be carried out annually. After calibration, meters should be sealed. The meters shall be jointly inspected and sealed on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives,

All the meters installed shall be tested by the qualified metrical organization co-authorized by the project owner and Grid Company within 10 days after:

i The detection of a difference larger than the allowable error in the readings of the main meters and the backup meters;

ii Repair the meters caused by the failure of operation.

6. Data Management

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM. In addition, a hard copy printout will be archived. In addition, the project owner will collect sales invoices for the power delivered to the grid as a cross-check. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. sales invoices).

Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the project owner.

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

7. Monitoring Plan

The project owner will keep sale and purchasing invoices, and will prepare a monitoring plan at the end of the year, including measuring of power supplied to the grid, audit report, calculation report of emission reduction and repair and calibration record of the monitoring equipments.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion: 17/07/2008

Name of persons determining the baseline:

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SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

08/09/2004 (the date of main equipment purchasing)

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

The expected operational lifetime of the project activity is 30 years

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

C.2.1. Renewable crediting period

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

01/11/2008(or earliest date after registration)

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Environmental impacts

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

According to the relevant environmental law and regulations, an environmental impact assessment had been carried out, and has been approved by Sichuan Environment Protection Bureau. The main assessment conclusions are be provided below:

1. Impact on Ambient Air

The main air pollutants due to project construction are TSP, CO, and SO_2 from fuel burning, blasting, rock crushing and transportation; however, the quantity of pollutants is little, and they can diffuse quickly. Besides, measures such as ventilation, watering, coverage, canned transportation, installing dust catcher equipment and virescence on the roads will be carried out to reduce the impact on air quality.

2. Impact on Aquatic Environment

The impact on aquatic environment is mainly from industrial wastewater and domestic wastewater. The industrial wastewater produced consists mainly of rock processing water, washing water for blending concrete and pit wastewater. The main pollutant is suspending solid. Waste water will be discharged in standard after treatment by sedimentation tank. The production of domestic wastewater is very little and is mainly from living area. The main pollutant is organic matter. It will be used to irrigation after treatment by septic tank.

3. Impact on Acoustic Environment

The noise from blasting, drilling, concrete casting and blending, excavating and transporting vehicles will have some negative impact on builders and part wild animals of construction area. During construction period, blasting will be forbidden in night, high noise equipments will be prohibited to operate, vehicle speed will be limited, and safety tools will be equipped. Besides, the project is located in the valley. Because of the shield of mountain and forest, the noise will be attenuated quickly.

4. Impact of Solid Waste on the Environment

During the construction period, solid waste is mainly discarded slag and domestic waste. The discarded slag will be piled up in two designated waste disposal sites and three temporary transfer slag sites, and engineering protection measures at the waste disposal site will be carried out to avoid the soil and water loss. The domestic waste generated is very little. Waste plant will be set up to collect the waste and will be cleared regularly.

5. Impact on the Soil and Water Loss

The excavation, discharged slag and road construction will destroy the vegetation and slop stability, and cause a little soil and water loss. Engineering project and vegetation project will be carried out. After the construction is finished, virescence will be carried out on temporarily occupied land, and the vegetation will be comeback.

6. Impact on Ecosystem

2.039289hm^2 land will be permanently occupied by the project, and 1,069,376 RMB will be paid for land compensation according to the local standard. Wanba Provincial Nature Protection Area is 20km from this project, and will not be impacted by the construction. The construction will have some negative impact on local plant and animal resources, however, the referred plant is mainly draught valley vegetation, the cover rate is very high, and there are no rare wild animals or fishes. After the construction is finished, with the ecology measures, the biomass will recover soon. There are 5 branches meeting the water need of

downstream and 0.8m^3/s flow from the dam has been used as ecological water. Ecological water will be sluiced and will benefit for hydro-ecosystem.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The project participants or the host Party think that the project causes little negative impact on environment.

SECTION E. Stakeholders' comments

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

Before the stakeholders' meeting, the project owner had distributed questionnaires for local residents to investigate the suggestion of them on the construction of Wanba River Hydropower Station, including the impact on local society, environment, economy, daily life etc.

A special stakeholder consultation meeting of the project was organized on Jan. 11, 2007 at Shimian County, Sichuan Province to collect opinions of all the potential stakeholders, such as local residents and so on, aiming at collecting advices on the influence imposed on the local society, economy, daily life etc for the project broadly. In order to make the potential stakeholders to receive information of the meeting, the project owner published a bulletin for the meeting of stakeholders on the newspaper of *Ya'an Daily* on Jan. 9, 2007, and also publicized the meeting bulletin via the website of www.tqcdmchina.com, in the bulletin, the companies noticed that all the potential stakeholders could learn the detailed information on the project. The Shimian County Government also sent a meeting notice to invite the Environment Protection Bureau, the Water Resources Bureau etc. to attend this meeting. At the meeting, the project owner and the consultant invited the participants in the meeting to express their comments and concerns about the project and CDM， and then they got satisfied answers from experts. The following is the questions that the questionnaires and the stakeholder meeting referred:

1. Whether the construction of the project is good?
2. Will the project bring noise impacts and other environment impact? How far is the project away from the nearest local resident?
3. What do the local residents live on? Will construction of the project bring negative impacts on the local residents' incomes? If increase, How the incomes increased?
4. Before the construction of the project, what is the site used for? Whether the local residents have some following questions, such as tilled land reduction and so on? If there are such kinds of questions, have they been resolved? Whether the standard of compensation has been complied with the national policy?
5. How much migration has been impacted?
6. Will the project impact on the cultural relics and historic sites?
7. Will the project bring any negative impacts on local ecological environment? Such as, local animals, fish, vegetable and so on.
8. Do the local government and residents agree with the CDM?
9. Do you agree with the construction of the project?

E.2. Summary of the comments received:

Forty-four filled in questionnaires have been returned, of which, about 64% are women, about 86% are graduated from junior middle school or lower, and 95% are elder than 20 years old and the investigation results are following:

- About 98% of the investigated residents think the electricity is in shortage in Shimian County, about 67% of which think that the electricity is in serious shortage.
- 100% of the investigated residents think the hydropower station will bring benefit to their lives and will increase their income.
- 100% of the investigated residents think the hydropower station will not cause negative impact on to their lives.

- 100% of the investigated residents think the hydropower station will improve the traffic and communication conditions.
- 100% of the investigated residents think the construction of the project will not bring negative impact on local environment.
- 100% of the investigated residents agree with the construction of the project.

There are twenty-four stakeholders attended the meeting, and the project owner keeps the meeting record. All stakeholders consider that the hydropower is a renewable energy and which will cause little negative impacts on the environment.

- There are no any residents around the project, and the station is far away from the residential areas, therefore, the project will cause little negative impacts on the local residents.
- The project will occupy only 2.039289 hm^2 land, and the effected residents are compensated and satisfied with the compensation for land requisition.
- The project will cause some negative impacts on biomass of some plants and animals, but they are dominant species in local area, and there are no any national and provincial protected rare species around the project site, therefore the negative impact is very little after adopting some environmental protective measures. Wanba Provincial Natural Protection Area is far from this project, and will not be impacted by the construction.

On the contrary,

- the project will provide electricity for life and manufacture; encourage the local resident to substitute electricity for firewood, reduce the destruction to forest, protect ecological environment, reduce Greenhouse Gas emission, and lessen water and soil loss;
- Built roads for local residents, and improve local traffic and communication conditions.
- Accelerate the development of local agriculture and tourism;
- The project will also help to increase the local employment opportunities, improve life quality of local residents, such as, increasing incomes of the local residents.

All stakeholders were pleased with the development of the project, and the CDM project would actually facilitate the development of local economy and increase incomes of the local residents.

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

Given the generally positive (or neutral) nature of the comments received, actions mentioned in EIA report has been taken to address the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex Ⅰ parties used in the project activity.

Annex 3

BASELINE INFORMATION

Table1. The ratio of power generated by hydropower and other low cost/compulsory resources for the Central China Grid, 2001-2005

	2001	2002	2003	2004	2005
Thermal Power Generation (MWh)	178,156,000	200,347,000	240,839,000	270,846,000	303,976,000
Hydro power Generation (MWh)	103,554,000	112,440,000	126,448,000	169,094,000	187,734,000
Other Power (MWh)	0	0	0	725,000	10,000
Total Electricity Generation of the Central China Grid (MWh)	281,710,000	312,787,000	367,287,000	440,665,000	491,710,000
The ratio of power generated by hydropower and other low cost/compulsory resources of total grid generation	36.76%	35.95%	34.43%	38.54%	38.18%

Data Source: China Electric Power Yearbooks 2002-2006.

Table2. Calculation of Thermal Power supplied to the Central China Grid in 2003

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan
Thermal power Generation (MWh)	27,165,000.0	95,518,000.0	39,532,000.0	29,501,000.0	16,341,000.0	32,782,000.0
Rate of Electricity Consumption of Power Plant (%)	6.43	7.68	3.81	4.58	8.97	4.41
Thermal power Supplied (MWh)	25,418,290.5	88,182,217.6	38,025,830.8	28,149,854.2	14,875,212.3	31,336,313.8
Total Thermal Power of the Central China Supplied to Grid (MWh)	225,987,719.0					

Data source: China Electric Power Yearbook. 2004.

Table3. Calculation of Thermal Power supplied to the Central China Grid in 2004

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan
Thermal power Generation (MWh)	30,127,000.0	109,352,000.0	43,034,000.0	37,186,000.0	16,520,000.0	34,627,000.0
Rate of Electricity Consumption of Power Plant (%)	7.04	8.19	6.58	7.47	11.06	9.41
Thermal power Supplied (MWh)	28,006,059.2	100,396,071.2	40,202,362.8	34,408,205.8	14,692,888.0	31,368,599.3
Total Thermal Power of the Central China Supplied to Grid (MWh)	249,074,186					

Data Source: China Electric Power Yearbook 2005.

Table4. Calculation of Thermal Power supplied to the Central China Grid in 2005

Province	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan
Thermal power Generation (MWh)	30,000,000.0	131,590,000.0	47,700,000.0	39,900,000.0	17,584,000.0	3,7202,000.0
Rate of Electricity Consumption of Power Plant (%)	6.48	7.32	2.51	5.00	8.05	4.27
Thermal power Supplied (MWh)	28,056,000.0	121,957,612.0	46,502,730.0	37,905,000.0	16,168,488.0	35,613,474.6
Total Thermal Power of the Central China Supplied to Grid (MWh)	286,203,305					

Data Source: China Electric Power Yearbook 2006.

Table5. Energy Consumption Statistics of Power Generation of the Central China Grid in 2003

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	The Central China Grid G=A+B+C+D+E+F
Raw coal	Ten thousand Tons	1,427.41	5,504.94	2,072.44	1,646.47	769.47	2,430.93	13,851.66
Clean coal	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other washed coal	Ten thousand Tons	2.03	39.63	0.00	0.00	106.12	0.00	147.78
Coke	Ten thousand Tons	0.00	0.00	0.00	1.22	0.00	0.00	1.22
Coke oven gas	10^8 Cubic meter	0.00	0.00	0.93	0.00	0.00	0.00	0.93
Other gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crude oil	Ten thousand Tons	0.00	0.5	0.24	0.00	0.00	1.20	1.94
Diesel oil	Ten thousand Tons	0.52	2.54	0.69	1.21	0.77	0.00	5.73
Fuel oil	Ten thousand Tons	0.42	0.25	2.17	0.54	0.28	1.20	4.86
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	1.76	6.53	0.00	0.66	0.00	0.00	8.95
Natural gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.04	2.2	2.24
Other petroleum products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tce	0.00	11.04	0.00	0.00	16.20	0.00	27.24

Data Source: China Energy Statistical Yearbook 2004.

Table6. Energy Consumption Statistics of Power Generation of the Central China Grid in 2004

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	The Central China Grid G=A+B+C+D+E+F
Raw coal	Ten thousand Tons	1,863.80	6,948.50	2,510.50	2,197.90	875.50	2,747.90	17,144.10
Clean coal	Ten thousand Tons	0.00	2.34	0.00	0.00	0.00	0.00	2.34
Other washed coal	Ten thousand Tons	48.93	104.22	0.00	0.00	89.72	0.00	242.87
Coke	Ten thousand Tons	0.00	109.61	0.00	0.00	0.00	0.00	109.61
Coke oven gas	10^8 Cubic meter	0.00	0.00	1.68	0.00	0.34	0.00	2.02
Other gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	2.61	0.00	2.61
Crude oil	Ten thousand Tons	0.00	0.86	0.22	0.00	0.00	0.00	1.08
Gasoline	Ten thousand Tons	0.00	0.06	0.00	0.00	0.01	0.00	0.07
Diesel oil	Ten thousand Tons	0.02	3.86	1.70	1.72	1.14	0.00	8.44
Fuel oil	Ten thousand Tons	1.09	0.19	9.55	1.38	0.48	1.68	14.37
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	3.52	2.27	0.00	0.00	0.00	0.00	5.79
Natural gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00	2.27	2.27
Other petroleum products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tce	0.00	16.92	0.00	15.20	20.95	0.00	53.07

Data Source: China Energy Statistical Yearbook 2005.

Table7. Energy Consumption Statistics of Power Generation of the Central China Grid in 2005

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	The Central China Grid G=A+B+C+D+E+F
Raw coal	Ten thousand Tons	1,869.29	7,638.87	2,732.15	1,712.27	875.40	2,999.77	17,827.75
Clean coal	Ten thousand Tons	0.02	0.00	0.00	0.00	0.00	0.00	0.02
Other washed coal	Ten thousand Tons	0.00	138.12	0.00	0.00	89.99	0.00	228.11
Coke	Ten thousand Tons	0.00	25.95	0.00	105	0.00	0.00	130.95
Coke oven gas	10^8 Cubic meter	0.00	0.00	1.15	0.00	0.36	0.00	1.51
Other gas	10^8 Cubic meter	0.00	10.2	0.00	0.00	3.12	0.00	13.32
Crude oil	Ten thousand Tons	0.00	0.82	0.36	0.00	0.00	0.00	1.18
Gasoline	Ten thousand Tons	0.00	0.02	0.00	0.00	0.02	0.00	0.04
Diesel oil	Ten thousand Tons	1.30	3.03	2.39	1.39	1.38	0.00	9.49
Fuel oil	Ten thousand Tons	0.64	0.29	3.15	1.68	0.89	2.22	8.87
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	0.71	3.41	1.76	0.78	0.00	0.00	6.66
Natural gas	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00	3.00	3.00
Other petroleum products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	Ten thousand Tons	0.00	0.00	0.00	1.50	0.00	0.00	1.50
Other Energy	Ten thousand Tce	0.00	2.88	0.00	1.74	32.80	0.00	37.42

Data Source: China Energy Statistical Yearbook 2006.

Table8. The Operation Margin Emission Factor Calculation of the Central China Grid in 2003

Fuel	Unit	Fuel Consumption of The Central China Grid in 2003 G	Emission Factor H （tc/TJ）	Oxidation Rate I (%)	Average NCV J (MJ/t,km^3)	CO_2 Emission(tCO_2e) K=G*H*I*J*44/12/10000 (for quality unit) K=G*H*I*J*44/12/1000 (for volume unit)
Raw coal	Ten thousand Tons	13,851.66	25.8	100	20,908	273,971,539.89
Clean coal	Ten thousand Tons	0.00	25.8	100	263,44	0.00
Other washed coal	Ten thousand Tons	147.78	25.8	100	8,363	1,169,146.40
Coke	Ten thousand Tons	1.22	29.2[49]	100	28,435	37,142.18
Coke oven gas	10^8 Cubic meter	0.93	12.1	100	16,726	69,013.15
Other gas	10^8 Cubic meter	0.00	12.1	100	5,227	0.00
Crude oil	Ten thousand Tons	1.94	20.0	100	41,816	59,490.23
Gasoline	Ten thousand Tons	0.00	18.9	100	43,070	0.00
Diesel oil	Ten thousand Tons	5.73	20.2	100	42,652	181,015.94
Fuel oil	Ten thousand Tons	4.86	21.1	100	41,816	157,229.00
LPG	Ten thousand Tons	0.00	17.2	100	50,179	0.00
Refinery gas	Ten thousand Tons	8.95	15.7[50]	100	46,055	237,285.34
Natural gas	10^8 Cubic meter	2.24	15.3	100	38,931	489,222.52
Other petroleum products	Ten thousand Tons	0.00	20.0	100	38,369	0.00
Other coking products	Ten thousand Tons	0.00	25.8	100	28,435	0.00
Other Energy	Ten thousand Tce	27.24	0.0	100	0	0.00
Total Emission (Q)		276,371,084.63tCO_2e				
Thermal Power supplied to the Central China Grid (P)		225,987,719.20MWh				
OM Emission Factor in 2003 [＝Q/P]		1.222947tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2004; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Table 1.3 and 1.4 of P1.21-1.24 in Chapter one

[49] Different with the one published by DNA based on the 2006 IPCC, the following is the same.

[50] Different with the one published by DNA based on the 2006 IPCC, the following is the same.

Table9. The Operation Margin Emission Factor Calculation of the Central China Grid in 2004

Fuel	Unit	Fuel Consumption of the Central China Grid in 2004 G	Emission Factor H （tc/TJ）	Oxidation Rate I (%)	Average NCV J (MJ/t,km^3)	CO_2 Emission(tCO_2e) K=G*H*I*J*44/12/10000 (for quality unit) K=G*H*I*J*44/12/1000 (for volume unit)
Raw coal	Ten thousand Tons	17,144.10	25.8	100	20,908	339,092,605.29
Clean coal	Ten thousand Tons	2.34	25.8	100	26,344	58,316.13
Other washed coal	Ten thousand Tons	242.87	25.8	100	8,363	1,921,441.23
Coke	Ten thousand Tons	109.61	29.2	100	28,435	3,337,011.41
Coke oven gas	10^8 Cubic meter	2.02	12.1	100	16,726	149,899.53
Other gas	10^8 Cubic meter	2.61	12.1	100	5,227	60,527.09
Crude oil	Ten thousand Tons	1.08	20.0	100	41,816	33,118.27
Gasoline	Ten thousand Tons	0.07	18.9	100	43,070	2,089.33
Diesel oil	Ten thousand Tons	8.44	20.2	100	42,652	266,627.32
Fuel oil	Ten thousand Tons	14.37	21.1	100	41,816	464,893.14
LPG	Ten thousand Tons	0.00	17.2	100	50,179	0.00
Refinery gas	Ten thousand Tons	5.79	15.7	100	46,055	153,506.38
Natural gas	10^8 Cubic meter	2.27	15.3	100	38,931	495,774.61
Other petroleum products	Ten thousand Tons	0.00	20.0	100	38,369	0.00
Other coking products	Ten thousand Tons	0.00	25.8	100	28,435	0.00
Other Energy	Ten thousand Tce	53.07	0.0	100	0	0.00
Total Emission （Q）		346,035,809.73tCO_2e				
Thermal Power supplied to the Central China Grid (P)		249,074,186.30MWh				
OM Emission Factor in 2004 [＝Q/P]		1.389288tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2005; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Table 1.3 and 1.4 of P1.21-1.24 in Chapter one

Table10. The Operation Margin Emission Factor Calculation of the Central China Grid in 2005

Fuel	Unit	Fuel Consumption of the Central China Grid in 2005 G	Emission Factor H (tc/TJ)	Oxidation Rate I (%)	Average NCV J (MJ/t,km³)	CO_2 Emission(tCO_2e) K=G*H*I*J*44/12/10000 (for quality unit) K=G*H*I*J*44/12/1000 (for volume unit)
Raw coal	Ten thousand Tons	17,827.75	25.8	100	20,908	352,614,496.76
Clean coal	Ten thousand Tons	0.02	25.8	100	26,344	498.43
Other washed coal	Ten thousand Tons	228.11	25.8	100	8,363	1,804,669.00
Coke	Ten thousand Tons	130.95	29.2	100	28,435	3,986,695.05
Coke oven gas	10^8 Cubic meter	1.51	12.1	100	16,726	112,053.61
Other gas	10^8 Cubic meter	13.32	12.1	100	5,227	308,896.88
Crude oil	Ten thousand Tons	1.18	20.0	100	41,816	36,184.78
Gasoline	Ten thousand Tons	0.04	18.9	100	43,070	1,193.90
Diesel oil	Ten thousand Tons	9.49	20.2	100	42,652	299,797.78
Fuel oil	Ten thousand Tons	8.87	21.1	100	41,816	286,959.09
LPG	Ten thousand Tons	0	17.2	100	50,179	0.00
Refinery gas	Ten thousand Tons	6.66	15.7	100	46,055	176,572.11
Natural gas	10^8 Cubic meter	3.00	15.3	100	38,931	655,208.73
Other petroleum products	Ten thousand Tons	0	20.0	100	38,369	0.00
Other coking products	Ten thousand Tons	1.50	25.8	100	28,435	40,349.27
Other Energy	Ten thousand Tce	37.42	0.0	100	0	0.00
Total Emission (Q)		360,323,575.39 tCO_2e				
Thermal Power supplied to the Central China Grid (P)		286,203,304.60MWh				
OM Emission Factor in 2005 [＝Q/P]		1.258978tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Table 1.3 and 1.4 of P1.21-1.24 in Chapter one

According to electricity supplied to the grid of fire power, the OM of latest three years should be weighted average, so the weighted average OM is:

$$EF_{OM,y} = \frac{(1.222947 \times 225{,}987{,}719.20 + 1.389288 \times 249{,}074{,}186.30 + 1.258978 \times 286{,}203{,}304.60)}{(225{,}987{,}719.20 + 249{,}074{,}186.30 + 286{,}203{,}304.60)} = 1.2909 tCO_2e / MWh$$

Table11. Calculation of CO_2 Emission of Solid, Liquid and Gas Fuel for Power Generation in 2005

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chong qing E	Sichuan F	Total G=A+B+C +D+E+F	NCV kJ/kg kJ/m^3 H	Emission Factor I	Oxidation Rate J	CO_2 emission (tCO_2e)	λ_{Coal} , λ_{Oil} λ_{Gas}
Raw coal	10^4 Tons	1,869.29	7,638.87	2,732.15	1,712.27	875.40	2,999.77	17,827.75	20,908	100	25.8	352,614,497	-
Clean coal	10^4 Tons	0.02	0.00	0.00	0.00	0.00	0.00	0.02	26,344	100	25.8	498	-
Other washed coal	10^4 Tons	0.00	138.12	0.00	0.00	89.99	0.00	228.11	8,363	100	25.8	1,804,669	-
Coke	10^4 Tons	0.00	25.95	0.00	106.5	0.00	0.00	132.45	28,435	100	29.2	3,986,695	
Other coking products	10^4 Tons	0.00	0.00	0.00	1.50	0.00	0.00	1.50	28,435	100	25.8	40,349.27	
Subtotal	-	-	-	-	-	-	-	-	-	-	-	358,446,709	99.48%
Crude oil	10^4 Tons	0.00	0.82	0.36	0.00	0.00	0.00	1.18	41,816	100	20	36,185	-
Gasoline	10^4 Tons	0.00	0.02	0.00	0.00	0.02	0.00	0.04	43,070	100	18.9	1,194	-
Coal oil	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43,070	100	19.6	0	-
Diesel oil	10^4 Tons	1.3	3.03	2.39	1.39	1.38	0.00	9.49	42,652	100	20.2	299,798	-
Fuel oil	10^4 Tons	0.64	0.29	3.15	1.68	0.89	2.22	8.87	41,816	100	21.1	286,959	-
Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0	38,369	100	20	0	
Subtotal	-	-	-	-	-	-	-	-	-	-	-	624,136	0.17%
Natural gas	$10^7 m^3$	0.00	0.00	0.00	0.00	0.00	3	3	38,931	100	15.3	655,209	-
Coke oven gas	$10^7 m^3$	0.00	0.00	1.15	0.00	0.36	0.00	1.51	16,726	100	12.1	112,054	-
Other gas	$10^7 m^3$	0.00	10.2	0.00	0.00	3.12	0.00	13.32	5,227	100	12.1	308,897	-
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,179	100	17.2	0	-
Refinery gas	10^4 Tons	0.71	3.41	1.76	0.78	0.00	0.00	6.66	46,055	100	15.7	176,572	-
Subtotal	-	-	-	-	-	-	-	-	-	-	-	1,252,732	0.35%
Total	-	-	-	-	-	-	-	-	-	-	-	360,323,575	100%

Table12. Calculating of Emission Factor for Various Power Plant

	Variable	Power Supply Efficiency L	Emission Factor for Fuels (tc/TJ) I	Oxidation Rate J	Emission Factor (tCO_2e/MWh) O=3.6/L/1000*I *J*44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Therefore, the emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9483 tCO_2e/MWh$$

Table13. Installed Capacity of the Central China Grid in 2003

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Power	MW	5,407.8	17,635.5	8,173.3	6,446.7	3,126.2	6,104.0	46,893.5
Hydro Power	MW	2,307.4	2,438.0	11,537.2[51]	6,603.1	1,329.8	12,341.5	36,557
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	7,715.2	20,073.5	19,710.5	13,049.8	4,456	18,445.5	83,450.5

Data Source: China Electric Power Yearbook 2004.

Table14. Installed Capacity of the Central China Grid in 2004

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Power	MW	5,496.0	21,788.5	9,509.3	6,779.5	3,271.1	6,900.3	53,744.7
Hydro Power	MW	2,549.9	2,438.0	15,115.1	7,448.2	1,407.9	13,382.9	42,342.0
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	MW	8,045.9	24,226.5	24,624.4	14,227.7	4,679.0	20,283.2	96,086.7

Data Source: China Electric Power Yearbook 2005.

[51] Different with the one published by DNA based on the China Electric Power Yearbook 2004.

Table15. Installed Capacity of the Central China Grid in 2005

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Thermal Power	MW	5,906.0	26,267.8	9,526.3	7,211.6	3,759.5	7,496.0	60,167.2
Hydro Power	MW	3,019.0	2,539.9	17,888.9[52]	7,905.1	1,892.7	14,959.6	48,205.2
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and others	MW	0.0	0.0	0.0	0.0	24.0	0.0	24.0
Total	MW	8,925	28,807.7	27,415.2	15,116.7	5,676.2	22,455.6	108,396.4

Data Source: China Electric Power Yearbook 2006.

Table16. The BM Calculation of the Central China Grid

	Installed Capacity in 2003	Installed Capacity in 2004	Installed Capacity in 2005	Capacity Addition Of 2003-2005	Ratio of Capacity Addition
Thermal Power（MW）	46,893.5	53,744.7	60,167.2	13,273.7	53.21%
Hydro Power（MW）	36,557.0	42,342.0	48,205.2	11,648.2	46.69%
Nuclear Power（MW）	0.0	0.0	0.0	0.0	0.00%
Wind Power（MW）	0.0	0.0	24.0	24.0	0.10%
Total（MW）	83,450.5	96,086.7	108,396.4	24,945.9	100.00%
Percent of Installed Capacity in2005	76.99%	88.64%	100.00%	-	-

Therefore, the BM was calculated as $EF_{BM,y} = 0.9483 \times 53.21\% = 0.5046\,\text{tCO}_2\text{e/MWh}$.

The baseline emission factor was calculated as the weighted average of the OM Emission Factor (1.2909tCO_2e/MWh) and the BM Emission Factor（0.5046tCO_2e/MWh）. The defaults weights for hydropower projects are used as 0.5 respectively. We obtain a baseline emission factor of 0.89775tCO_2e/MWh.

[52] Different with the one published by DNA based on the China Electric Power Yearbook 2006.

Annex 4

MONITORING PLAN

Selection procedure:
The chief monitoring officer (CMO) will be appointed by the general manager of Sichuan Liyuan Electricity Development Co., Ltd. The monitoring officer will be selected among the senior technical or managerial staff at the power station. Before he/she commences monitoring duties, he/she will receive training on monitoring requirements and procedures by Beijing Tianqing Power International CDM Consulting, Co., Ltd.

The selection of the CMO has taken place and the following person was appointed:
Name: Zhou Zhongjian
Position: The Engineer

Tasks and responsibilities:
The monitoring officer will be responsible for carrying out the following tasks:

- **Supervise and verify metering and recording:** The monitoring officer will coordinate with the plant manager to ensure and verify adequate metering and recording of data, including power delivered to the grid.
- **Collection of additional data, sales / billing invoices:** The monitoring officer will collect sales invoices for power delivered to the grid, billing invoices for power delivered by the grid to the hydropower station and additional data such as the daily operational reports of the hydropower station.
- **Calibration:** The monitoring officer will coordinate with staff of the project entity to ensure that calibration of the metering instruments is carried out periodically in accordance with regulations of the grid company.
- **Calculation of emission reductions:** The monitoring officer will calculate the annual emission reductions on the basis of net power supply to the grid, as per meter reading and invoices from the grid company. The monitoring officer will be provided with a calculation template in electronic form by the project's CDM advisors.
- **Preparation of monitoring report:** The monitoring officer will annually prepare a monitoring report, which will include among others a summary of daily and/or monthly operations, metering values of power supplied to and received from the grid, copies of sales/billing invoices, a report on calibration and a calculation of emission reductions.

Support:
The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting, Co., Ltd., Ltd in his/her responsibilities through the following actions:
- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving;
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions;
- Continuous advice to the monitoring officer on a need basis;
- Review of monitoring reports.