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

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SECTION A. General description of project activity

A.1. Title of the project activity:

Sichuan Jiangyou Longfeng Hydropower Station
Ver. 6.0
Date: 29/07/2008

Revision History of the PDD

Version	Date	Comments
Version 1.0	22 January 2007	Complete version of the PDD, prepared for the host country approval process
Version 2.0	29 May 2007	Revised draft PDD; prepared for validation
Version 3.0	30 October 2007	Revised draft PDD, prepared on the basis of corrective action requests in the Validation protocol of TUV SUD.
Version 4.0	10 December 2007	Revised draft PDD, prepared on the basis of the first response of corrective action requests in the Validation protocol of TUV SUD.
Version 5.0	22 April 2008	Revised draft PDD, prepared on the basis of the second response of corrective action requests in the Validation protocol of TUV SUD.
Version 6.0	29 July 2008	Revised draft PDD, prepared on the basis of comments of TUV SUD.

A.2. Description of the project activity:

Summary:

The proposed project activity involves the construction and operation of a diversion type hydropower station by the Sichuan Jiangyou Longfeng Hydro Power Co., Ltd. The hydropower station is located in Longfeng Town, Jiangyou City, Sichuan Province, China. The project is a new hydropower project with reservoir. The reservoir has daily regulating capacity with a total installed capacity of 54MW and a surface area at full reservoir level of 1.54km^2. The power density is 35W/m^2. On the average, the project activity is expected to operate 4,700 hours per year, which corresponds to an average annual generation of 253,800MWh, considering the absorption ability of local grid, the "effective coefficient"[1] is 85%, after deducting the plant consumption and transmission loss and a net electricity supply to the grid of 213,440MWh. The power generated will be connected to the 220kV Mianyang Chengbei transformer station, then to Sichuan Grid, and finally, to the Central China Grid.

Contributions to sustainable development:

The project activity contributes significantly to the region's sustainable development in the following ways:

- In recent years, China has witnessed a huge increase in power consumption. Both public and private parties are struggling to meet the demand for electricity. The proposed hydropower project will contribute in a sustainable manner to bridging the gap between supply and demand of power on a regional and national level.
- In China, more than 80% of total electricity production is derived from coal based power plants. Being so heavily dependant on coal for its energy requirements, this project carries environmental benefits for the country's air, soil and water sources. The project activity will displace the generation of fossil fuel power plants, reducing CO_2, SO_x and NO_x emissions significantly, thus mitigating the air pollution and its adverse impacts on human health.

[1]The "effective coefficient" is calculated according to the absorption ability of local grid. Due to low absorption ability of local grid and the load of local grid is relatively lower, which results in an effective coefficient of 85% under full load of the project.

- The project activity promotes the growth of sustainable and renewable capacity in China and makes it less dependent on exhaustible and polluting fossil fuels.
- The project will definitely contribute to the province's economic development by improving the local energy generation infra-structure and generating employment during both the construction and the operation of the power plant.

The proposed hydropower project is grid-connected electricity generation from renewable sources, which will be supplied to the Central China Grid and will replace electricity generated by thermal power plants, which are predominant in the Central China Grid. This will reduce anthropogenic emissions of greenhouse gases.

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 Jiangyou Longfeng Hydro Power Co., Ltd. (as the project owner)	No
Germany	RWE Power AG	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:

Longfeng Town, Jiangyou City

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

The proposed project is located in Longfeng Town, Jiangyou City, Sichuan Province, China. The station is 18km from Jiangyou City and 20km from Mianyang City. The dam is located in Boniutan Village and the powerhouse is located in Longfeng Village. The dam site is 3.4km from the government of Qinglian Town; the powerhouse is 1.5km from the government of Longfeng Town. And the distance between the dam site and powerhouse is 2.6km. The exact location of the powerhouse is at the longitude of 104°42′41″E and latitude of 31°37′45″N. The exact location of the dam is at the longitude of 104°42′10″E and latitude of 31°39′20″N.

The map in figure A.1 shows the location of the proposed project activity.

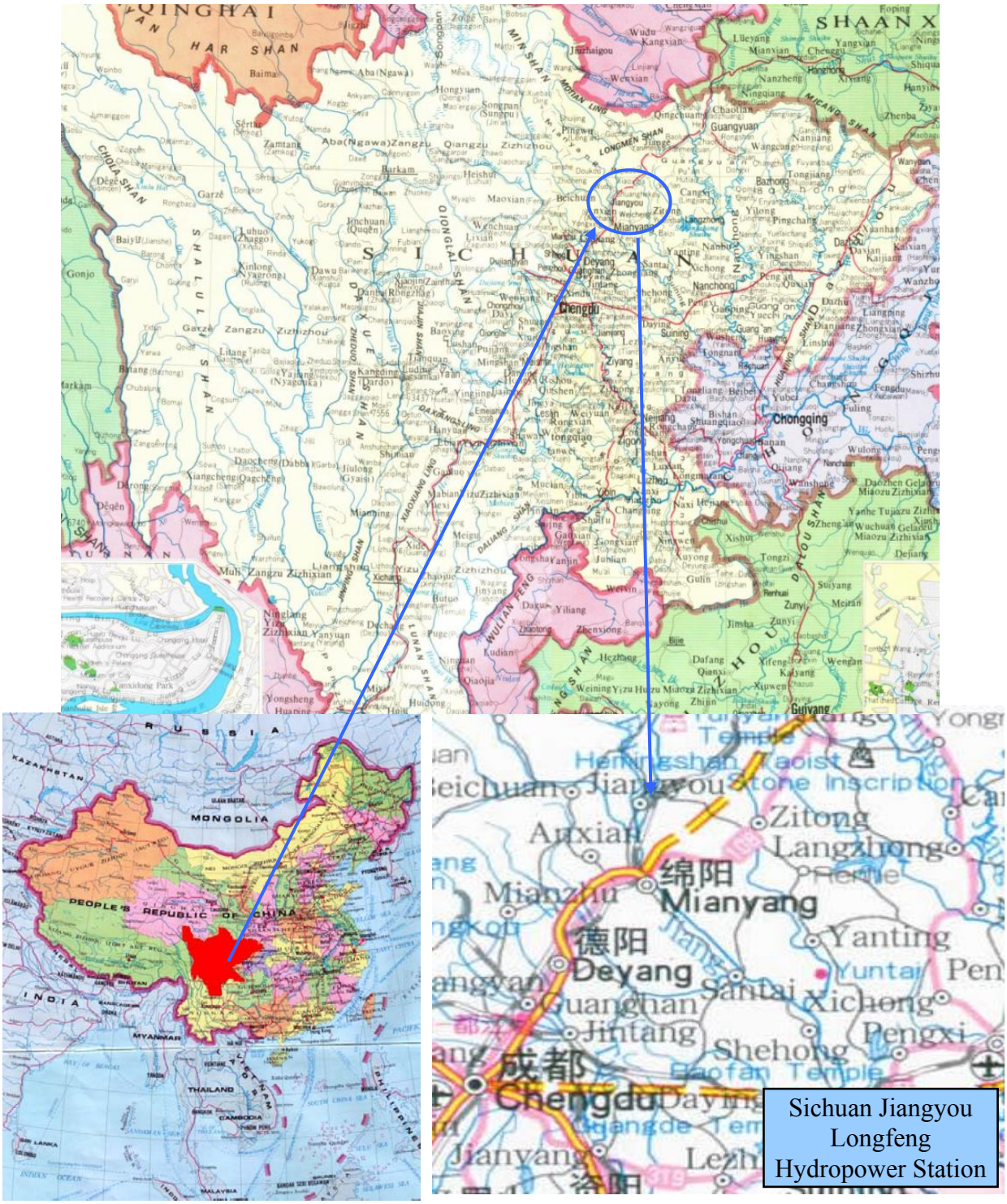


Fig A.1 the Location of Sichuan Jiangyou Longfeng Hydropower Station

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 consists of barrage, right bank dike, water gap, intake sluice, open canal, plant houses, and tail water tunnel etc.

The project is a diversion type hydropower station with installed capacity of 54MW. The normal water level of the reservoir is 496.50m, the total storage capacity is 14,600,000m^3, and the surface area at full reservoir level is 1.54km^2. The project employs three units of ZZ660-LH-380 turbines and 3 units of SF18-40/6600 generators matched with turbines. The specific technical data of turbine and generator are listed in Table A.1.

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

The Main Technical Data		Value
Turbines	Units	3
	Designation	ZZ660-LH-380
	Rated Water Head	19m
	Rated output	18.75MW
	Rated Rotational Speed	150r/min
	Type	Kaplan turbine
Generators	Units	3
	Designation	SF18-40/6600
	Rated Power	18MW
	Rated Voltage	10.5kV
	Type	Axial-flow

The power generated by the proposed project will be transmitted to Mianyang Chengbei transformer station via one 110kV bus line of 6.3km, then to the Sichuan Grid, and finally to the Central China Grid.

There is no technology transfer due to all the technology employed is domestic.

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

The project activity uses the renewable crediting period (7 years, renewable twice), and the estimation of the emission reductions in the first crediting period (from July 2010 to June 2017) is presented in Table A.2. Estimated Emission Reductions throughout the first crediting period are **1,341,312tCO_2e**.

Table A.2 The Estimation of the Emission Reductions in the Crediting Period

Years	Annual estimation of emission reductions in tones of CO_2e
Year 1: 01/07/2010-30/06/2011	191,616
Year 2: 01/07/2011-30/06/2012	191,616
Year 3: 01/07/2012-30/06/2013	191,616
Year 4: 01/07/2013-30/06/2014	191,616
Year 5: 01/07/2014-30/06/2015	191,616
Year 6: 01/07/2015-30/06/2016	191,616
Year 7: 01/07/2016-30/06/2017	191,616
Total Estimated Reductions (tCO_2e) of the First Period	1,341,312
Total Number of the First Crediting Period Years	7
Annual Average Reductions over the First Crediting Period (tCO_2e)	191,616

A.4.5. Public funding of the project activity:

There is no public funding from Annex I countries 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 6): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BW759ID58ST5YEEV6WUCN5744MN763

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

Monitoring methodology:

Approved consolidated monitoring methodology ACM0002 (Version 6): "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources". http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BW759ID58ST5YEEV6WUCN5744MN763

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

The baseline and monitoring methodology ACM0002 is applicable to the proposed project, because the project meets all the applicability criteria stated in the methodology:
1. The proposed Project activity involves an electricity capacity addition from new hydropower project with reservoirs having power density greater than 4W/m^2 *(the installed capacity of the hydropower station is 54MW; the surface of the reservoir is 1.54Km^2; hence the reservoir has a power density of 35W/m^2*);
2. The proposed 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 relevant electricity grid can be clearly identified (the Central China Grid) and information on the characteristic of the grid is available.

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

According to the definition of project boundary given by ACM0002 methodology, the project boundary includes the project site (the physical site of the project plant as well as the reservoir area) and the electricity system where the project is connected to.

In accordance with methodology ACM0002 (version 6), the delineation of grid boundaries as provided by the DNA of the host country has been used to define the relevant grid. As a result, the regional grid "Central China Grid" is selected as the project boundary.

In this specific case, the station is connected to the Sichuan Grid and then 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 approved methodology ACM0002, and considering the substantial inter-grid power exchange among the Central China Grid and its sub-regional grids, it is appropriate to determine the Central China Grid as the project boundary for this specific project.

The sources and gases included in the project boundary are described in Table B.1 below:

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

	Source	Gas	Included ?	Justification / Explanation
Baseline	Thermal power plants in the Central China Grid	CO_2	Included	According to ACM0002 methodology, it is only 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 only 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 only necessary to account for CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.
Project Activity	Sichuan Jiangyou Longfeng 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	Since the project's power density is 35W/m^2, which is greater than the threshold of 10W/m^2 specified in ACM0002, and in line with the methodology, CH_4 emissions are not considered.
		N_2O	Excluded	The project is grid-connected electricity generation from renewable sources, According to methodology ACM0002, N_2O emission are not considered.

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

The following baseline scenario options have been identified as realistic and credible alternatives to the project activity:

1. The specific hydropower activity undertaken without being registered as a CDM project activity;
2. A thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with comparable annual power generation;
4. The equivalent annually generated electricity supplied by the Central China Grid.

The baseline scenario options described above are discussed individually below, considering relevant laws and regulations, as well as investment analysis.

First scenario,

The first scenario is in compliance with the Chinese relevant laws and regulations. However, as shown in more detail in section B.5 below, an investment analysis of this scenario shows that the Project IRR post-tax is 6.89% without CDM revenue which is lower than the benchmark threshold of 8% [2] for project IRR post-tax. Therefore, the project would face serious economic and financial barriers without CDM revenues; hence the first scenario is not feasible.

Second scenario,

[2] Economical Evaluation Interim Rules of Electrical Engineering Retrofit, China State Power, March 2003

The second scenario is not consistent with Chinese laws and regulations. According to Chinese regulations, construction of thermal power plants of capacity less than 135MW is prohibited in districts covered by large regional grids [3], while the construction of thermal units under 100MW is strictly controlled [4]. A fossil fuel power plant providing an equivalent generation capacity of the proposed hydropower plant and with an annual utilization hour of 5,988h, which was the average utilization hours of the thermal units in China in 2004[5], would be one with an installed capacity of about 42MW. Therefore, it is concluded that the second alternative does not comply with Chinese relevant laws and regulations, and hence it is not a feasible scenario.

Third scenario,

There are no a wind plant, solar plant, wave and tidal plant or geothermal plant with equivalent annual power generation in this area. The cost of other renewable energy power plant with equivalent installed capacity or power generation is very high. The economic return of other renewable power plants with similar amount of capacity should be little attractiveness. The third scenario is therefore not feasible nor is it a baseline scenario.

Fourth scenario,

The fourth scenario option is in compliance with Chinese relevant laws and regulations, and it does not face economic and financial barriers. Hence it is a feasible scenario.

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:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, without the proposed project activity.

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 by using the Tool for the Demonstration and Assessment of Additionality (version 4) as indicated in the baseline methodology ACM0002/Version 06.

Feasible Study Report of the proposed project has been finished On April 2005 and the installed capacity is 51MW. The Feasibility Study Report was approved by local DRC on July 28, 2005. Considering the utilization rate of water resource, the local DRC also suggested the project owner can increase the installed capacity of the project. And then development process transfer into the preliminary design phase. The project owner consigned Sichuan Province Neijiang Institute of Architectural Design & Water Resources & Hydropower Research to finish the PDR. The Institute further revised and adjusted parameter and design of project in detail base on feasibility study report and finished PDR(draft) in the early of 2006. The installed capacity in PDR is 54MW for effective utilization of water resource. After the discussion between the project owner and Institute, the PDR (final version) was finished and submitted to local DRC[6]. However, this PDR can not reflect the actual situation of the project. Because, firstly, the PDR didn't

[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] The Management Provisional Regulation on the Construction of Small Fuel fired Generators.

[5] 2005 China Electric Power Yearbook.p.18

[6]In PDR the IRR is 8.13%. However, this IRR of 8.13% can not reflect the actual situation of the project, about the reason, please see the following explanation in PDD.

include the power connection system project and Feasibility Study Report of the power connection system for the Longfeng project was finished by Mianyang Aoruite Power Design and Consulting Co.,Ltd in Oct 2006 and approved by Sichuan Power Company on December 20, 2006. The project owner has to construct a transmission line of 6.3km length from the project plant site to Mianyang Chengbei 220kV transformer substation; the cost for the transmission line should be paid by the project owner. Secondly, the project owner had to provide more investment to immigrant and the Regulation on compensation for requisition of land and Immigrant Settlement of large and medium hydropower project issued by State Council began to take effect on Sep 1, 2006. According to this Regulation, the project owner has to pay more compensation to immigrant. Because Feasibility Study Report of the power connection system for the Longfeng project was finished in Oct 2006 and the Regulation on compensation for requisition of land and Immigrant Settlement of large and medium hydropower project began to take effect on Sep 1, 2006. However, the PDR (draft version) was finished in the early of 2006 and the PDR (final version) was finished in Sep 2006 and was also not revised according to a series of new regulation and policies. Therefore, the PDR already can not reflect the actual situation. In addition, the PDR used the tariff is 0.232yuan/kWh which is a calculated price and also can not reflect the actual situation because the actual tariff is 0.288yuan/kWh according to latest tariff policy at that time. Therefore, for knowing the actual investment and financial index, the project owner consigned the Institute to compile the more detail and actual report again. Considering all kinds of factors above, the Institute finished the Investment Budget Supplementary Report and Financial Supplementary Report of Preliminary Design Report. And in the Financial Supplementary Report of Preliminary Design Report, the IRR is 6.89%, which is lower than the benchmark. Because there is some change in investment and design of project, so the project owner submitted the Investment Budget Supplementary Report and Financial Supplementary Report to local DRC according to national rule. The local DRC went through the Investment Budget Supplementary Report and Financial Supplementary Report in detail, and found the low IRR in the report, therefore, the local Development and Reform Commission recommended the project owner to apply for CDM project. After confirmed this, the local DRC approved the two reports and issued Approval on November 12, 2006.

At the same time, Considering poor economic parameters and recommendation of the local Development and Reform Commission, the project owner decided to cooperate with Beijing Tianqing Power and apply to CDM formally in directorate on November 17, 2006. At the same time, the Sichuan Branch Bank of Agriculture Bank of China also issued a bank loan to the Longfeng project, so we choose the date of the grant of bank loan was issued as the staring date of the project activity. Consequently, the CDM stakeholder consultation meeting was organized on Dec. 28, 2006 and the project owner also published a bulletin for the meeting of stakeholders on the newspaper of Mianyang Daily Paper on Dec. 27, 2006. The project owner also got the support from the Government of Jiangyou City who supported that the project owner applied the Longfeng hydropower station for CDM project on December 28, 2006. And then the project owner applied CDM project for the National Development and Reform Commission on February 7, 2007 and got LOA of China on July 2, 2007. At present, the project owner estimates that the main construction will be constructed in July 2008. So before the start of the main construction activities and the staring date of the project activity, the project owner decided to apply for CDM to overcome barriers. The schedule of key events in detail is given in Table B.2.

Table B.2 The time schedule

Date	Main event	Source
4-2005	Feasible Study Report of the proposed project has been finished.	Feasible Study Report of the proposed project
28-7-2005	The "Approval of Feasibility Study Report" issued by Local Development and Reform Committee.	The Approval of Feasibility Study Report of Longfeng Hydropower Station
2-2006	The Environment Assessment Report was finished.	Environmental Impact

		Assessment of the proposed project
27-3-2006	The Environmental Impact Assessment of the proposed project has been approved by Sichuan Environment Protection Bureau.	Approval of Environmental Impact Assessment Report
9-2006	The Preliminary Design Report of the proposed project was finished by Sichuan Province Neijiang Institute of Architectural Design & Water Resources & Hydropower Research.	The Preliminary Design Report of the proposed project
9-11-2006	The "Approval of Preliminary Design Report" issued by Local Development and Reform Committee.	Approval of Preliminary Design Report of Longfeng Hydropower Station
11-2006	The Investment Budget Supplementary Report and Financial Supplementary Report of Preliminary Design Report were finished by Sichuan Province Neijiang Institute of Architectural Design & Water Resources & Hydropower Research.	The Investment Budget Supplementary Report and Financial Supplementary Report of Preliminary Design Report
12-11-2006	The Investment Budget Supplementary Report and Financial Supplementary Report of Preliminary Design Report were approved together by the local Development and Reform Commission and on approval the local Development and Reform Commission recommended the project owner to apply for CDM project.	Approval of t he Investment Budget Supplementary Report and Financial Supplementary Report of Preliminary Design Report
17-11-2006	Considering poor economic parameters and recommendation of the local Development and Reform Commission, the project owner decided to cooperate with Beijing Tianqing Power and apply to CDM formally in directorate.	Directorate decision for applying CDM
21-11-2006	The grant of bank loan was issued by Sichuan Branch Bank of Agriculture Bank of China.	The grant of bank loan
28-12-2006	The CDM stakeholder consultation meeting was organized and the project owner also got support from the Government of Jiangyou City who supported that the project owner applied the proposed project for CDM project.	Mianyang Daily Paper and the support Letter from the Government
7-2-2007	The project owner applied CDM project for the National Development and Reform Commission.	The application Form to apply CDM project for NDRC.
2-7-2007	The project start GSP for validation from July 2 to 31in 2007. At the same time, the project owner acquired LOA of China DNA.	The UNFCCC website and LOA
7-2008	The main construction will be constructed.	
31-5-2010	The diversion tunnel, powerhouse and dam will be finished.	
7-2010	The project will be commissioning.	

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

Sub-Step1a. Define alternatives to the project activity

There are only a few alternatives that are realistic and credible in the context of the Central China Grid. They are:

1. The specific hydropower activity undertaken without being registered as a CDM project activity;
2. A thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with comparable annual power generation;
4. The equivalent annually generated electricity as supplied by the Central China Grid.

As discussed in section B.4 above, the third alternative is not feasible, since in the project region there are not enough renewable energy sources other than hydro, such as wind, biomass, solar, wave and tidal, or geothermal sources, able to provide equivalent power generation.

Sub-Step1b. Consistency with mandatory Laws and Regulations

As also discussed in section B.4, the second alternative (i.e. a thermal power plant with equivalent annual power generation) is not in compliance with Chinese relevant laws and regulation[7], hence it is not a realistic and credible alternative. On the contrary, the first and fourth alternatives are in compliance with Chinese relevant laws and regulations

The proposed project activity is consistent with national policies for environmental protection, energy conservation and sustainable development. However, there are no binding legal and regulatory requirements for this project type. The Renewable Energy Law adopted by the National People's Congress on 28 Feb. 2005 encourages and supports renewable-based power generation, but does not stipulate specific goals/requirements for actual implementation.

Step 2 Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The Investment analysis will be performed using Option III, i.e. Benchmark analysis. This method is applicable because:

- Option I: Simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.
- Option II: Investment comparison analysis is not appropriate as, the only realistic alternative to the project not being implemented as a CDM project activity involves the delivery of power by the grid, which is not a project.
- Option III, benchmark analysis is appropriate. It provides the simplest method of analysis which is the least demanding in terms of data availability.

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

Within the benchmark analysis, we calculated the Internal Rate of Return (project IRR post-tax) of the project activity and compared it with a project IRR post-tax benchmark of 8%. The latter value represents the minimum acceptable threshold for viable investments in the power industry for the region, according

[7] Conventional coal-fired power plants are consistent with regulations although the construction of small-scale power plants with a capacity under 135 MW has been prohibited, see General Office of the State Council (2002), Notice of the General Office of the State Council concerning the Strict Prohibition of the Construction of Thermal Power Units with a Capacity of 135MW or Below, Guo Ban Fa Ming Dian [2002] Document No.6.

to the Economical Evaluation Interim Rules of Electrical Engineering Retrofit, China State Power, March 2003.

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

The basic parameters for calculating key financial indexes are provided in TableB.3.

Table B.3 the Basic Financial Parameter of the Project [1€ =10.00RMB]

Parameter	Value	Source
Installed capacity (MW)	54	The Financial Supplementary Report of Preliminary Design Report
Annual Power supplied to the Grid (MWh)	213,440	The Financial Supplementary Report of Preliminary Design Report
Static Investment (€)	49,249,590	The Financial Supplementary Report of Preliminary Design Report
Tariff (€/ kWh, with VAT)	0.0288	The Financial Supplementary Report of Preliminary Design Report
Operation Period (years)	30	The Financial Supplementary Report of Preliminary Design Report
VAT	17%	The Financial Supplementary Report of Preliminary Design Report
Corporate Income Tax	33%	The Financial Supplementary Report of Preliminary Design Report
Annual Operational Cost (€)	1,151,360	The Financial Supplementary Report of Preliminary Design Report

We calculate a Project IRR post- tax of 6.89% for this project without CDM revenues and an IRR of 8.50% with CDM revenues, based on a CER price of €8/tCO_2e. From this result we can conclude that without CDM, the project is economically and financially unattractive. The revenues from CDM, through the sale of CERs, are necessary to raise the IRR above the acceptable benchmark of 8%.

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

A sensitivity analysis is conducted to check whether the above conclusions on IRR are robust, i.e., whether the IRR remains under 8% for reasonable variations in critical input parameters. We have varied the following critical assumptions for IRR:

- Static total investment
- Annual operational cost
- Tariff
- Annual Power supplied to the Grid

Variations in the critical assumptions of ±10% have been considered. Table B.4 summarizes the results of the sensitivity analysis, i.e., the impact on IRR, while Figure B.1 provides a graphic depiction.

Table B.4 Impact of Variations in Critical Assumptions on Project IRR post- tax

	-10%	-5%	0%	5%	10%
Tariff	5.92%	6.42%	6.89%	7.36%	7.82%
Static total investment	7.94%	7.40%	6.89%	6.43%	6.00%
Annual operational cost	7.16%	7.03%	6.89%	6.76%	6.63%
Annual Power supplied to the Grid	5.93%	6.42%	6.89%	7.36%	7.81%

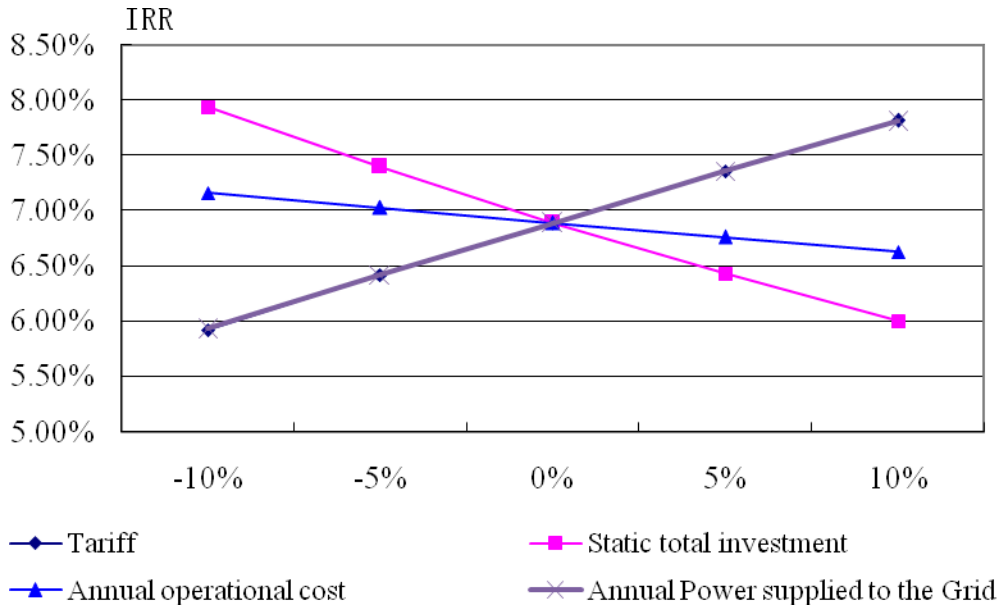


Fig B.1 the IRR Sensitivity Analysis when Static Total Investment, Annual Operation Cost, Annual Power supplied to the Grid or Tariff changed

The IRR without CDM of the proposed project is 6.89%, which is lower than the benchmark rate of 8%. When a decrease in the static investment could reach 10%, the IRR of the project is only 7.94%, However, the price of equipment, material etc have been increasing, and likely to continue doing so, thus it is impossible improve the economic attraction by lowering the static total investment. Furthermore, the IRR only rises by 0.27% even if the annual operational cost fall 10%, so it is difficult to adjust annual operational cost to raise the IRR. When the annual power supplied to the grid increases by 10%, the IRR of the project is only 7.81%, which is lower than 8%. At last, the IRR is 7.82% when the grid price increases by 10%. However it is impossible improving the economic revenue based on an increase of the tariff, since the tariff is regulated by Price Bureau and cannot exceed €0.0288/kWh that is the maximum price considered in our calculation.

On the other hand, the total investment IRR will increase greatly when CERs revenues are included (see Table B.5).

Table B.5 Impact of Variations in CERs price on IRR

CERs price(€/tCO_2e)	8	10	12
IRR	8.50%	8.90%	9.29%

If we take the CERs price as €8/tCO_2e into account, the IRR of the project reaches 8.50% .Under these conditions, the repayment of capital and interest will be facilitates and the project financial situation will be improved. It is thus clear that the benefits from the CDM help to reduce financial barriers, making the project activity attractive to investors.

Table B.6 IRR of total investment of the project

	IRR of total investment
Without CDM revenue	6.89%
With CDM revenue	8.50%

In conclusion, the sensitivity analysis shows that our IRR computations are robust: the project is not economically and financially attractive, without the revenues from the sale of CERs through CDM.

The project thus faces significant economic and financial barriers without CDM support.

Step 4 Common Practice Analyses

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

According to Standard for ***Classification and Flood control of Water resources and Hydroelectric Project*** (Document No. SL252-2000), the hydropower project with the total installed capacity greater the 50MW and less than 300MW are classified into middle hydropower project in China. Considering the similar investment scale, the activities similar to the project activity are limited to those hydropower project with installed capacity larger than 50MW and less than 100MW. The Central China Grid is a larger regional grid, which consists of six sub-grids: Chongqing, Sichuan, Henan, Jiangxi, Hubei and Hunan Grids. The investment environment is incomparable among provinces. So Sichuan Province is regard as a similar investment region. The hydropower stations that started operation before 2002 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.[8] So the basic information concerning existing hydropower stations similar to the proposed activity (recently constructed or under construction with installed capacities between 50MW to 100MW) in Sichuan Province in operation since the year 2002 is provided in Table B.7.

Table B. 7 Hydropower plants similar to the proposed activity

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

Name of hydropower plant	Capacity (MW)	Location	Operation year	Applying CDM or not	Investor	Company type	Remark
Hongye second level Hydropower Station	90	Zagunao River	2002	No	Sichuan Huadian Zagunao Power Development Co. Ltd.	State holding company[9]	-
Yangcun Hydropower Station	66	E'bian County	2004	No	Sichuan Daduhe Electricity Co., Ltd	State holding company[10]	-
Yongle Hydropower Station	58	Leshan City	2003	No	Sichuan Leshan Yongle Power Development Co. Ltd.	Private owned	The annual utilization hours is 7652h [11]
Sichuan Pingwu Xiannvbao Hydropower Station	76	Pingwu County	constructing	Yes/GSP	Sichuan Chuanhui Hydropower Investment Co., Ltd.	Private owned	-
Sichuan Yanyuan Yongning River Hydroelectric Power Station	50	Yanyuan County	constructing	Yes/GSP	Yanyuan Yongning River Electric Power Development Co.,Ltd	Private owned	
Sichuan Shimian Xieluo Wanba River Hydropower Station	69	Shimian County	2007	Yes/GSP	Sichuan Liyuan Electricity Development Co., Ltd.	Private owned	-
Jiaojiping Hydroelectric Project	72	Tianquan County	2007	Yes/GSP	Sichuan Tianquan Jiaojiping Hydropower Generation Co., Ltd.	Private owned	
Ganxipo Hydroelectric Project	75	Tianquan County	2007	Yes/GSP	Sichuan Tianquan Jiaojiping Hydropower	Private owned	

[9] http://www.zgn-chd.com/guanywmen/index.htm

[10]http://www.lpia.org.cn/intro/ShowArticle.asp?ArticleID=145

[11]http://baike.baidu.com/view/667876.htm

					Generation Co., Ltd.		

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

Out of the projects listed above only three projects are not applying for CDM.

Discussion of projects not applying for CDM:

Out of the three projects not applying for CDM, Hongye second level Hydropower Station and Yangcun Hydropower Station are owned by state holding companies. In China, these projects have easier access to capital and higher capacity of resisting risks since they are backed up by the government.

The remaining private project is Yongle Hydropower Station. It is not comparable because the annual utilization hour is 7,652h obviously higher than the project (4,700h).

Therefore, they were more economic attractive than the project

Projects applying for CDM[12]:
From the above listed hydropower projects, the Sichuan Pingwu Xiannvbao Hydropower Station, the Sichuan Yanyuan Yongning River Hydroelectric Power Station, the Sichuan Shimian Xieluo Wanba River Hydropower Station, the Jiaojiping Hydroelectric Project and Ganxipo Hydroelectric Project are currently undergoing the CDM application process. From the table above it is clear that the vast majority of comparable projects to the proposed project activity face similar barriers and are applying for CDM to overcome the same.

Therefore, all the projects mentioned above do not have to face the barriers that the proposed project faces, and they are economically more attractive, whereas the proposed project lacks these advantages.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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 ($EF_{BM,y}$).

Although the new emission factors were issued by NDRC on August 9th, 2007, some mistakes have been found after checking input data and calculated result of NDRC. The calculation formula of OM and BM is kept same as NDRC. The checked data sources include Electricity Yearbook 2004-2006, Energy Yearbook 2004-2006 and IPCC2006 (for details please see below).

[12]http://cdm.unfccc.int/Projects/Validation/index.html

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. Some mistakes have been found after checking input data and calculated result of NDRC.

For example,

1. According to IPCC2006, the emission factor of coke should be 29.2tC/TJ, instead of 25.8 in NDRC. This has to be revised.
2. According to IPCC2006, the emission factor of refinery gas should be 15.7tC/TJ, instead of 18.2 in NDRC. This has to be revised.

After above revision, the calculated OM factor shall be 1.2909 tCO_2/MWh, instead of 1.2899 tCO_2/MWh in NDRC.

3. After above revision of point 1 and point 2, the value of _coal, _oil, and _gas shall be 99.48%, 0.17% and 0.35% respectively, instead of 99.47%, 0.36% and 0.17% in NDRC. Accordingly, the calculated EF thermal will be 0.9483tCO_2/MWh, instead of 0.9370tCO_2/MWh in NDRC.

4. According to Electricity Yearbook 2006 P571 and Electricity Yearbook 2004 P709, the installed capacity in 2005 shall be 17888.9MW, instead of 8088.9MW and the installed capacity in 2003 shall be 11537.2MW, instead of 7337.2MW of Hydropower of Hubei Province in NDRC.

As explained in Annex 3, we have calculated the EF with the corrected data.

For more information on the published OM and BM emission factors, please refer to:
http://cdm.ccchina.gov.cn:80/english/NewsInfo.asp?NewsId=1891

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 hydro-power and other low cost/compulsory resources is as following: 36.76% in 2001,35.95% in 2002, 34.43% in 2003, 38.37% 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:

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

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

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

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 , from 2006 IPCC Guidelines for default values;

$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i, from 2006 IPCC Guidelines 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. The result of the Operating Margin emission factor (EF_{OM}) for the Central China Power Grid is 1.2909tCO_2e/MWh.

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:

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

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,

$COEF_{i,j,m}$ 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 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. [13]

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 [14] the following 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 1-5 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

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

[14] 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:
http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

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,

$F_{i,m,y}$, 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:

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

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 distributed over 11 turbines 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

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

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. The result of the Build Margin emission factor calculation is 0.5046 tCO_2e/MWh.

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* (figures are for 2003-2005),
- 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.

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

So 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:

$$ER_y = BE_y - PE_y - L_y \quad \text{Equation (B.10)}$$

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) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_y \quad \text{Equation (B.11)}$$

Where,

EG_y is the electricity supplied to the grid in y year, it is calculated by:

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

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

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

EF_y is baseline emissions factor, in tCO_2e/MWh.

$EG_{baseline}$ is the baseline electricity supplied to the grid in the case of modified or retrofit facilities.

There is no modified or retrofit facilities for the proposed project, therefore $EG_{baseline} = 0$.

The power density of the project is $35W/m^2$, which is larger than $10W/m^2$. Thus according to ACM0002, greenhouse gas emissions from the project activity are zero. Hence $PE_y = 0$;

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

Therefore, the emission reductions of this specific project are equal to the baseline emissions, that is:

$$ER_y = BE_y - PE_y = EG_y \times EF_y - PE_y = EG_y \times 0.89775\ tCO_2/MWh \quad \text{Equation (B.13)}$$

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	Official Statistical Data

procedures actually applied :	
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 applied :	IPCC Default Value
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	IPCC Default Value

applied :	
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:	*China DNA: Bulletin on Baseline Emission Factors of the Chin Grids-the calculation of baseline Build Margin emission factor for the China's Regional Grids*
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:	*China DNA: Bulletin on Baseline Emission Factors of the China Grids -the calculation of baseline Build Margin emission factor for the China's Regional Grids*
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 Electricity 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 BM

Data / Parameter:	*SRA*
Data unit:	km^2
Description:	Surface area at full reservoir level
Source of data used:	Preliminary Design Report
Value applied:	1.54

Justification of the choice of data or description of measurement methods and procedures actually applied :	The surface area was calculated using the design schematics and area maps. Photographs of the reservoir at several key locations will be taken when the project becomes operational to check whether the actual reservoir does not deviate substantially for the design.
Any comment:	To calculate power density

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

The annual net power supply to the Central China Grid by the project is estimated to be 213,440MWh.

The baseline emission factor of the project, calculated in section B6.1 above, is 0.89775tCO_2e/MWh.

Given the equation B12 above,

$$BE_y = EG_y \times EF_y,$$

the annual emission reductions BE_y in the first crediting period is to be calculated as follows:

BE_y = 213,440MWh ×0.89775tCO_2e/MWh = **191,616tCO_2e**

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

The total emission reductions of the project are 1,341,312tCO_2e during the first crediting period.

Table B.8 Estimate of Emission Reductions Due to the Project

years	Project Emissions (tCO_2e)	Baseline Emissions (tCO_2e)	Leakage (tCO_2e)	Emission Reductions (tCO_2e)
Year 1: 01/07/2010-30/06/2011	0	191,616	0	191,616
Year 2: 01/07/2011-30/06/2012	0	191,616	0	191,616
Year 3: 01/07/2012-30/06/2013	0	191,616	0	191,616
Year 4: 01/07/2013-30/06/2014	0	191,616	0	191,616
Year 5: 01/07/2014-30/06/2015	0	191,616	0	191,616
Year 6: 01/07/2015-30/06/2016	0	191,616	0	191,616
Year 7: 01/07/2016-30/06/2017	0	191,616	0	191,616
Total(tCO_2e)	0	1,341,312	0	1,341,312

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

B.7.1. Data and parameters monitored:

We need to monitor the power 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 ($EG_y = EG_{s,y} - PR_{g,y}$)

Data / Parameter:	$EG_{s,y}$ **Electricity supplied to the grid by the project activity**
Data unit:	MWh
Description:	Power supplied to the grid in year y
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 annually to the grid by the project is estimated to be 213,440MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis. The supply of power to the grid by project is measured through national standard electricity metering instruments. Meters accuracy is 0.2, bi-directional.
QA/QC procedures to be applied:	The metering instruments will be calibrated annually in accordance with the *"Technical administrative code of electric energy metering (DL/T448 —2000)"*.Sales record to the grid and other records are used to ensure consistency.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PR_{g,y}$ **Electricity used by the project activity**
Data unit:	MWh
Description:	The electricity use of power plant supplied by the grid in year y
Source of data to be used:	Measured by meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The electricity use of power plant supplied by the grid.
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis. The consumption of power by the project is measured through national standard electricity metering instruments. Meters accuracy is 0.2, bi-directional.
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity purchase receipt.
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[15] 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 implementation of the monitoring plan, and the Grid Company cooperates with the project entity.

1. Monitoring Objective

The main monitoring data are electricity supplied to the grid and electricity used by the project activity from the grid because the baseline emission factor is fixed by Ex-ante calculation.

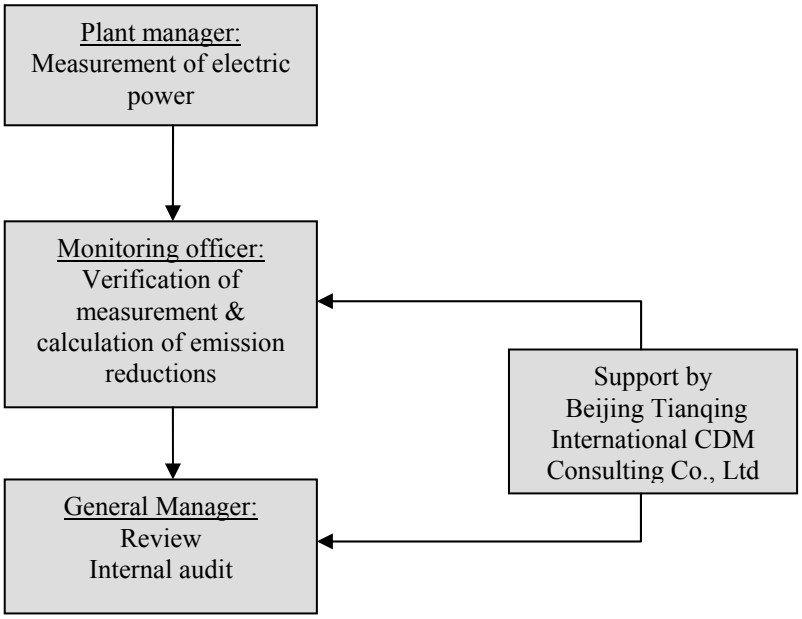
2. Monitoring Organization

The project owner will appoint a monitoring officer, who will supervise and verify metering and recording, collection of data (e.g. sales / billing receipts), calculation of emission reductions and development of monitoring report. The plant manager will be in charge of direct electricity measurement.

[15] This monitoring plan is just a draft version. The project owner will sign the PPA with the grid company before operation of the project and the project owner will decide the final MP according to the PPA. Therefore the monitoring plan will be adjusted based on the PPA and real situation.

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.

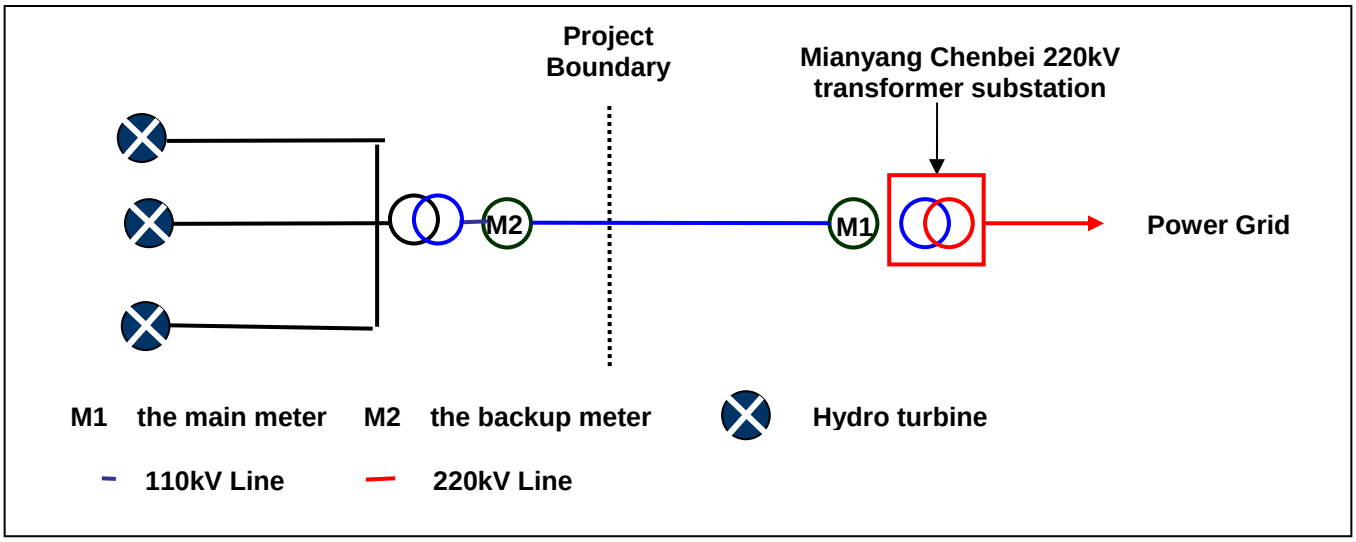


3. Monitoring Equipment and program

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.

Two meters (accuracy degree is 0.2, bi-directional) will be required, of which, the first meter M1(main meter) measures the electricity supplied to the grid by the project activity $M1_A$ and electricity used by the project activity from the grid $M1_B$ at the input of the Mianyang Chengbei transformer station of the Grid Company (included the line losses). And the second meter M2(backup meter) at the exit of the proposed project station is employed to measure output electricity and the electricity transmitted to the plant from the grid(excluded the line losses). According to the main meter, achieving the net power supplied to the grid, and in case the main meter meets some malfunctioning, the project owner should employ the data monitored by the backup meter.

The net power supplied by the proposed project activity will be calculated as: $M1_A$-$M1_B$.



4. Data Collection:

The project owner is responsible for monitoring of the backup meter and the grid company is responsible for monitoring of the main meter, thus guarantee the measuring equipments are in good operation and with complete seal.

The electricity recorded by the main meter alone will suffice for the purpose of billing and emission reduction verification as long as the accuracy of the Main Meter 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 meter and record the data at 24:00 on the last day of every month;
ii The project owner sells the electricity to the Grid Company;
iii The Grid Company provides an electricity bill to the project owner and the project owner confirmation the sale electricity data.
iv The project owner provides an electricity sales invoice to the Grid Company. A copy of the invoice is stored by the project owner, together with a record of the payment by the grid company.
v The project owner records the electricity supplied to the grid electronically;
vi The project owner keeps the records of the main meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the main meter has exceeded the allowable tolerance or otherwise the meter functioned will operate in one certain month, or any other unexpected problems, the grid-connected electricity generated by the proposed project shall be followed by:

i Reading the backup meter(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 proposed project owner and the Grid Company shall jointly prepare a new agreement for the correct reading; and
iii If the proposed 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 meter reading will be readily accessible for the DOE. Calibration test records will be maintained for verification.

5. Calibration

The verification of electric energy meter should be periodically carried out according to relevant national electric industry standards or regulations. After verification, meters should be sealed. Both meters shall be jointly inspected and sealed on behalf of the project owner and Grid Company and they 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 qualified metrical organization co-authorized by the project owner and Grid Company within 10 days after:

i Detection of a difference larger than the allowable error in the readings of the main meter and the backup meter;
ii Repair the meter caused by the failure of operation.

6. Data Management

The project owner will provide an electricity sales invoice to the Grid Company based on the agreed figure which is obtained from the transaction meter.

Data is archived at the beginning of each month based on the readings taken at the end of the previous month using an electronic spreadsheet which is to be included in the Monitoring Plan. The electronic files will be stored on hard disk and cd-rom. In addition, the project owner compiles a hard copy printout of the spreadsheets and copies of sales invoices and sales receipts for the net power delivered to the grid.

At the end of each crediting year, a monitoring report will be prepared by compiling the monthly data.

The project owner compiles and keeps the monitoring reports together with other necessary information such as maps, electrical one-line diagrams and environmental assessment for verification by the DOE.

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

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: 29/07/2008
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:

The date of the grant of a bank loan: 21/11/2006(Because the project owner has not purchased the generator and turbine yet and main construction has not been constructed, we choose the date of the grant of bank loan was issued as the staring date of the project activity)

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

The expected operational lifetime of the project activity 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:

01/07/2010 or the date of registration, whichever is later

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 has been carried out, and has been approved by Sichuan Environment Protection Bureau on Mar. 27, 2006. The environment protecting measures and investment budget table are be provided below:

Table D.1The Environment Protecting Measures and Investment Budget Table

Project		Environment Protecting Measures		Investment (ten thousand Yuan)
Wastes and polluted water treatment	Construction period	Sand stone aggregate machining water: the waste water will be in sedimentation treatment and discharged after satisfying the requirement.		68.00
		Concrete mixing and machine washing wastewater: the wastewater will be discharged after flocculation sedimentation treatment satisfying the requirement		4.00
		Repairing machining wastewater: the wastewater will be discharged after the insulation oil sedimentation treatment and satisfying the requirements		3.00
		Domestic wastewater	Produced in dam site and power plant and the waste water will be treated as biological contact oxidation process and discharged after satisfying the requirements	36.00
			Other working place: the wastewater will be treated in local resident's instruments.	3.00
	Operation Period	Domestic wastewater: the measure will be taken biological contact oxidation process and discharged after satisfying the requirements.		
The air condition environment protection		Those measures as watering will be taken to reduce the dust and will be equipped with a watering cart.		
The acoustic environment protection		To build the sound insulation wall along the resident allocation in the construction plant		6.00
		As for noise resources, those measures will be taken as place sign, forbid demolish in the night, forbid whistling loudly and limit car speed etc.		0.40
Solid waste treatment	Construction period	Waste slag will be transported to the slag plant and treated combined with water and soil conservation. The measures could be referred to water and soil conservation.		

		The domestic garbage: there will be located ash bin, collected and transported to the garbage disposal facilities and treated.	5.00
	Operation period	The domestic garbage: there will be located ash bin, collected and transported to the garbage disposal facilities and treated.	1.00
Water and soil loss protection		Take engineering and plant measures together to prevent the soil and water loss	950.01
Ecological Protection	Construction period	Publicity and education	3.00
		Influencing compensation fee for fishery in construction period	35.00
	Operating period	Breed fry to recover fishery resources, and strengthen the management of fishery administration ecology monitoring and promote the necessary salvage measures. And compensate in long term.	
The water guarantee for irrigation		Supply water for Longxi Weir and Tianxing Weir, and construct specific water supply instrument.	
Water supply for Ecological Purpose		The discharged ecological is 8.45m3/s, and will construct certain discharging water device and monitoring device to satisfy the requirements.	
Population health protection		Implement the sanitation cleaning, health investigation, epidemic monitoring and documentation periodically.	15.00
The work on reservoir flooding and land occupation		Allocate the immigrants caused by reservoir flooding and land occupation	
Social security guarantee		Safety alarming instruments, safety education, and the traffic management during the construction period	4.00
Citizen easy reach measurement		There will be built four foot bridges and road bridges along the diversion tunnel.	
Environment Management and Monitoring	Management Training	The training for management people.	0.80
	Construction period	Strengthen the environment management, keep monitoring on water quality, air condition, noise, ecology, drinking water, water and soil loss etc.	24.00
	Operation period	Keep monitoring on water quality, noise, water and soil conservation, ecology.	30.00
Total			1196.41

The main assessment conclusions are be provided below:

1. Impact on Ambient Air

The main air pollutant due to project construction is dust produced during the project construction. Mitigation measures such as ventilation, soil watering, coverage, close transportation, installation of dust

catcher equipment and utilization of worker protection gears will be adopted to reduce the impact of dust pollution.

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 parts of pit wastewater. The main pollutant is suspending solid. The domestic wastewater is very little and is mainly from living life and dejection of living area. The main pollutant is organic matter. All the wastewater will be discharged after treated reaching the standard I through sedimentation tank or septic tank,

3. Impact on Acoustic Environment

The impact on Acoustic environment is mainly on construction period from transporting vehicles, blasting and other working machines. By using corresponding protective measures and environmental protection measures, the environmental impact will be negligible.

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 three designated waste disposal sites, and engineering protection measures at the waste disposal site will be carried out to protect the soil and water. The domestic waste generated is very little, the dump plant will be set up and 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 to prevent soil and water loss. After the construction is finished, virescence will be carried out on temporarily occupied land, and the vegetation will comeback.

6. Impact on Ecosystem

The project will have some negative impact on the local ecosystem, but there are no national or provincial protected rare species of fish nor local endemic species or migrating fish in the area, so the project will have little negative impact on the ecological environment.
The impact from the proposed project is so limited that the ecosystem can endure this.

7. Impact on Land Utilization and Immigration

The total occupied land amounts to 87.49hm^2, of which, permanently occupied land represents 21.09hm^2 and temporarily occupied land 66.40hm^2.The flooding area amounts to 153.74 hm^2, of which, infield represents 2.55hm^2, woodland 1.16hm^2, other land 150.03hm^2. The proposed project involves the migration of 56 people who do so voluntarily and will obtain proper compensation according to the national immigration policy.

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:

The project owner had distributed questionnaires to local residents who may be impacted by the project to collect advice for the project and come back 51 investigation questionnaires.

Furthermore, a special stakeholder consultation meeting of the project was organized at 10:00 on Dec. 28, 2006 at Taibai Hotel, Jiangyou City, 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 Mianyang Daily News on Dec. 27, 2006, 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. On 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. The representatives asked some following questions focusing on CDM and the project.

1. Whether construction of the project is good?
2. Will the project bring noise impacts and other environment impacts? 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 the income is increased, then how is it increased?
4. Before 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 for compensation has been complied with the national policy?
5. How many migrants will be impacted? Whether the migrants are satisfied with the allocation and compensation.
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. Whether the project will flood the local mine resource?
9. What's the attitude of government and local residents to the CDM? For or against?
10. Do you agree with construction of the project?

E.2. Summary of the comments received:

51 filled-in questionnaires have been returned, of which, 22% are women, 100% are graduated from junior middle school or lower, and 100% are elder than 20 years old and the investigation results are:

- 50% of the investigated residents think the local electricity is short.
- 86% of the investigated residents use wood to warm and cook food; 10% use coal or gas to warm and cook food; the rest 4% use electricity to warm and cook food.
- 100% of the investigated residents think the hydropower station will bring benefits to their lives which include improving transportation and communication, capability to develop industries like fish breeding and poultry raising and tourism, and the convenience of electricity. 100% of them think the transportation will be improved after construction of the station.

- 100% of the investigated residents think the hydropower station will not cause negative impact on to their lives.
- 91% of the investigated residents think construction of the project will not bring negative impact on local environment, and the rest 9% think there will be some impacts on local environment, but they can be mitigated by the proper protection measures of the project owner.
- 100% of the investigated residents agree with construction of the project.

There are 18 stakeholders attended the meeting.

All stakeholders considered that hydropower is a renewable energy which will not have negative impacts on the environment. There is no residents closed to the project, therefore the project will not have negative impact on local residents. The affected residents will be compensated and are satisfied with the compensation for land requisition. All of the immigrants are voluntary and will obtained corresponding compensation. There is a possibility that the project will have some negative impact on the local biological organisms, but there are no endemic species or migratory fish, so the negative impact is very small. On the contrary, the project will provide electrical power for daily life and manufacturing; improve quality of life of local residents, such as: bring an increase in their income and, accelerate the development of local agriculture, service industries and tourism. The project will also increase the local employment opportunities. In summary, there is little negative impact from the project. 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 and support the construction of the station.

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

No negative comments received, so no action 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 countries used in the project activity.

Annex 3

BASELINE INFORMATION

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

	2001	2002	2003	2004	2005
Thermal Power Generation (MWh)	178,156.00	200,347.00	240,839,000	270,846,000	303,976,000
Hydro power Generation (MWh)	103,554.00	112,440.00	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)	281,710.00	312,787.00	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%	38.37%	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	95,518,000	39,532,000	29,501,000	16,341,000	32,782,000
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					

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	109,352,000	43,034,000	37,186,000	16,520,000	34,627,000
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	131,590,000	47,700,000	39,900,000	17,584,000	3,7202,000
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	16.2	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	1.7	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	15.2	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[16]	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[17]	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)		225,987,719MWh				

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

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

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

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,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	17,827.75	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:

$$EF_{OM,y} = \frac{(1.222947 \times 225,987,719.20 + 1.389288 \times 249,074,186.30 + 1.258978 \times 286,203,304.60)}{(225,987,719.20 + 249,074,186.30 + 286,203,304.60)} = 1.2909 tCO_2 e / MWh$$

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	Chongqing 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	
Subtotal	-	-	-	-	-	-	-	-	-	-	-	358,406,359	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	-	-	-	-	-	-	-	-	-	-	-	360,283,227	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	$EF_{Oil,Adv}$	47.67%	15.3	1	0.4237
Oil-fired Power Plant	$EF_{Gas,Adv}$	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 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.

Table14. 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[18]	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.

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

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

Hydro Power	MW	3,019.0	2,539.9	17,888.9[19]	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	53744.7	60167.2	13,273.7	53.21%
Hydro Power（MW）	36,557.0	42342	48205.2	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	96086.7	108396.4	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.

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

Annex 4

MONITORING PLAN

Selection procedure:
The monitoring officer will be appointed by the general manager of Sichuan Jiangyou Longfeng Hydro Power Co., Ltd. The monitoring officer will be selected among the senior technical or managerial staff. 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 initial monitoring officer has taken place and the following person was appointed:
Name:
Position:

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 receipts: The monitoring officer will collect sales receipts for power delivered to the grid, billing receipts 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. 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 monthly operations, metering values of power supplied to and received from the grid, copies of sales/billing receipts, 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