



**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:**

Project title: Chongqing Youyang County Youchou Hydropower Station Project

PDD Version: 3.0

Completion date PDD: 20/07/2010

Revision History:

Version 1.0: Submitted for host country approval

Version 2.0: Submitted for validation / global stakeholder comments

Version 3.0: Respond to Draft Validation Report

A.2. Description of the project activity:

The Chongqing Youyang County Youchou Hydropower Station Project involves the construction of a new hydro electric power project at the main stream of Youshui River near Youchou Township of Youyang County, Chongqing Municipality, China.

The main objective of the project is to generate power from clean renewable hydro power in Chongqing Municipality and contribute to the sustainability of power generation of the Central China Grid.

The scenario prior to the implementation of the project activity is that electricity delivered to the grid is generated by the operation of grid-connected power plants and by the addition of new generation sources, which is identical with the baseline scenario. Coal-fired power generation is currently the dominant power supply option within the Central China Grid. By displacing coal-fired power generation with clean renewable energy, the project leads to the reduction of CO₂ emissions into the atmosphere. Total annual Green House Gases emissions reduction is estimated to be of 332,611tCO₂e annually.

The project scenario falls within sectoral scope 1 - Energy Industries, Electricity generation from hydropower- and consists of the construction of a dam with a maximum height of 62.2 meters which includes flood gates and sand sluices. The powerhouse is integrated in the dam with the turbines installed at the base of the dam in the river bed, providing a total capacity of 120 MW.

Average water flow at the project location is 145m³/s, while the head available for power generation is 43 meters. The expected full load operating hours are 3,267 hours annually, the power load factor is 0.3729 and expected net annual power supply to the grid is 390,000 MWh. The power generated by the proposed project will be routed via an on-site step-up station to the 220 kV Youyang transformer station which is an integral part of the Chongqing Municipality Power Grid.

The baseline scenario is the same as the scenario existing prior to the start of the project activity mentioned above, as the project is the construction of a new power plant.

The project activity's contributions to sustainable development are:

- Reducing the dependence on exhaustible fossil fuels for power generation;
- Reducing air pollution by displacing coal-fired power plants with clean, renewable power;
- Reducing the adverse health impacts from air pollution;
- Reducing the emissions of greenhouse gases, to combat global climate change;



- Contributing to local economic development through employment creation.

This project fits with the Chinese government objective to reduce the dependence on exhaustible fossil fuels for power generation, make the energy sector in general and the power sector in particular more sustainable.

A.3. Project participants:

The parties involved in the project are shown in Table A.1:

Table A.1 Project participants

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	the Party involved wishes to be considered as project participant (Yes/No)
China (Host)	Private entity: Chongqing Youshui Hydropower Development Co., Ltd.	No
The Netherlands	AES Carbon Exchange, Ltd.	No

For more detailed contact information on participants in the project activities, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Chongqing Municipality

A.4.1.3. City/Town/Community etc:

Youchou Township, Youyang County of Chongqing Municipality

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

The Youchou Hydropower Station is located at the main stream of Youchou River near Youchou Township of Youyang County, Chongqing Municipality, China. It is 73 kilometers northeast of Youyang county seat. The site location's coordinates are east longitude of 109°08'51" and north latitude of 28°58'01". Figure A.1 shows the location of the project.

Figure A.1: Map of the project location



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

The project activity falls within Sectoral Scope 1: Energy Industries.
- Electricity generation from renewable energy (hydropower)

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

The project will install conventional hydro power technology and equipments which will be domestically manufactured, therefore the project does not relate to technology transfer. The technology employed has been used in China before and its implementation at the proposed location received approval by the Environment Protection Bureau as further discussed in section D.

The scenario prior to the implementation of the project activity is that electricity delivered to the grid is generated by the operation of grid-connected power plants and by the addition of new generation sources. Coal-fired power generation is currently the dominant power supply option within the Central China Grid.



Generation data within the Grid are monitored and published by Chinese authorities through the Electric Power Yearbook and the Energy yearly.

In accordance with the applied methodology, the greenhouse gases involved in the project activity consist of CO₂ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity.

The project is a new hydro-electric facility with a medium head of 43 meters with limited storage capacity. The technology employed is a conventional integrated dam-powerhouse design. The structure consists of a dam with a maximum height of 62.2 meters, including water intakes on the left hand side, a power house located at the base, and a set of 5 floodgates towards the right bank.

The reservoir will have a total surface area of 7.7 km². The power density of the project is 15.6 W/m² (see section B.6.1 for the calculation).

The choice of turbines for this project reflects the medium head nature of the project. The project will install two Francis turbine/generator sets with an individual capacity of 60MW. The specific technical data of the turbines / generators are listed in Table A.2. The units will be manufactured by Zhejiang Fuchunjiang Hydropower Equipment Manufacturing Co. Ltd.

Table A.2 Technical data of the turbine / generator units (specifications are per unit)

Turbines 1& 2	Nominal flow	161.3 m ³ /s
	Nominal power	61.86 MW
Generators 1 & 2	Nominal power	60 MW
	Frequency	50Hz

The baseline scenario is the same as the scenario existing prior to the start of the project activity mentioned above, as the project is the construction of a new power plant.

The spatial extent of the project boundary includes all power plants connected physically to the electricity system that the CDM project power plant is connected to, including the project power plant itself. Data for installed capacity and power generation within the Central power Grid are provided in Table B.8, section B.6.1

Implementation schedule:

An indicative implementation schedule of the proposed project activity is indicated in Table A.4 below (the dates are best estimates).

Table A.3 Implementation schedule proposed project activity

Start date	End date	Activity
June 2006	March 2008	Construction of the dam and water intake
June 2006	July 2008	Construction of the power house
Nov. 2007	April 2008	Construction of on-site transformer station and transmission lines
Dec. 2007	Dec. 2008	Installation, commissioning and operationalization of first turbine/generator
May 2008	Jan.2009	Installation, commissioning and operationalization of second turbine/generator

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

A 7-year renewable crediting period (renewable twice) is selected for the proposed project activity. The estimation of the emission reductions in the crediting period is presented in Table A.5.

Table A.4 The estimation of the emission reductions in first crediting period

Year	The estimation of annual emission reductions (tCO ₂ e)
Year 1: 01/01/2011 – 31/12/2011	332,611
Year 2: 01/01/2012 – 31/12/2012	332,611
Year 3: 01/01/2013 – 31/12/2013	332,611
Year 4: 01/01/2014 – 31/12/2014	332,611
Year 5: 01/01/2015 – 31/12/2015	332,611
Year 6: 01/01/2016 – 31/12/2016	332,611
Year 7: 01/01/2017 – 31/12/2017	332,611
Total estimated reductions (tonnes of CO ₂ e)	2,328,277
Total number of crediting years in 1st crediting period	7
Annual average over the 1st crediting period of estimated reductions (tonnes of CO ₂ e)	332,611

A.4.5. Public funding of the project activity:

There is no public funding from Annex I countries available to the proposed 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 and monitoring methodology ACM0002 (Version 10): Consolidated baseline methodology for grid-connected electricity generation from renewable sources (approved on 47th CDM EB conference on 28th of May, 2009)

This methodology draws upon the following tools:

- Tool for the demonstration and assessment of additionality (version 05.2)
- Tool to calculate the emission factor for an electricity system (version 02)
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 02)

For more information on the baseline and monitoring methodology we refer to the UNFCCC website:
<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

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

The baseline and monitoring methodology ACM0002 is applicable to the proposed project, because the project meets all the applicability criteria stated in the methodology and associated tools:

- The proposed projects involve the installation of a new hydropower plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant).
- The project activity results in new reservoir and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4W/m². (See section B.6.1. for detailed calculations)
- The project does not involve an on-site switch from fossil fuels to a renewable source.
- The methodology will be used in conjunction with the tools referred to above.

The latest version of ACM0002 (Version 10) has been applied.

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

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Emission sources and gases included in the project boundary for the purpose of calculating project emissions and baseline emissions are determined in the methodology, and shown in Table B.1 below.

**Table B.1 Inclusion of gases and sources in the calculation of the emission reductions**

	Source	Gas	Included?	Justification / explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project Activity	Emissions of CH ₄ from the reservoir	CO ₂	No	Minor emission source
		CH ₄	Yes	Main emission source
		N ₂ O	No	Minor emission source

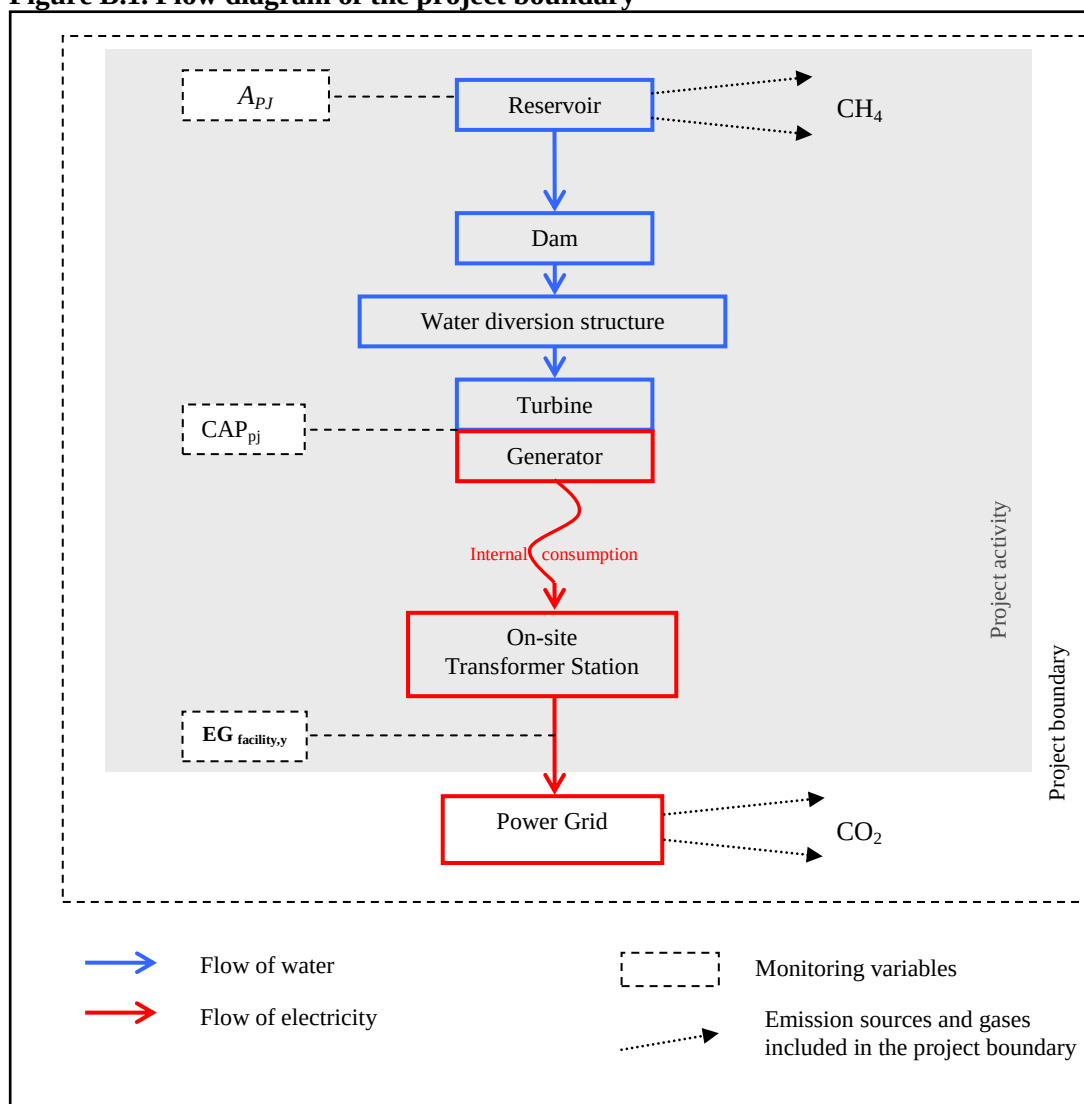
In line with the methodology, the greenhouse gasses accounted for are CO₂ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the proposed project activity and CH₄ emissions from the reservoir. As will be shown in Section B.6.1, the power density is greater than 10 W/m², and therefore reservoir emissions (and hence project emissions) have been assumed at zero, and do not result in deductions from the proposed project emission reductions, in line with the methodology.

Methodology ACM0002 refers to the ‘Tool to calculate the emission factor for an electricity system’ for the definition of an electricity system. According to this tool, the relevant grid definition should be based on the following considerations:

1. Use the delineation of the project electricity system and connected electricity system as provided by the DNA of the host country if available; or
2. Use, where DNA guidance is not available and the electricity system does not have spot markets for electricity or where it is impossible to determine the operational rate of the transmission line, the following definition of boundary:

In large countries with layered dispatch system (e.g. state/provincial/regional/national) the regional grid definition should be used.

In accordance with the above, the regional grid is selected as the project electricity system, which includes all power plants physically connected to this system. The proposed project activity is connected to the Chongqing Municipality Power Grid, which is part of the Central China Power Grid, which is selected as the project electricity system. The Central China Power Grid includes the Provinces of Henan, Hunan, Hubei, Jiangxi, Sichuan and Chongqing. The Central China Power Grid imports electricity from the Northwest China Power Grid. Accordingly, we have selected the Northwest China Power Grids as the connected electricity system. For ease of reference, when we refer throughout this PDD to Central China Power Grid, this will take account of the emissions associated with the imports of power from the connected electricity system (i.e. the Northwest China Power Grid).

Figure B.1. Flow diagram of the project boundary

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

The Chongqing Youyang County Youchou Hydropower Station Project is the installation of a new grid-connected renewable power plant. Therefore, the baseline is identified in the methodology and defined as:

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

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



The additionality of the project activity is demonstrated using the steps described in the ‘Tool for the demonstration and assessment of additionality’ (version 05.2). See UNFCCC website:

<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>

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

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

The methodology requires a number of sub-steps to provide realistic and credible alternatives to the project activity. There are only a few alternatives that are prima facie realistic and credible in the context of the Central China Power Grid:

- **Scenario 1:** Fossil fuel-fired power generation
- **Scenario 2:** Power generation from wind power or other renewable energy
- **Scenario 3:** The proposed hydropower Station, without the support of CDM
- **Scenario 4:** The same service of power supply is provided from grid (i.e. continuation of the present situation)

These alternatives are in accordance with the description of the methodology (the additionality tool requires that the proposed project activity be included as an alternative, without the benefit from CDM). Coal-fired power generation is the dominant power supply option in China. In the case of the Central China Grid, both coal-fired power generation and hydropower are common options. In 2007, coal-fired power accounted for 64.56% of total power generation and hydropower accounted for 35.44% of power generation.¹

There is no available wind, solar, geothermal or biomass renewable resource resulting in the same annual power generation at the project location that is financially attractive, scenario 2 is not feasible and cannot be considered as an alternative. Therefore, **Scenario 2 is excluded**.

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

The second sub-step involves the compliance of the alternatives with all China’s mandatory applicable laws and regulations. The construction of small-scale power plants with a capacity under 135 MW has been prohibited.² **Scenario 1** is consequently **excluded**.

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 for local air quality improvement.

Scenario 3 and 4 are in compliance with the relevant Chinese laws and regulations.

Step 2. Investment analysis

¹ China Electrical Power Yearbook 2008

² 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.



Sub-step 2a: Determine appropriate analysis method

The analysis will be analyzed through Option III of the additionality tool, 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 used as the most credible alternative scenario (provision of same amount of electricity from the Grid) is not considered an investment.
- Option III: Benchmark analysis is used as the return on investment relative to the industry benchmark was crucial for the decision to go ahead with the project.

Option III is applicable to the project activity.

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

The project faces a barrier to implementation due to the poor returns on investment. To illustrate this, we performed a benchmark analysis in which we calculate the project Internal Rate of Return (Project IRR after tax) of the project and compare the result with the 8% benchmark applied in the Feasibility Study of the Youchou Project³ which is also in accordance with the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*.

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

For the calculation of the financial indicators for the proposed hydropower project, we used the parameters listed in Table B.2.

³ Chapter 15 of FSR lists benchmark documents and standards applicable to the project, which consist of “*Economic Evaluation Method and Parameters for Project Construction (second edition)*”, “*Instruction for Feasibility Study of investment project*” and “*Interim provisions concerning hydropower construction project financial assessment*”. Only the latter document provides a benchmark value for hydropower projects, set at 12%, while the 8% benchmark applied in the FSR is in accordance with “*Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*”. This benchmark document is primarily applicable to retrofit projects in the power industry but can be applied more generally to power projects for which no relevant benchmark is available. This benchmark has therefore been applied to projects in the wind power, fossil-fuel fired power and large hydro power (>50MW) sectors as no relevant benchmark existed. Consequently, 8% is applied in this PDD in strict accordance with the FSR, and in keeping principles of conservativeness in the determination of the project financial attractiveness without the revenue from the sale of certified emission reduction.

**Table B.2 Parameters used in the calculation of the project IRR after tax**

Proposed project		
Parameters	Data	Source
Installed capacity	120 MW	Feasibility Study Report
Static total investment	886,460,000 RMB	Feasibility Study Report
Annual power supply	390,000,000 kWh 1 st year: 26,900,000 kWh	Feasibility Study Report
Annual O & M Cost	1 st year: 2,180,000RMB 2-10 year: 16,180,000RMB 11-30 year:14,230,000RMB	Feasibility Study Report
Investment horizon	33 years	Feasibility Study Report
Grid Tariff (VAT incl.)	0.284 RMB/kWh	Highest price at the time of investment decision
VAT	17%	Actual rate
Depreciation period	20 years	Guoshuifa[2000] 84
Residual rate	5%	Guoshuihan[2005] 883
Loan	709,168,000 RMB	Feasibility Study Report
Interest rate on loan	5.76%	Feasibility Study Report
Duration of loan	20 years	Feasibility Study Report
Income tax	33%	Feasibility Study Report
Expected CER price	8 EUR /tCO ₂ e	Market price

The investment analysis compares the internal rate of return (IRR) of the project with the benchmark defined in sub-step 2b. The main results of the investment analysis are presented in Table B.3, where the IRR for the proposed project has been calculated with and without CDM revenues.

Table B.3 Main results of the IRR calculations

Scenario	IRR
Project without revenues from the sale of CERs	6.55%
Project with CER revenues (at 8 EUR / tCO ₂)	8.88%

From the results in Table B.3 it is clear that the return on investment for the Chongqing Youyang County Youchou Hydropower Station Project without the revenues from the sales of CERs is lower than the 8% benchmark that applied in the feasibility study. This demonstrates that the proposed project activity is not a commercially viable option to supply power. The detailed spreadsheet calculations are available to the validator.

The suitability of input values:

Static investment costs:

The Feasibility Study report of the project was designed by Central South Survey & Design Academy of State Grid Company which has authorized design qualification Class A. All data used in IRR originate from the approved FSR which were prepared based on “*Economic Evaluation Method and Parameters for Project Construction (Second edition)*”, “*Instruction for Feasibility Study of investment project*” and “*Interim provisions concerning hydropower construction project financial assessment*”, and approved by the Chongqing Municipality Development and Reform Commission on Jun 30th, 2004.

The breakdown of total investment costs is stated in Table B.4.:

Table B.4. Static investment costs



Items	Investment cost in FSR	Actual investment cost
Civil works	265,838,300	563,107,800 (Turnkey contract)
Equipments cost and installation	133,354,100	
Metal structure equipment and installation	45,828,500	
Temporary works	53,455,900	
environmental protection	6,880,600	
Land flooded compensation and migration	215,282,300	490,804,300
Other cost	111,104,400	129,250,000
Preparation cost(10% of total construction cost)	54,720,500	
Static investment cost ⁴	886,460,000	1,183,162,100

The table above compares total costs as estimated in the Feasibility Study with actual costs incurred at the time of writing the PDD. Furthermore, as indicated in Audit Report 2009 published by Chongqing Wulian Certified Public Accountants, the total investment cost occurred by the end of 2009 is 1,011,234,457 Yuan, which is higher than that of FSR. Therefore, we consider the estimate total investment in FSR is reasonable and conservative to be applied in IRR calculation.

Annual power supply

The power supply is calculated in Chapter 15 in FSR. The calculation formulation is listed below:

$$\text{Annual Power Supply} = \text{Electricity generation} \times (1 - \text{auxiliary power consumption rate}) \\ = 392,000,000 \text{ kWh} \times (1 - 0.5\%) \approx 390,000,000 \text{ kWh}$$

Grid tariff (VAT incl.):

Due to differences on resource distribution and investing scale in Chongqing region, Chongqing municipality did not establish a bus-bar tariff for all hydropower projects⁵, different project has a different tariff, according the official document in Chongqing Municipality “*The Notice on Chongqing Price Bureau's Implementation of the Grid Tariff Adjustment Made by NDRC*”⁶ for normal hydropower projects and a statistical table⁷ made by the Regulatory Authority of Centre China Grid, the **highest** tariff issued to hydropower project at the time of investment decision in Chongqing is 0.284 Yuan/kWh(VAT incl.). This tariff applied in IRR calculation is conservative and suitable.

Annual Operation and Maintenance costs:

The table below compares O&M costs as estimated in FSR with O&M costs recalculated based on Official Guidance from the Chinese Government.

Table B.5 Annual Operation and Maintenance costs recalculated in accordance with official guidance

Cost item	Recalculation Amount (10 ⁴ RMB)	Justification
Repair Cost	938	1% of fixed assets

⁴ The sum up of all break up items in total static investment cost is 886,464,600, however the value in detailed break up table of Feasibility Study is round to 886,460,000. To be consistent and conservative, we apply 886,460,000 here and in IRR calculation.

⁵ http://www.cqpn.gov.cn/gb/news/news_detail.asp?id=35273

⁶ http://www.cqwater.gov.cn/sjym/sjym.aspx?id=109&table=Water_sxzh&dy=1

⁷ <http://hzj.serc.gov.cn/news?id=272>



Wages and Welfare Expenses	80	30 people * 23,292RMB/year(based on published 2005 salary standard);Welfare is 14% of total wages
Social insurance	14	20% of total wage
Retirement insurance	7	10% of total wage
House fund	2	15% of total wage
Education fund	2	3.5% of total wage
Material cost	60	5yuan /kW
Reservoir maintenance cost	39	0.001yuan/kWh (power supply)
The support fund for immigrant	195	0.005yuan/kWh
Others	288	24yuan/kW
O&M cost 1 st year	219	
O&M cost 2-10 years(with the support fund for immigrant)	1,625	
O&M cost 11-30 years (without the support fund for immigrant)	1,430	

As shown in table B.5, it was noticed that the O&M costs provided in FSR are lower than our recalculation according to the official Guidance document “*Interim Regulations of Hydropower Construction Project Financial Evaluation*”. The 23,292RMB/year is strictly in compliance with the guidance as average wages of Staffs and Workers in Urban Economic Units by Electricity, water and gas production and supply industry for Chongqing municipal in year 2005⁸, which is slightly higher than the designed value 20,000 yuan per year in FSR.

Therefore, the O&M costs applied in Investment analysis are conservative. In addition, variations in the annual O&M costs have a small impact on the return of the project. The IRR which will be 7.31% remains below the benchmark (8%) even if the O&M costs decreased by 50%.

Income Tax / VAT

Income tax rate of 33% was used in the IRR calculation which was the standard rate at the time when the Project Owner made his investment decision. The standard income tax rate has changed into 25% from Jan.2008 so that we also provide an IRR calculation spread sheet in which 25% income tax rate is used to demonstrate that even using the latest income tax rate, the project IRR after tax is 6.80% without CDM revenues, an extremely same conclusion that the proposed project faces an investment barrier due to its commercial unattractiveness is made as the IRR results are low.

The 17% of VAT rate is actual rate approved by Chongqing Price Bureau and could be evidenced by the power sales invoices.

Use of fixed values in the IRR calculations:

The IRR calculation is based on real and fixed values. The use of fixed input values is appropriate in case both the input values and the benchmark are defined in real terms (as opposed to nominal terms, which refers to any price or value expressed in money of the day, as opposed to real values: the latter adjust for the effect of inflation) and when there is no expectation that the change in the nominal value of the input parameters will differ significantly from the rate of inflation. The use of fixed real input values (such as grid tariff and O&M cost) is common practice in China and is in accordance with guidance for the

⁸ <http://jtj.cq.gov.cn/szcq/tjnj/>

preparation of feasibility studies which demonstrates that the benchmark is defined in real terms and therefore the application of fixed real input values is appropriate. The IRR calculation compares the real IRR with a real benchmark which in both cases takes out the effects of general price increases due to inflation.

From the results in Table B.3 it is clear that the return on investment for the Youchou Hydropower Station Project without the revenues from the sales of CERs is lower than the 8% benchmark applied in the feasibility study. This demonstrates that the proposed project activity is not a commercially viable option to supply power. The detailed spreadsheet calculations are available to the validator.

Sub-step 2d: Sensitivity analysis

The ‘Tool for the demonstration and assessment of additionality’ requires that a sensitivity analysis is conducted to check whether the financial attractiveness remains unaltered for reasonable variations in the critical assumptions. For the IRR with CDM revenues, we have considered variations in the CER price. For the IRR without CDM revenues, the following parameters were used as critical assumptions:

- Total investment
- Grid tariff
- Operating hours
- Annual operation and maintenance cost

In the sensitivity analysis, variations of $\pm 10\%$ have been considered in the critical assumptions. Such variation is considered appropriate as it is consistent with the approach taken by the official Chinese Standard document “*Interim provisions concerning hydropower construction project financial assessment*” and in accordance with the general guidance provided by the “*Document for Registered Engineering Consultants in China*”, published by the China Planning Press under the supervision of the National Development & Reform Commission.

In addition it is not considered likely that the project’s return will exceed the benchmark due to the following reasons:

- Investment Cost:

As discussed in suitability of input value section above, actual investment costs are increased 33.4% more than the estimated value in feasibility study because construction, engineering costs and immigration allowance are rising in China. Therefore, a 10% decrease of total costs is not considered realistic.

- Annual O&M cost:

Annual O&M costs are expected to rise rather than fall due to increases in the wage level. According to Chongqing Statistical Yearbook⁹ (2007-2009), it indicates that the average wage of the employed in Electricity, water and gas production and supply industry of State owned company keeps rising from 2005 to 2008. Therefore, a 10% decrease of annual O&M costs is not considered realistic.

Table B.5.1 Average wages of Staffs and Workers of state owned companies in Urban Economic Units by Electricity, water and gas production and supply industry

Year	Average wages of Staffs and Workers (Yuan)
2005	23,292
2006	27,454
2007	31,076
2008	36,772

⁹ <http://jtj.cq.gov.cn/szcq/tjnj/>



Furthermore, the IRR which will be 7.31% remains below the benchmark (8%) even if the O&M costs decreased by 50%, which is impossible to happen.

- Annual Power Generation:

Annual power generation designed by Central Southern Survey & Design Institute is based on 46 years of water flow statistics (1957-2003) and the fixed water head data available at the project site. When the power generation increased by 15.9%, the IRR of proposed project will reach the benchmark of 8%. Considering the construction is complete now, the occurred total investment is fixed anyhow in the future. With the actual total investment (1,183,162,100 RMB) applied in the above IRR calculation, only if the power generation increased by 49.4%, the IRR of proposed project can reach the benchmark of 8%, which is impossible to happen.

- Grid Tariff (VAT incl.)

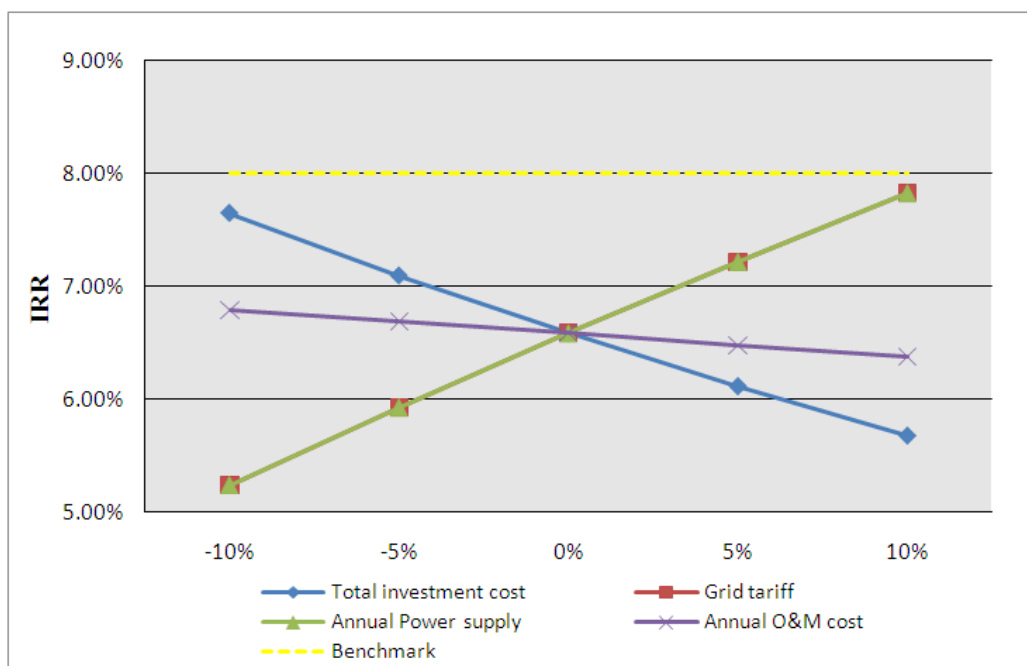
The value of **0.284RMB/KWh** (VAT incl.) that is the highest tariff attainable at the time of investment decision is applied in the above IRR calculations. When grid tariff is increased by 15.9%, the IRR of proposed project will reach the 8% benchmark. Considering the construction is complete now, the occurred total investment is fixed anyhow in the future. With the actual total investment (1,183,162,100 RMB) applied in the above IRR calculation, only if the grid tariff increased by 49%, the IRR of proposed project can reach the benchmark of 8%, which is not likely to happen.

The results of the sensitivity analysis for the IRR without CDM revenues are shown in Table B.6. Figure B.2 provides a graphic depiction.

Table B.6 Sensitivity analysis; impact of variations in assumptions on the IRR without CDM revenues

Percentage Variation	-10%	-5%	0%	+5%	+10%
Critical assumption					
Total Investment cost	7.61%	7.06%	6.55%	6.08%	5.65%
Grid tariff	5.21%	5.90%	6.55%	7.18%	7.79%
Annual power supply	5.21%	5.90%	6.55%	7.18%	7.79%
Annual O&M Cost	6.76%	6.66%	6.55%	6.45%	6.34%

Figure B.2 Results of the sensitivity analysis



The sensitivity analysis of the Internal Rate of Return confirms that the proposed project after realistic modifications to the critical assumptions remains commercially non viable without CDM revenues. The Internal Rate of Return of the proposed project activity without CDM revenues remains below the 8% benchmark.

The conclusion may be clear that with reasonable modifications in the critical assumptions, the main results remain unaltered. The results of the sensitivity analysis therefore confirm that the project faces significant economic barriers without CDM revenues.

Step 3. Barrier analysis

The project does not face other barriers besides the low economic returns. Therefore step 3 of the additionality tool is skipped.

Step 4. Common practice analysis

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

According to the ‘*Tool for the demonstration and assessment of additionality*’, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of similar scale, and take place in comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

Choose the similar area

For the area chosen for common practice, the development policies and investment environments for hydropower projects in different provinces of China are different, Chongqing Municipality is chosen as geographic boundary which is in accordance with the delineation of Provincial Power Grid set by Chinese authorities.

Choose the similar scale



For the similar scale to the proposed project, projects below 50MW and above 300MW are excluded because the Chinese government considers hydropower stations between 50MW and 300MW as middle scale projects with a different set of regulations and industry benchmarks.¹⁰

Choose the similar construction year

Projects that started construction before the 10th February 2002 reforms restructuring the power sector are not taken into account, since they did not benefit from comparable environment with regard to regulatory framework¹¹. Therefore, the projects which started construction activities before 10th February 2002 have the essential difference and are excluded from the similar projects.

Based on the above analysis, the power plants similar to the proposed project are those located in Chongqing Municipality with installed capacity of 50MW-300MW which started construction activities after 10th February 2002.

According to ‘Yearbook of China Water Resources, 2006’, the hydropower stations located in Chongqing Municipality are as follows:

Table B.7a Hydropower stations in Chongqing Municipality from “Yearbook of China Water Resources, 2006”

	Project name	Developer	Operationalization date	Capacity (MW)
1	Yujiankou hydropower station	Chongqing Yujiankou Hydroelectricity Co., Ltd	2004	60
2	Shiban hydropower station	Local government	1997 ¹²	115
3	Dahekou hydropower station	Sichuan Wujiang electric power Co., ltd.	1996 ¹³	75
4.	Shuanghe hydropower station	Chongqing Three Gorges Water Conservancy and Electric Power Co., Ltd.	N.A.	27
5.	Ganchang hydropower station	Chongqing Three Gorges Water Conservancy and Electric Power Co., Ltd.	N.A.	37.5
6.	Tizidong hydropower station	Chongqing Wujiang electric power (Group) Co., Ltd .	2004	36
7	Anju hydropower station	Chongqing Three Gorges Water Conservancy and Electric Power Co., Ltd.	1992	30
8	Weituo hydropower station	Chongqing waterway construction	1993	30

¹⁰ The definition of small scale, medium scale, and large scale hydropower stations is provided in the “Ranks of Hydraulic and Hydropower Engineering”, State Document No. SL 252-2000. Based on this definition, the small scale hydropower benchmark guidance document (SL16-95) employs a 10% project IRR benchmark for hydropower stations below 50MW, where the benchmark for medium and large scale hydropower stations is 8%. Additionally, small scale hydropower stations can under certain circumstances apply for a special 6% VAT rate, whereas medium and large scale hydropower stations cannot.

¹¹ <http://www.fj.sgcc.com.cn/dcsqxx/PublicWeb/Lawrule/file/%E5%9B%BD%E5%8A%A1%E9%99%A2%E5%85%B3%E4%BA%8E%E5%8D%B0%E5%8F%91%E7%94%B5%E5%8A%9B%E4%BD%93%E5%88%B6%E6%94%B9%E9%9D%A9%E6%96%B9%E6%A1%88%E7%9A%84%E9%80%9A%E7%9F%A5%EF%BC%88%E5%9B%BD%E5%8F%91%5B2002%5D5%E5%8F%B7%EF%BC%89.pdf>

¹² [http://www.mwr.gov.cn/weiye/shuili/gongcheng16\(1\).html](http://www.mwr.gov.cn/weiye/shuili/gongcheng16(1).html)

¹³ <http://www.wjep.com/gb/aboutus/content.asp?id=218&style=7&title=%E5%A4%A7%E4%BA%8B%E8%AE%B0>



		Development Co., Ltd.		
9	Yutiao hydropower station	Daxihe Hydropower Co., Ltd.	2001	48

Furthermore, the projects constructed on Youshui River are analyzed:

Table B.7b Hydropower stations constructed on Youshui River

	Project name	Location	Operationalization date	Capacity (MW)
1	Wantang hydropower station	Hunan Province	1993	24.5
2	Tangkou hydropower station	Hubei Province	1994	15
3	Baifusi (Lajitan) hydropower station	Hubei Province	N.A	36
4	Jilongtan hydropower station	Hubei Province	N.A	27
5	Shidi hydropower station	Chongqing City	2007	120
6	Wanmipo hydropower station	Hunan Province	2004	240
7	Fengtang hydropower station Expansion project	Hunan Province	2004	400
8	Gaotan hydropower station	Hunan Province	1998	56

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

There are essential distinctions between the above projects and proposed project.

For the projects listed in the Table B.7a, First, Shuanghe hydropower station, Ganchang hydropower station, Tizidong hydropower station, Anju hydropower station, Weituo hydropower station and Yutiao hydropower station are excluded because they are not ranged between 50 MW and 300MW; Second, Shibao hydropower station and Dahekou hydropower station are not considered similar, because they were developed before 2002. Third, Yujiankou hydropower station is the only project that can be considered similar to the proposed project as it took place in a comparable environment. However, there are essential distinctions between Youchou hydropower station and Yujiankou hydropower station and the latter is developed by Chongqing Yujiankou hydroelectricity Co., Ltd. Chongqing Yujiankou hydroelectricity Co., Ltd is invested by Asia Power Corporation Limited¹⁴ which is Singapore based company, and the Yujiankou hydropower station has a low investment per kilowatt of 6600 Yuan/kW, whilst the investment per kilowatt of Youchou project is 7387 Yuan/kW.

For the projects listed in the Table B.7b, As the Wantang hydropower station, Tangkou hydropower station, Baifusi hydropower station, Jilongtan hydropower station, Wanmipo hydropower station, Fengtan hydropower station, Gaotan hydropower station are excluded due to different region; the only project is Shidi hydropower station, and it is development under CDM¹⁵.

In light of the above, it is clearly demonstrated there are essential distinctions between the above projects and the proposed project. The proposed project would not be feasible without additional revenues from the CDM.

In conclusion, the proposed Project is deemed to be additional according to ACM0002 and the tool for the demonstration and assessment of additionality.

Impact of CDM registration

¹⁴ http://mszz.f.d.gov.cn/gov/HTML/20091016142428_51805.html

¹⁵ http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new614.pdf



Registration of the project as a CDM project would result in additional revenues for the project, significantly improving the economic attractiveness of the project and consequently overcoming the barrier to implementation. The income through CDM will raise the IRR for the project from 6.59 % to 8.93%, which is above the 8% benchmark.

The project entity was aware of the CDM incentive before the start of project activity.

Early CDM Consideration

In June 2004, Feasibility Study Report was completed. According to the conclusion of FSR, only if the gross tariff reached 0.326yuan/kwh, the IRR of Youchou project would crossover the industry benchmark of 8%. However project owner noted that the tariff of 0.326yuan/kWh was not realistic and attainable when they investigated the tariff level of Chongqing municipality, And they noticed that the highest actual tariff issued to hydropower project was only 0.284Yuan/kWh. Youchou project was less financial attractive for project owner under this investment environment. That is reason why the project owner did not start construction even the government approved the project in Jun. 30th 2004.

In June 2005, the shareholder of project owner took part in a CDM training seminar organized by the National Development and Reform Commission. Since then, they started to seek CDM support.

In September 2005, the Board of Director finally made a decision to invest in the project with serious consideration of the CDM revenue.

This can be evidenced by the fact that additional revenues from the CDM were considered a key factor in the decision by Chongqing Youshui Hydropower Development Co., Ltd.to invest in the proposed project activity, as detailed in the below timeline.

**Table B.8 Timeline of CDM consideration**

Date	Events	Remarks
Jun. 2004	Feasibility Study Report is completed	FSR
Jun. 30 th 2004	Feasibility Study Report is approved	FSR approval
May 2005	“The Notice on Chongqing Price Bureau's Implementation of the Grid Tariff Adjustment Made by NDRC Yujia[2005]214” is published.	Yujia[2005]214 from Chongqing price bureau
Jun. 2005	M. Liu Zhongqi and M. Mou Min from Chongqing Construction Investment Co, Ltd (a major shareholder of Youshui Hydropower Development Co., Ltd) take part in a CDM training seminar organized by the National Development and Reform Commission.	Training list: http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=350 Line 50 and 51
Sep. 2005	The financial incentive from the Clean Development Mechanism is acknowledged by the Board of Directors as a key element for the project's profitability.	Board Meeting Resolution
Dec. 14 th 2005	Start of project activity - The turnkey contract is signed	Contract
Jun. 6 th 2006	Start of construction activities	Construction start order
Jul. 3 rd 2006	An internal CDM development team is established	Notice on establishment of an internal CDM team
Jan. – 30 th Jun. 2007	ERPA negotiation with original potential CER buyer.	Meeting minute and draft ERPA
Sep. 28 th 2007	Parties failed to reach an agreement and negotiations with original CER buyer are terminated. The CDM internal team contacts other buyers and an engagement agreement is signed between the project entity and AES	CDM engagement agreement
28 th Feb.-1 st Mar. 2008	A Stakeholder consultation meeting was held	Meeting memo, records, pictures, questionnaires
May, 2008	CDM Application for Host Country approval is suspended as both party fail to reach a final agreement on ERPA	Email correspondence on ERPA negotiation
May-Aug. 2008	ERPA re-negotiation and finally signed	Signed ERPA and email correspondence
19 th Sep. 2008	Application documents and PDD submitted to NDRC	Email correspondence
11 th Nov. 2008	Host Country DNA meeting	55 th meeting announcement http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2012.pdf
27 th Nov. 2008	DOE selection process commences	email correspondence
Oct.-26 th Dec. 2008	- Information and evidence collection for updating GSP PDD - GSP PDD completed for DOE to release quotation	Email correspondence Updated PDD
Jan. 2009	Letter Of Approval issued by NDRC	LoA
May 2009	Contract negotiation with DOE is terminated	Email correspondence
Jun. 2009	CEC identified as potential DOE, Quotation from CEC submitted to buyer's headquarter for approval	Email correspondence
8 th Jul. 2009	Obtain approval for validation and initiate contract negotiation	Email correspondence
12 Feb. 2010	Start GSP	http://cdm.unfccc.int/Projects/Validation/DB/2FCMQYFYDRJJ7VN7TWVX2OFA7RBKCI/view.html

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:****Baseline emissions**

In accordance with the ‘ACM0002 methodology’ (Version 10), baseline emissions for the year y are calculated as:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (B.1)$$

Where:

- BE_y are the baseline emissions in year y (tCO₂/yr);
- $EG_{PJ,y}$ is quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);
- $EF_{grid,CM,y}$ is the Combined Margin CO₂ emission factor for grid connected power generation in year y , calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.

Calculation of $EG_{PJ,y}$

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

$$EG_{PJ,y} = EG_{facility,y} \quad (B.2)$$

Where:

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

The expected net power supply to the grid and an *ex ante* calculation of the emission factor in the first crediting period, and will hence be revised during the implementation of the project activity on the basis of actual net power supply to the grid.

For the calculation of Combined Margin CO₂ emission factor, $EF_{grid,CM,y}$, the methodology refers to the ‘Tool to calculate the emission factor for an electricity system’ (Version 02). In accordance with this tool, the baseline emission factor is calculated as a combined margin: a weighted average of the operating margin emission (OM) factor and the build margin (BM) emission factor. Both the OM and BM emission factors are calculated *ex ante* and will not be updated during the first crediting period.

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA on July in 2009. We will refer to these emission factors as the ‘published emission factors’.

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

http://qhs.ndrc.gov.cn/qfzjz/t20090703_289357.htm: calculation result of the baseline emission factor of Chinese power grid.

The description below focuses on the key elements in the calculation of the published emission factors and the subsequent calculation of emission reductions. The full process of the calculation of the emission factors and all underlying data are presented in English in Annex 3 to this PDD.

Selection of values for net calorific values and CO₂ emission factors of various fuels.

As mentioned above, the Chinese DNA has entrusted key experts with the calculation of the grid emission factors. In these calculations choices have been made for the values of net calorific values and CO₂ emission factors. In the calculation files of the published emission factors, the net calorific values are based on the China Energy Statistical Yearbook, and the CO₂ emission factors are based on IPCC 2006 default values. The following table summarizes the values used. Note that the table lists the carbon emission factor of the fuels, while the CO₂ emission factor has been obtained by multiplying with 44/12. Besides, in accordance with Chinese DNA, the lower limit of 95% confidence interval is applied for CO₂ emission factor calculation to reflect the uncertainty. Rounded figures have been reported but exact figures have been used in the calculations in this PDD. The IPCC 2006 default carbon emission factors assume as a default value 100% oxidation in the combustion process. The calculation by the Chinese DNA and the calculations presented here follow the same approach by assuming complete combustion of the fuels. The ‘Tool to calculate the emission factor for an electricity system’ does not take into account oxidation rates, which is equivalent to assuming 100% oxidation.

Table B.9. Default values used for net calorific values and CO₂ emission factors of fuels

Fuel	Unit	NCV	Carbon emission factor	CO ₂ emission factor
		(TJ/unit)	(TC/TJ)	(kgCO ₂ e/TJ)
Raw coal	10 ⁴ Tons	209.08	25.8	87,300
Clean coal	10 ⁴ Tons	263.44	25.8	87,300
Other washed coal	10 ⁴ Tons	83.63	25.8	87,300
Briquettes	10 ⁴ Tons	209.08	26.6	87,300
Coke	10 ⁴ Tons	284.35	29.2	95,700
Coke oven gas	10 ⁸ m ³	1672.60	12.1	37,300
Other gas	10 ⁸ m ³	522.70	12.1	37,300
Crude oil	10 ⁴ Tons	418.16	20.0	71,100
Gasoline	10 ⁴ Tons	430.7	18.9	67,500
Diesel	10 ⁴ Tons	426.52	20.2	72,600
Fuel oil	10 ⁴ Tons	418.16	21.1	75,500
LPG	10 ⁴ Tons	501.79	17.2	61,600
Refinery gas	10 ⁴ Tons	460.55	15.7	48,200
Natural gas	10 ⁸ m ³	3893.1	15.3	54,300
Other petroleum products	10 ⁴ Tons	383.69	20.0	75,500
Other coking products	10 ⁴ Tons	284.35	25.8	95,700
Kerosene	10 ⁴ Tce	430.7	19.6	87,300

Data source: All data are from the files mentioned above, and have been crosschecked against the original sources cited, as follows:

- Net calorific values: China Energy Statistical Yearbook, 2008, P.284;
- Carbon emission factors and oxidation rates: IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy);
- CO₂ emission factors: calculated in accordance with Chinese DNA.

Description of the calculation process

The key methodological steps according to the ‘Tool to calculate the emission factor for an electricity system’ are:

1. Identify the relevant electricity power systems;
2. Choose whether to include off-grid power plants in the project electricity system (optional).
3. Select an operating margin (OM) method;
4. Calculate the operating margin emission factor according to the selected method;
5. Identify the group of power units to be included in the build margin (BM);
6. Calculate the build margin emission factor, and;
7. Calculate the combined margin (CM) emission factor.

Step 1. Identify the relevant electricity power systems

The Chinese DNA has defined and published a delineation of the *project electricity system* and *connected electricity systems*. Therefore, in accordance with the above mentioned tool, this delineation is applied to the project activity. The Youchou hydropower station **project electricity system** is defined as the Central China power grid.

Electricity transfers from connected electricity systems to the project electricity system are defined as electricity imports and electricity transfers to connected electricity systems are defined as electricity exports. The Central China power grid does not import or export electricity from other grids; consequently there is no **connected electricity system**.

The project is connected to the Chongqing Municipality Power Grid through local transformer station. The Chongqing Municipality Power Grid is part of the Central China Power grid, which includes the Sichuan, Henan, Hubei, Hunan, and Jiangxi and Chongqing city power grids.

Figure B.3 Central China Power Grid



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

Two options are provided in the “Tool to calculate the emission factor for an electricity system” to calculate the operating margin and build margin emission factor:

- **Option I:** Only grid power plants are included in the calculation.
- **Option II:** Both grid power plants and off-grid power plants are included in the calculation.

In China, off – grid plants are not significant as electricity grids under government control are dominant power supplier. Therefore, option I is chosen for operating margin and build margin emission factor calculation.

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

The ‘Tool to calculate the emission factor for an electricity system’ offers several options for the calculation of the OM emission factor. Of these, dispatch analysis, cannot be used, 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. The average OM does not take into account the non-dispatchable nature of low-cost/must-run resources and as low-cost/must-run resources constitute less than 50% of total grid generation (see table B.9), we have selected the Simple OM method as the most appropriate method.

Table B.9 Electricity generation of the Central China Grid, 2002-2006

Year	Generation (GWh)				
	Thermal	Hydro	Others	Total	% Low cost/must run
2003	240,839	126,448	n.a.	367,287	34.43%
2004	270,846	169,094	n.a.	439,940	38.44%
2005	303,976	187,734	n.a.	491,710	38.17%
2006	334,027	202,500	n.a.	559,100	36.22%
2007	408,400	224,300	n.a.	632,800	35.44%

Source: China Electric Power Yearbook (editions 2004, 2005, 2006, 2007 and 2008)

Data vintage selection

In accordance with the ‘Tool to calculate the emission factor for an electricity system’, the OM is calculated according to the ‘ex ante option’ and the emission factor is determined once at validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required: For grid power plants, use a three-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period.

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

According to the Simple OM method, the OM emission factor is calculated as the generation-weighted average tCO₂ emissions per unit of net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including the low-cost/must-run power plants/units.

We calculate the OM emission factor according to option C (based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system) of the Simple OM method, as

- Data required for option A (based on data on the net electricity generation and a CO₂ emission factor of each power unit), fuel consumption and net electricity generation of each power plant / unit) and B (based on data on net electricity generation, the average efficiency of each power unit

and the fuel type(s) used in each power unit) such as electricity generation, CO₂ emission factor for specific power plants/units serving the grid is not available to the public or to the project participants.

- According to the Chinese publicly available data such as China Electric Power Yearbooks, nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known. And
- Off-grid power plants are not included in the calculation (i.e., Option I has been chosen in Step 2).

Under option B is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{EG_y} \quad (B.3)$$

Where:

- $EF_{grid,OMsimple,y}$ is the simple operating margin CO₂ emission factor in year y (tCO₂/MWh);
- $FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (in a mass or volume unit);
- $NCV_{i,y}$ is the Net Calorific Value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit);
- $EF_{CO_2,i,y}$ is the CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ);
- EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);
- i are all fossil fuel types combusted in power sources in the project electricity system in year y , and;
- y is the three most recent years for which data is available.

Choice of aggregated data sources

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the CO₂ emission factor.

Calculation of the OM emission factor as a three-year full generation weighted average

On the basis of these data, the Operating Margin emission factors for 2005, 2006 and 2007 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Annex 3. It is calculated the Operation Margin Emission Factor as **1.1255tCO₂e/MWh**.

The calculation of the OM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions.

Step 5. Identify the group of power units to be included in the build margin (BM)

According to the ‘Tool to calculate the emission factor for an electricity system’, the sample group of power units m used to calculate the build margin consists of either:

- The set of five power units that have been built most recently, or
- The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

A direct application of this approach is difficult in China. The Executive Board (EB) has provided guidance on this matter with respect to the application of the AMS-1.D and AM 0005 methodologies for projects in China on 7 October 2005 in response to a request for clarification by DNV on this matter. The EB accepted the use of capacity additions to identify the share of thermal power plants in additions to the grid instead of using power generation. The relevance of this EB guidance extends to the ‘Tool to calculate the emission factor for an electricity system’. The calculation in step 6 and the calculation of the published BM Emission factor by the Chinese authorities are based on this guidance. The approach is explained below in step 6 and is the one that has been followed in numerous PDDs using the similar ACM0002 methodology since the EB decision.

Data vintage selection

In accordance with the ‘Tool to calculate the emission factor for an electricity system’, the BM is calculated according to option one: For the first crediting period, the build margin emission factor is calculated ex-ante based on the most recent information available. For the second crediting period, the build margin emission factor will be updated based on most recent data available at the time of submission of the request for registration. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used.

Step 6. Calculate the build margin emission factor

The Build Margin Emission Factor is, according to the ‘Tool to calculate the emission factor for an electricity system’, calculated as the generation-weighted average emission factor (measured in tCO₂/MWh) of all power units m during the most recent year y for which data is available:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (B.4)$$

Where:

- $EF_{grid,BM,y}$ is the build margin CO₂ emission factor in year y (tCO₂/MWh);
- $EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);
- $EF_{EL,m,y}$ is the CO₂ emission factor of power unit m in year y (tCO₂/MWh);
- m are the power units included in the build margin, and;
- y is the most recent historical year for which power generation data is available.

The sample m , according to the methodology, should be over the latest 5 power plants added to the grid, or over the last added power plants accounting for at least 20% of power generation. We apply an indirect approach based on the EB decision as mentioned in step 5.

First the newly-added installed capacity and the share of each power generation technology in the total capacity are calculated. Second, the weights of each power generation technology in the newly-added installed capacity are calculated.¹⁶ Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology and a weighted average carbon emission factor on the basis of IPCC default carbon emission factors of individual fuels.

Since the exact data are aggregated, the calculation will apply the following method: We calculate the share of the CO₂ emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

Using the emission factor for advanced efficient technology we calculate the emission factor for thermal power; the BM emission factor of the power grid will be calculated by multiplying the emission factor of the thermal power with the share of the thermal power in the most recently added 20% of total installed capacity.

Detailed steps and formulas are as below:

First, the share of CO₂ emissions of the solid, liquid and gaseous fuels in total emissions respectively is calculated.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \quad (B.5)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \quad (B.6)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \quad (B.7)$$

Where:

- $F_{i,j,y}$ the amount of the fuel i consumed in y year of j province (measured in tce);
- $COEF_{i,j,y}$ the emission factor of fuel i (measured in tCO₂/tce) while taking into account the carbon content and oxidation rate of the fuel i consumed in year y , and;
- $COAL, OIL$ and GAS subscripts standing for the solid fuel, liquid fuel and gas fuel.

Second, calculate the emission factor of the thermal power:

¹⁶ Newly added capacity is determined as follows. First, the latest year (2007) for which data on total installed capacity is available is identified. Then, the last year is identified in which the total installed capacity was below 80% of the total installed capacity in 2007. This defines “newly added capacity”. Note that this approach does not follow the EB decision in response to the DNV request as mentioned in the main text to the letter, but the approach taken is the one that has been followed in numerous PDDs since the EB decision.



$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv} \quad (B.8)$$

While $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the emission factors of advanced coal-fired, oil-fired and gas-fired power generation technology, see detailed parameter and calculation in Annex 3.

Third, calculate BM of the power grid:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \cdot EF_{Thermal} \quad (B.9)$$

Where CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity.

The λ s are calculated on the basis of the weight of CO₂ emissions of each type of fuel in the total CO₂ emissions from thermal power. Subsequent calculation of the Build Margin emission factor yields a baseline emission factor of **0.5802tCO₂e/MWh**.

For details please refer to Annex 3.

The calculation of the BM emission factor for the first crediting period is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the advantage of simplifying monitoring and verification of emission reductions.

Step 7. Calculate the combined margin (CM) emission factor

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

$$EF_{grid,CM,y} = EF_{grid,OM,y} \cdot W_{om} + EF_{grid,BM,y} \cdot W_{BM} \quad (B.10)$$

The “Tool to calculate the emission factor for an electricity system” provides the following default weights: Operating Margin, $W_{OM} = 0.5$; Build Margin, $W_{BM} = 0.5$

We apply published data of 1.1255 for the Operating Margin Emission Factor and 0.5802 for the Build Margin Emission Factor. Applying the default weights and the published emission factors, a combined margin Baseline Emission Factor of **0.85285tCO₂/MWh** is calculated.

The published emission factor in the calculation of baseline emissions is applied.

Calculation of Baseline Emissions

Baseline Emissions are calculated by multiplying the Baseline Emission factor by the net quantity of electricity supplied to the grid electricity system by the project according to formula B.2 repeated below for convenience:

$$BE_y = EG_y \cdot EF_{grid,CM,y}$$



The estimated baseline emissions (see Section B.6.3) are based on expected net power supply to the grid and an *ex ante* calculation of the emission factor in the first crediting period, and will hence be revised during the implementation of the project activity on the basis of actual net power supply to the grid.

Project Emissions:

$$PE = PE_{HP,y}$$

$PE_{HP,y}$ = Emissions from water reservoirs of hydro power plants

For hydro power project activities that result in new reservoirs, emissions from water reservoirs of hydro power plants shall be accounted for and are based on the power density of the project activity, which is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (B.11)$$

Where:

PD = Power density of the project activity, in W/m^2 .

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

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

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).

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

The Youchou project will create a new hydro power plant and a new reservoir. Therefore, the power density is determined as:

Total installed capacity: 120,000,000 W

Reservoir surface area at full reservoir level: 7,700,000 m^2

$PD = 15.6 W/m^2$

Consequently, and according to the methodology, the power density is greater than $10W/m^2$, therefore project emissions equal zero.

Leakage

In agreement with the methodology, leakage emissions (arising from power plant construction, upstream emissions from fossil fuel use, etc.) are ignored.

Calculation of Emission Reductions

As the project involves neither project emissions nor leakage emissions, emission reductions are equal to baseline emissions. Using the results of the preceding sections, we calculate the emission reductions using formula B.13:

$$ER_y = BE_y - PE_y - LE_y \quad (B.12)$$



The project will install one on-site diesel generator with total capacity of 400kW which will be maintained for emergency purpose in case the power line which sends the power from the grid is cut off. In case of emergencies the project will not claim emission reductions and the use of the diesel generator will be monitored. The project owners will run the diesel generator about 10 hours¹⁷ annually. So the expected annual power generation can be calculated to be 4,000kWh. Once the emissions of the diesel generator are less than 1% of total emission reductions and are considered negligible. For the emission factor of the diesel generator we refer to the AMS-I.D (version 13) methodology which provides emission factors for diesel generator systems. We apply the highest value listed in the methodology which is 2.4kgCO₂e/kWh (generator below 15kW), which is conservative considering the size of the generator used on-site. The annual emissions by the diesel generators is estimated as 9.6tCO₂e, which would reduce annual emission reductions about 0.003% and can therefore be considered negligible. If the emissions of the diesel generator are more than 1% of total emission reductions and the emission from diesel generator will be taken into project emission.

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

Data / Parameter:	EF_{grid,CM,y}
Data unit:	tCO ₂ e/MWh
Description:	Combined Margin Grid Emission Factor for the project electricity system in year y
Source of data:	Calculated ex-ante based on the OM emission factor and BM emissions factor.
Value applied:	0.85285tCO ₂ e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated from the published emissions factors.
Any comment:	-

Data / Parameter:	EF_{grid,BM,y}
Data unit:	tCO ₂ e/MWh
Description:	Build Margin Grid Emission Factor for the project electricity system in year y
Source of data:	Calculated ex-ante (see Annex 3)
Value applied:	0.5802tCO ₂ e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated ex-ante (see Annex 3).
Any comment:	-

Data / Parameter:	EF_{grid,OM,y}
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¹⁷ The back-up diesel generator is installed to supply emergency power in case the power line which sends the power from the grid. For the conservative consideration and according to the project owner's experience, project owner assumed that the annual operation hours of diesel generator for emergency is around 10 hours as mentioned above. The operation hours of the diesel generator is just an estimated value, while the value used for calculating the actual emission reduction will come from the monitoring result.



Data unit:	tCO ₂ e/MWh
Description:	Operating Margin Grid Emission Factor for the project electricity system in year y
Source of data:	Calculated ex-ante (see Annex 3)
Value applied:	1.1255 tCO ₂ e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated ex-ante (see Annex 3).
Any comment:	-

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydropower plant before the implementation of the project activity. For new hydropower plants the value is zero.
Source of data:	N.A.
Value applied:	Zero
Justification of the choice of data or description of measurement methods and procedures actually applied:	The proposed CDM project activity involves a new hydropower station and hence Cap _{BL} is zero.
Any comment:	-

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydropower plant after the implementation of the project activity.
Source of data:	Feasibility study report
Value applied:	120,000,000 W
Justification of the choice of data or description of measurement methods and procedures actually applied:	This is the best data available.
Any comment:	-

Data / Parameter:	PLF
Data unit:	-
Description:	Ex-ante power load factor
Source of data used:	Feasibility Study Report
Value applied:	0.3729
Justification of the choice of data or description of measurement methods and procedures actually applied:	In accordance with the guidance for the reporting and validation of Plant Load Factor, the ex-ante plant load factor is defined according to the data determined by Central South Survey & Design Academy of State Grid Company which has authorized design qualification Class A. Ex-ante Plant Load Factor=Operating hours/8760=3267/8760=0.3729
Any comment:	



Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (M ³).
Source of data:	N.A.
Value applied:	Zero
Justification of the choice of data or description of measurement methods and procedures actually applied:	Not applicable: A_{BL} is determined ex-ante: the size of the reservoir before implementation of the project cannot be monitored after implementation of the project activity.
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data used:	Feasibility study report
Value applied:	7,700,000 m^2
Justification of the choice of data or description of measurement methods and procedures actually applied:	This is the best data available
Any comment:	-

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	(Net) Electricity supplied by the project to the grid
Source of data used:	Feasibility study report
Value applied:	390,000 MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	This is the best data available
Any comment:	-

Parameters used for the calculation of the Operating Margin (OM) and Build Margin (BM) Emission Factors in accordance with the “Tool to calculate the emission factor for an electricity system”:

Data / Parameter:	$EG_y, EG_{jy}, EG_{k,y}$ and $EG_{n,h}$
Data unit:	MWh (per annum)
Description:	Net electricity generated and delivered to the grid by power plant / unit m, j, k , or n in year y or hour h
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Electric Power Yearbook (Editions 2006, 2007 and 2008)
Value applied:	For detailed values; see Annex 3



Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities. For the calculation of the OM emission factor, total electricity supply per power generating category has been used instead of electricity supply per power plant/unit. For the calculation of the BM emission factor, the latest 20% capacity addition to the grid has been employed. For values and a detailed description of the calculation method see Annex 3 and Section B.6.1 respectively.
Any comment:	-

Data / Parameter:	Internal power consumption of power plants
Data unit:	Percentage
Description:	Internal consumption of power by source
Source of data used:	China Electric Power Yearbook (Editions 2006, 2007 and 2008)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.

Data / Parameter:	$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,j,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$, and $FC_{i,n,h}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plants / units m,j,k , or n in year y or hour h
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Energy Statistical Yearbook, 2006, 2007 and 2008 editions
Value applied:	For detailed values; see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities. For the calculation of the OM emission factor, total fuel consumption per power generating category has been used instead of fuel consumption per power plant/unit. For the calculation of the BM emission factor, the latest 20% capacity addition to the grid has been employed. For values and a detailed description of the calculation method see Annex 3 and Section B.6.1 respectively.
Any comment:	-

Data / Parameter:	Power generation by source
Data unit:	GWh (per annum)
Description:	Provincial level power generation data by source
Source of data used:	China Electric Power Yearbook (Editions 2006, 2007 and 2008)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.



Data / Parameter:	Efficiency of advanced thermal power plant additions
Data unit:	%
Description:	
Source of data used:	See the downloadable files mentioned above for the full data set. Data are based on the best technologies available in China.
Value applied:	Coal: 38.1%; Oil: 49.99%; Gas: 49.99%
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Capacity by power generation source
Data unit:	MW
Description:	For the different power generation sources, installed capacity in 2005, 2006 and 2007 in the Central China Grid. Calculated by summing provincial data.
Source of data used:	See the downloadable files mentioned above for the full data set.
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Oxidation Factor
Data unit:	Percentage
Description:	Oxidation factors for 16 different fuels
Source of data used:	Data used are IPCC default values. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy
Value applied:	For detailed values; see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the most recent data available, and have been used by the Chinese authorities to calculate the emission factors.
Any comment:	2006 IPCC emission factors are based on 100% oxidation default values and the “Tool to calculate the emission factor for an electricity system” does not require the use of oxidation values. We have listed them as a parameter as the Chinese DNA uses them (100%) and we want to be comprehensive. Utilizing 100% oxidation default values does not influence the calculation of the combined margin grid emission factor.



Data / Parameter:	EF_{co2,i,y} and EF_{co2,m,i,y}
Data unit:	tCO ₂ /GJ
Description:	tCO ₂ emission factor of fossil fuel type <i>i</i> in year <i>y</i>
Source of data used:	Data used are IPCC default values. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy
Value applied:	For detailed values; see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the most recent data available, and have been used by the Chinese authorities to calculate the emission factors.
Any comment:	

Data / Parameter:	NCV_{i,y}
Data unit:	GJ / mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type <i>i</i> in year <i>y</i>
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Energy Statistical Yearbook, (2004) p. 302.
Value applied:	For detailed values; see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Fuel CO₂ Emission Coefficients
Data unit:	kgCO ₂ /TJ
Description:	Carbon emission factors for 17 different fuels
Source of data used:	In accordance with Chinese DNA, the lower limit of 95% confidence interval is applied for CO ₂ emission factor calculation to reflect the uncertainty. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the China Clean Development Mechanism website online at: http://qhs.ndrc.gov.cn/qjzjz/W020090703644238739485.xls .
Value applied:	For detailed values see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These are the most recent data.
Any comment:	

Data / Parameter:	Electricity imports from connected grids
Data unit:	MWh (per annum)
Description:	Electricity imports of power from other grids
Source of data used:	Original data are from China Electric Power Yearbook (Editions 2006,



	2007 and 2008)
Value applied:	For detailed values; see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Primary fuel input for thermal power supply
Data unit:	10 ⁴ tons, 10 ⁸ m ³ , 10 ⁴ tce, depending on the specific fuel. We refer to Annex for details.
Description:	Physical amount of fuel input, for 17 different fuels
Source of data used:	China Energy Statistical Yearbook 2006, 2007 and 2008 editions.
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions

The annual net power supply to the Central China Grid during the first crediting period is estimated to be 390,000 MWh.

Applying formula B.2 presented in Section B.6.1, we obtain the values for the baseline emissions during the first crediting period provided in Table B.10:

Table B.10 The estimation of baseline emissions during the 1st crediting period

Year	Period	Annual net power supply to the grid (EGy) (MWh)	Baseline emission factor (tCO ₂ /MWh)	Baseline emissions (tCO ₂ e)
1	01/01/2011 – 31/12/2011	390,000	0.85285	332,611
2	01/01/2012 – 31/12/2012	390,000	0.85285	332,611
3	01/01/2013 – 31/12/2013	390,000	0.85285	332,611
4	01/01/2014 – 31/12/2014	390,000	0.85285	332,611
5	01/01/2015 – 31/12/2015	390,000	0.85285	332,611
6	01/01/2016 – 31/12/2016	390,000	0.85285	332,611
7	01/01/2017 – 31/12/2017	390,000	0.85285	332,611
	Total			2,328,277
	Average	390,000		332,611



In a given year, the emission reductions realized by the project activity (ER_y) is equal to baseline GHG emissions (BE_y) minus project emissions:

$$ER_y = BE_y - PE_y = 332,611\text{tCO}_2/\text{y} - 0 = 332,611\text{tCO}_2/\text{y}$$

**B.6.4 Summary of the ex-ante estimation of emission reductions:****Table B.11 Ex ante estimation of emission reductions due to the project**

Year	Project Emissions (tCO ₂)	Baseline emissions (tCO ₂)	Leakage (tCO ₂)	Emission Reductions (tCO ₂)
Year 1: 01/01/2011 – 31/12/2011	0	332,611	0	332,611
Year 2: 01/01/2012 – 31/12/2012	0	332,611	0	332,611
Year 3: 01/01/2013 – 31/12/2013	0	332,611	0	332,611
Year 4: 01/01/2014 – 31/12/2014	0	332,611	0	332,611
Year 5: 01/01/2015 – 31/12/2015	0	332,611	0	332,611
Year 6: 01/01/2016 – 31/12/2016	0	332,611	0	332,611
Year 7: 01/01/2017 – 31/12/2017	0	332,611	0	332,611
Total	0	2,328,277	0	2,328,277
Average	0	332,611	0	332,611

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

Data / Parameter:	EG_{facility,v}
Data unit:	MWh
Description:	Electricity supplied to the grid by the project (net)
Source of data:	Project activity site
Measurement procedures:	The net electricity supplied to the grid by the project is calculated by measured result of ES _y (electricity supplied to the grid) minus measured result ED _y (electricity delivered from the grid to the project). For details we refer to section 7.2. ES _y and ED _y are continuously measured and monthly recorded by project entity with national standard electricity metering instruments M1 (see Figure B.4). The measurement will be conducted technically in accordance with the “ <i>Technical administrative code of electric energy metering (DL/T448 –2000)</i> ”.
Monitoring frequency:	Continuous measurement and monthly recording
QA/QC procedures to be applied:	These data will be directly used for calculation of emission reductions. Measurement results of electricity supplied to the grid and that delivered from the grid to the project will be cross-checked against Electricity Transaction Notes (hereinafter ETNs). In case of discrepancies the conservative value will prevail. The metering instruments will be calibrated annually.
Any comment:	-

Data / Parameter:	Cap_{PI}
Data unit:	W
Description:	Installed capacity of the hydro power plant after implementation of the project activity.
Source of data:	Project activity site
Measurement procedures:	Installed capacity of the project activity will be determined according to installed equipments’ nameplates and will be monitored annually. The nameplate will be checked by DOE during verification.
Monitoring frequency:	Yearly



QA/QC procedures to be applied:	No further QA/QC procedures are considered necessary.
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m ²
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data:	Measured at the project site
Measurement procedures:	The project entity will commission a third party to conduct the measurement from topographical surveys and maps. A measurement report will be issued by this qualified party. The surface area will be calculated using the design schematics and area maps.
Monitoring frequency:	Yearly
QA/QC procedures to be applied:	A qualified third party will be commissioned by the project entity to measure reservoir surface area when the reservoir is full. Qualification is issued by governmental surveying and mapping department.
Any comment:	-

Data / Parameter:	Operational hours of emergency back-up diesel generator
Data unit:	Hours / year
Description:	Annual hours that the emergency back-up gasoline generator is running either for the purpose of commissioning/maintenance or actual emergencies
Source of data:	Project site
Measurement procedures (if any):	The project entity will record the operational hours in the daily operation logs.
Monitoring frequency:	Simultaneous measurement and recording along with operation
QA/QC procedures to be applied:	The expected annual emissions associated with the operation of the emergency back-up diesel generator amount to about 0.003% of total emission reductions. The actual emissions resulted from the operation of the diesel generator will be calculated and considered as project emissions once it is more than 1% of emission reduction and therefore deducted from baseline emissions. In case of actual emergencies the project entity will not claim emission reductions (see section B.7.2). Further QA/QC procedures are therefore not considered necessary.
Any comment:	-

B.7.2 Description of the monitoring plan:

This monitoring plan outlines the principles which shall be followed in the monitoring of the parameters listed in section B.7.1.

Monitoring of net electricity supplied by the project to the grid

The proposed project activity is connected to the Chongqing Municipality Power Grid through two on-site transformers. The project will supply electricity to the Grid through an on-site step up station

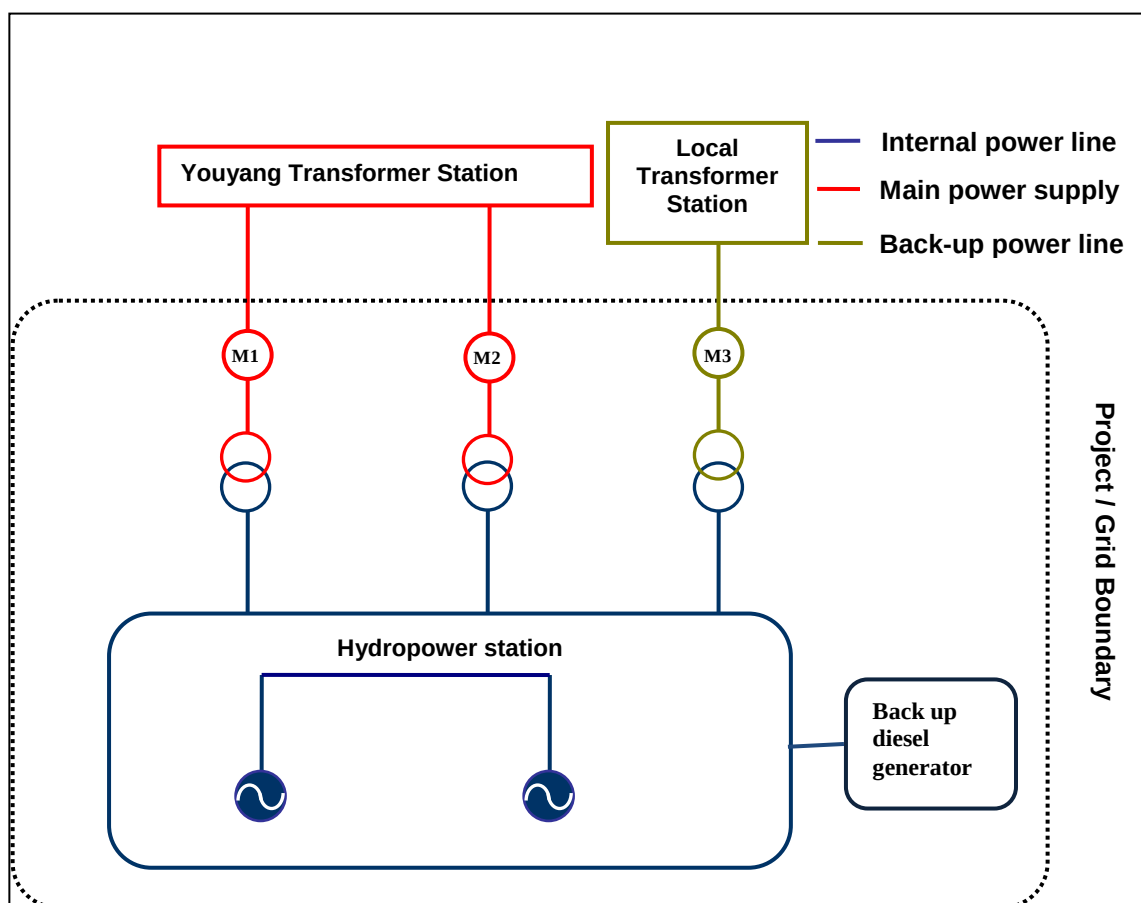
connected to the Youyang 220 kV transformer station, which is part of the Chongqing Municipality Power Grid. The project is connected to one back-up power line to provide emergency power in case the project is not operational (indicated in dark yellow line in figure B.4). An indicative grid connection diagram is provided in figure B.4.

The grid connection diagram indicates the principles for positioning of metering instruments that will be used in the monitoring of emission reductions. A detailed grid connection diagram which is updated on the basis of the actual implementation of the project's grid connection and will serve as the basis for periodic verification.

The project entity will ensure that the actual implementation of grid connection will not deviate from the procedures outlined in this section.

Figure B.4 Indicative grid connection diagram

The project entity will meter electric power according to the following principles:



- The **Power supplied to the grid through main power line (ES_y)**:
As indicated in Figure B.4 the project is connected by two main power supply lines (indicated in red) which will supply power generated by the project to the grid. Electricity supplied to the grid is metered as below:



Project entity: The electricity supplied to the grid is measured continuously by the project entity with standard metering instrument M1 and M2 in accordance with national regulations. ES_y will be recorded monthly.

Calibration:

Calibrations of M1 and M2 are carried out annually by the grid company or by a certified company.

The grid company will issue purchase electricity records (i.e. ETNs, Electricity Transaction Notes, hereinafter ETNs) each month to the project entity where the monthly amount of electricity supply to the grid is mentioned. The measurement results of ED_y by M1 and M2 will be cross-checked against the values on ETNs. In case of discrepancies between measured power supply and that on ETNs the lower value will be taken into account for emission reductions calculation.

▪ **Electricity delivered from the grid to the project (ED_y or electricity received by the project):**

As M1 and M2 are bidirectional the electricity received by the project activity from the grid through the main power line will be measured continuously by the project entity with M1 and M2. ED_y will also be monthly recorded.

Besides, as indicated in Figure B.4 the project is connected by one back-up emergency power line (indicated in dark yellow line) which will deliver power from the grid to the project in case of emergencies or when the turbines of the proposed project activity are not in operation. This back-up line may be dismantled in the future as the electricity can be delivered from the grid through main power lines. The metering instrument M3 will measure continuously the power received by the project activity from the grid via the back-up power line and the measurement results of M3 will be recorded monthly. Calibrations of M3 will be carried out annually by the grid company or by a certified entity.

The grid company will issue ETNs (or statements if applicable) each month where ED_y via main power line as well as back-up power line is settled. The measurement results of power received through M1, M2 and M3 recorded monthly by the project entity will be cross-checked against values on the ETNs (or other evidence provided by the grid company). In case of inconsistency the higher value will prevail and be used for the purpose of claiming emission reductions.

Both the metering instruments M1 and M2 have their back-up meter that measures electricity exchange following the same principle mentioned above. These back-up meters will be used for claiming emission reductions in case of emergencies¹⁸ or that M1 and M2 are non-functional. Calibrations of these back-up meters will be carried out periodically by the grid company or by a certified entity.

Installed capacity of the hydropower plant:

In addition to the above, the installed capacity of the hydropower plant will be monitored yearly. The project entity will annually prepare photographic evidence of the installed equipment on the basis of the nameplates, which will be in accordance with domestic and international standards.

▪ **Monitoring of reservoir surface area:**

The project entity will commission a qualified third party to conduct the measurement from topographical surveys and maps. A measurement report will be issued by this qualified party and

¹⁸ Emergencies are defined here as “conditions under which the project entity has not been able to monitor due to unexpected accidents”.

will be available for verification. The surface area will be calculated using the design schematics and area maps.

▪ **Reporting, archiving and preparation for periodic verification:**

The project entity will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. The project entity will ensure that all required documentation is made available to the verifier. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

The project entity will collect internal records, the ETNs for power supplied to the grid and for power received from the grid as evidence. The net supply (i.e. gross supply minus supply by the grid to the project) will be used in the calculations. In case of discrepancies between the measurements results of M1, M2 and M3 and values on ETNs the conservative values will prevail. All records of generation, power delivered to the grid, ETNs and the results of calibration will be collated in a central place by the project entity.

An overview of detailed information on minimum accuracy requirements of the metering instruments, measuring intervals, recording form, calibration and available documentation is provided in Table B.12.

Determination of net power supply:

Net electricity supplied to the grid by the project (EG_y in section B.7.1.) is calculated on a monthly basis as:

$$EG_y = ES_y - ED_y$$

With:

- ES_y , electricity supplied by the Project through the main power line (in MWh) measured by project entity and cross-checked against ETNs. In case of inconsistencies between project entity measurement results and ETNs the lower values will prevail.
- ED_y , electricity delivered to the Project through main power line as well as back-up power line measured by the project entity cross-checked against ETNs (or grid statement). In case of discrepancies between project entity measurement results and ETNs the higher value will be used for emission reductions calculation.

Table B.12 Details of metering instruments

Meter	Operated by	Electronic measurement	Recording	Calibration	Accuracy	Documentation
M 1	Project entity	Continuous	Monthly	Annual calibration conducted by a certified company	Accuracy Class 0.2S	Plant log books cross checked against ETNs or statements
M 2	Project entity	Continuous	Monthly			
M 3	Project entity	Continuous	Monthly			

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

Damages to metering equipment:



In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the proposed project activity according to the following procedure:

1. In case metering equipment is damaged:

If the metering instrument(s) M1 or M2 is non-functional, the project entity will use readings from the backup metering instrument(s) onsite to cross-check that is installed against ETNs and the conservative value between the two will be used for emission reductions calculation.

In the unlikely event that both metering instrument(s) are damaged, the electricity supplied to the grid or electricity delivered from the grid to the project activity that is recorded by the grid company, or may be evidenced by the ETNs, will be used for the days for which no record could be recorded.

The project entity will furthermore document all efforts taken to restore normal monitoring procedures.

Emergencies:

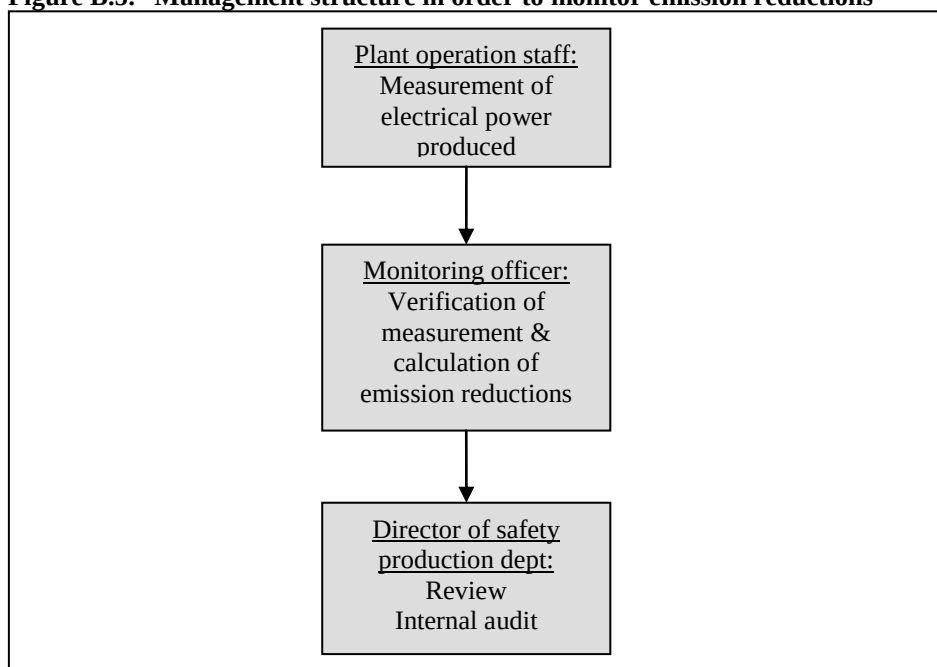
In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.5. The director of the Safety Production department will hold the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant operation staff.

The project owner will appoint a monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the hydropower plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the hydropower station including operating periods, power generation, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by the director of the Safety Production department.

**Figure B.5. Management structure in order to monitor emission reductions****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 of the baseline study and monitoring methodology: 20/07/2010

Name of persons determining the baseline study and the monitoring methodology:

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Gansu Tonghe Investment Project Consulting and Caspervandertak Consulting are not project participants.

**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:**

14/12/2005

This was the date when the turnkey contract was signed.

C.1.2. 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**

A renewable crediting period will be used.

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

01/01/2011, or the date of registration, whichever is later.

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

Not applicable

C.2.2.2. Length:

Not applicable

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

An Environmental Impact Assessment (EIA) was carried out by the Chongqing Research & Design Institute of Sino-Coal International Engineering Group and was approved by Chongqing Municipality Environment Protection Bureau on November 7th 2005. A summary of the main findings of the EIA is provided below.

SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT**Main positive impacts of the project**

The Youchou hydropower project will have the following impacts: The sustainability of power generation of the Central China Grid, the reduction local power shortage, as well as environmental and social benefits and employment opportunities. In the longer term, the project will increase local financial revenues and promote local economic development while at the same time stimulating the development of several industries including the building materials industry, construction industry. The project will generate electricity from renewable energy and replace the common use of coal-fired thermal power which will significantly reduce the air pollution. The project will be beneficial to the environment and sustainable economic development in the surrounding area, developing transportation and communication conditions. Besides, the construction and layout of a new residential area as well as infrastructure will be improved compared to the current situation.

Main negative impacts of the project*1) Impact on social environment*

The construction of the Youchou Reservoir will reduce the total farmland of Youyang County, thus reducing the production of grains and agriculture income during a period of transition.

2) Environment impact caused by resettlement

In the process of resettlement, no pollution of surface water, deforestation and/or land reclamation is allowed. In order to sustain the current forest coverage rate a comprehensive area plan will be developed covering the local mountains, water bodies, forest, farmland and roads of the resettlement area.

The construction of the reservoir will improve the conditions for treatment solution of domestic sewage and waste compared to the original reservoir.

Domestic waste produced by Daxi township, Wufu township and other centralized resettlement areas in the reservoir area will be treated in accordance with domestic landfill site standards and combined with the clean up activities of the reservoir.

On the basis of an analysis of the capacity of the land to sustain tourism development, development of the secondary and tertiary industries, it is concluded that it is feasible for the displaced people to retreat to areas that are located higher in the mountains. The construction of the Youchou Hydropower Station will improve the transport conditions and will contribute towards the development of tourism in the areas surrounding the reservoir area. This will provide opportunities to increase displaced people's income. At the same time, the natural resources in the reservoir area will be developed and transportation, communication, electric power and water resource conditions will be improved greatly. This will lead to an accelerated development of second and tertiary industry and thus provide new channels for employment of displaced people.



In general, the construction of the Youchou Reservoir will improve the displaced people's living quality.

3) *Soil and water loss*

The construction of the Youchou Hydropower Station will occupy and disturb a total area of 621.06 hm². Additional soil and water losses during the construction period and operation period amount to 22,500 ton while soil and water losses caused by waste slag amount to 252,400 ton. The total soil and water losses as a result of the project amount to 274,900 ton.

For the soil and water losses caused by project construction several preventive structures will be constructed including drainage ditches, a debris retaining dam and sedimentation tanks as well as other measures including shortening the unprotected slag stacking period and greening of the area. The additional cost for the prevention of water and soil losses amounts to 7,808,800RMB.

Environmental management and monitoring

The construction company should strengthen the environmental management activities and set up an environment protection department. This department should be equipped with professional environmental protection staff which shall manage environmental protection activities works and execute the monitoring plan for the construction and operation phases.

In order to control the environmental pollution, assess the impact on the ecological environment and properly mitigate this impact in the construction area and the rest of the Youshui River Basin, the environmental monitoring must be executed in accordance with environment monitoring plan in the Report on Environmental Quality in the Construction and Operation Period. The monitoring shall be executed by firms with the proper competence in this field.

Economic loss analysis of environmental impacts

The expenses for environment protection measures amount to 24,562,212 RMB (which includes soil / water conservation and protection of the forest) and form 2.64% of the total project investment.

Summarizing, Youchou Hydropower Project forms part of the hydropower cascade development plan for Youshui River. The construction of the project will make full use of the available hydropower resources of Youshui River and will improve the efficient use of the water resources by projects located downstream. The project constitutes a high quality hydropower addition and a peak demand power source to the Chongqing Grid. The project will benefit the development of Youyang County and therefore has a favourable social and economic impact. Upon completion of the Youchou Hydropower Station and with all environmental protection and pollution treatment measures properly executed, the project will have a limited impact to the local ecological environment and environmental quality of the Youshui River Basin. Therefore, the project is acceptable from the perspective of environmental protection.

Recommendations

During the construction of the project, the project entity should take environmental protection into consideration in the bidding proposals for construction activities. Furthermore, environmental protection supervision should be strengthened and the utmost should be done to carry out the environment protection measures and reduction of ecological environment impacts.

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 environmental impacts of the project are not considered significant by the Chinese government and the project participants. The Environmental Impact Assessment (EIA) was approved by the Chongqing Municipality Environmental Protection Bureau.

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

The project entity carried out a separate stakeholder consultation to confirm the impacts of the project on the relevant stakeholders. The consultation lasted for one month, from March 18th to April 20th 2008, and consisted of the following elements:

- **Distribution of questionnaires to local residents**

The seventeen villages impacted by the project were subject to an opinion poll, conducted in the form of a questionnaire distributed. A total of 422 questionnaires (418 collected) were distributed to local residents, including 82 questionnaires (79 collected) during the consultation meeting described below and 340 questionnaires (339 collected) directly in the villagers. The main findings are available in section E.2, table E.2.

- **Organization of a stakeholder consultation meeting near project site:**

Date / time: February 27th 2008, from 9:00 to 11:30.

Location: Youchou Township Government meeting hall

Agenda of the meeting:

- Opening of the meeting
- Introduction of the project
- Introduction of the Clean Development Mechanism
- Explanation of the stakeholder consultation process
- Round of comments by each participant
- Further questions and answers
- Closing of the meeting

To ensure wide participation of stakeholders, announcements of the stakeholder consultation meeting and website were made through the following channels:

- Newspaper announcement on February 19th, 2008, in the Youyang News
- Online announcement on the Youyang News Site: www.yybwl.com on February 19th, 2008.
- Bill postings in every village impacted by the project

In addition to the above announcements, important stakeholders received personal invitations to attend the meeting. See for attendance of the meeting Table E.1. A report of the main comments and outcomes of the meeting is provided in section E.2.

Table E.1. List of stakeholders that attended the stakeholder consultation meeting

No.	Organization	Participant
1	Environment protection bureau of Youyang County	Yang Xinyuan
2	Water resource bureau of Youyang County	Tian Fangli
3	Land resource and real estate bureau of Youyang county	Li Shifu
4	Resettlement Bureau of Youyang county	Huang Yiqun
5	Resettlement Bureau of Youchou hydro power station	Weng Qin
6	Resettlement Bureau of Youchou hydro power station	Chen Tuyong
7	Resettlement Bureau of Youchou hydro power station	Zhang Jiecheng
8	Local government of Youchou town	Luo Junxun



9	Local government of Daxi town	Li Maohong
10	Local government of Daxi town	Xie Zhenwen
11	Local government of Pianbai town	Tian Huaqiang
12	Local government of Wufu town	Ran Chengjun
13	Local government of Keda town	Luo Jinjie
14	Local government of Keda town	Tian Gongli
15	Xikou village	Tian Renduo
16	Xikou village	Tian Renyou
17	Xikou village	Peng Lanying
18	Xikou village	Bai Changke
19	Jiangxi Village	Li Shuhui
20	Jiangxi Village	Li Shuyuan
21	Jiangxi Village	Li Dexiang
22	Jiangxi Village	Song Wuquan
23	Daxi village	Huang Fujiang
24	Daxi village	Xiao Hebai
25	Daxi village	Xing Yuangao
26	Daxi village	Bai Guihua
27	Changling village	Peng Shiguo
28	Changling village	Peng Shicheng
29	Changling village	Xiao Lishang
30	Changling village	Yang Zaixing
31	Jinxian village	Tian Guoyin
32	Jinxian	Tian Yingquan
33	Jinxian	Tian Qingyu
34	Jinxian village	Wu Jide
35	Chadian village	Li Shixian
36	Chadian village	Li Wenyou
37	Chadian	Zhou Mingwu
38	Chadian	Liu Hongwan
39	Shidi village	Zhang Tinggui
40	Shidi village	Tian Fangzhi
41	Shidi village	Lei Shiyong
42	Shidi village	Li Shiquan
43	Erping village	Chen Changhua
44	Erping	Tian Yongguo
45	Erping	Wang Xuefu
46	Erping	Huand Ningshu
47	Shanling village	Ran Guohua
48	Shanling village	Peng Xiangao
49	Shanling village	Long Zongbao
50	Shanling village	Huang Lianmu
51	Hetao village	Zhang Wei
52	Hetao village	Zhai Zixuan
53	Hetao village	Zhang Yao
54	Hetao village	Zhang Yixiong
55	Wufu village	Tian Ying
56	Wufu village	Zhang Anxiang
57	Wufu village	Zhang Xiuhe
58	Wufu village	Xiong Liangfu
59	Longsha village	Luo Jinguo



60	Longsha village	Peng Wenfu
61	Longsha village	Xiang Shiguo
62	Longsha village	Luo Songbo
63	Zhaojia village	Lin Yiju
64	Zhaojia village	Zhang Zhihua
65	Zhaojia village	Wang Shichun
66	Zhaojia village	Tian Yingshou
67	Dahe village	Peng Mingqing
68	Dahe village	Peng Shijin
69	Dahe village	He Wangfen
70	Dahe village	Peng Fanzhi
71	Wujia village	Chen Yuanfeng
72	Wujia village	Peng Jianguo
73	Wujia village	Zhang Zhixue
74	Wujia village	Peng Changjun
75	Zhongba village	Tian Yibei
76	Zhongba village	Luo Bifu
77	Zhongba village	He Shunmin
78	Zhongba village	Liu Rangjie
79	Chengxiang village	Song Jiawang
80	Chengxiang village	Song wenhou
81	Chengxiang village	Xiang Mingcai
82	Chengxiang village	Song Jiakai

E.2. Summary of the comments received:**Comments and opinions received at stakeholder consultation meeting:**

Each attendant of the stakeholder consultation meeting expressed his or her opinion on the proposed project. During the meeting many stakeholders asked general questions about the CDM procedures, these comments were omitted from the comments stated below.

The project entity was represented by Chongqing Youshui Hydropower Development Co Ltd.

- Mr. Fan Hu (Director)
- Mr. Qin Lin (General Manager)

An overview of the main comments/questions expressed during the meeting:

Name: Yang Xinyuan

Position / Affiliation: Environment Protection Bureau, Youyang County

Comments:

Mr. Yang explains that the Youchou station will not create air pollution after operation and that hydropower has a lot of advantages compared to coal based electricity generation. The project will also contribute to reduce greenhouse gas emissions. He adds that environmental impacts monitoring measures will be executed on a monthly basis, in accordance with the requirements of the EIA report.

Name: Huang Yiqun

Position / Affiliation: Resettlement Bureau, Youyang County

Comments:



Mr. Huang says that the project will contribute to a sustainable development while making full use of water resources in the area. He confirms that local regulations on resettlement have been enforced.

Name: Weng Qin
Position / Affiliation: Resettlement Bureau of Youchou hydropower station

Comments:

Mr. Qin mentions that the project development abides by National Laws on resettlements. The Youyang County Government ensures the interests of relocated residents are protected. In addition, effective measures are enforced to preserve farmland whenever possible. Fish breeding activities will be developed. The project also contributes to alleviate local power shortage. Finally, Mr. Qin gives supplementary explanation that land expropriation and compensation work is complete and that 70% affected population has been relocated. He estimates the whole process will be finished by August 2008, before operationalization of the station.

Name: Tian Fangli
Position / Affiliation: Water resources bureau, Youyang County

Mr. Tian states that renewable energy projects such as hydropower are supported by the Government.

Name: Luo Junxun
Position / Affiliation: Youchou Township Government

Comments:

For Mr. Luo, the project contributes to local economic development, improves infrastructure and also creates employment opportunities for local residents.

Mr. Fan Hu, from the project entity, adds that about 1,000 local residents are employed during construction.

Name: Tian Huaqiang
Position / Affiliation: Pianbai Township Government

Comments:

Mr. Tian brings forward that living conditions of relocated residents will improve due to the project.

Name: Bai Changke
Position / Affiliation: Spokesperson for Xikou village

Comments:

Mr. Bai supports the construction of the Youchou station as employment opportunities will contribute to increase incomes.

Name: Song Wuquan
Position / Affiliation: Spokesperson for Jiangkou village

Comments:

Mr. Song explains that the project turns a natural resource into an economic resource. Jiangkou village supports the Youchou project.

Name: Tian Yingquan
Position / Affiliation: Jinxian village

Comments:

Mr. Tian explains that local residents are satisfied with the compensation for relocation and land expropriation. The new houses are of better quality than the old ones.



Name: Peng Jianguo

Position / Affiliation: Spokesperson for Wujia village

Comments:

Mr. Peng expresses Wujia village's support to the project as it brings convenience regarding transportation.

Results of the opinion poll in impacted villages:

The survey clearly showed that local residents approve the construction of the project and expect that the operationalization of the Youchou hydropower station will bring additional benefits and contribute to the development of Youyang County.

Table E.2. Main findings of the questionnaire

Impacts of Youchou hydropower station		Number of people investigated	% people who agree with the statement
Land expropriation	Compensation for relocation abides by the Law	75	98.67
	Relocation process is satisfactory	408	100
	Relocation process is not satisfactory	408	0
	Compensation for expropriated land abides by the Law	74	98.65`
	Compensation for expropriation is satisfactory	413	100
	Compensation for expropriation is not satisfactory	413	0
Economy	Promote local economic development	411	100
	Help develop livestock breeding	411	99.2
	Without negative impacts	407	99.75
	With negative impacts	401	0.25
	Employment opportunities	412	100
Society	Increase local income	412	98.09
	Improve stability of electric power	412	97.13
	Improve communications (boats, dam)	412	95.93
	Without negative impacts	407	99.75
	With negative impacts	407	0.25
Environment	Replace the use of wood in daily life	412	100
	No discharge of pollutants	412	97.59
	Without negative impacts	392	100
	With negative impacts	392	0
Water	Facilitate water fetching	405	100
	Improve irrigation	405	99.75
	Without negative impacts	403	100
	With negative impacts	403	0
Daily life	With positive impacts	417	99.52
	With negative impacts	417	0.24
	Make no difference	417	0.24
General opinion	Support the project	414	100
	Against the project	414	0

Furthermore, the stakeholder consultation results were summarized in Environment Impact assessment. The local residents approve the construction of the project and consider the Youchou hydropower station will promote the economy development.

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



Given the generally positive nature of the comments received, no further measures are considered necessary.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY****The Project Entity:**

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**The Purchasing Party:**

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Represented by:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project does not receive any public funding from Annex I countries.

Annex 3

BASELINE INFORMATION

Our baseline calculation follows the methodology used in the OM and BM emission factors baseline calculation published by the Office of National Coordination Committee on Climate Change in 2nd July, 2009. Full information on the calculation of the baseline and underlying data can be found at:

http://qhs.ndrc.gov.cn/qjzjz/t20090703_289357.htm

Below we provide the main data used in the calculation of the baseline emission factor.

Table A1. Calculation of the Combined Margin Emission Factor

	Emission factor	Value and Source	Weight	Weighted value
	A	B	C	D = B * C
1	EF _{OM}	1.1255	0.5	0.56276
		Table A2		
2	EF _{BM}	0.5802	0.5	0.29008
		Table A10, C		
3	CM			0.85285
				D1 + D2

Table A2. Calculation of the Operating Margin Emission Factor

	Variable	2007	2006	2005	Total
		A	B	C	D
1	Supply of thermal power to Central China grid (MWh)	377,233,680	334,027,226	286,203,305	997,464,211
		Table A3c, C7	Table A3b, C7	Table A3a, C7	D1 = A1 + B1 + C1
2	Imports of power from other grids (MWh)	3,005,400	3,028,950	0	6034350
		Files cited above	Files cited above	Files cited above	D2 = A2 + B2 + C2
3	Total power supply for calculation EF _{OM} (MWh)	380,239,080	337,056,176	286,203,305	1,003,498,561
		A3 = A1 + A2	B3 = B1 + B2	C3 = C1 + C2	D3 = D1 + D2
4	CO2 emissions associated with thermal power generation on Central China grid (tCO2)	415,974,066	375,028,077	332,420,496	1,123,422,640
		Table A4c, E	Table A4b, E	Table A4a, E	D4 = A4 + B4 + C4
5	CO2 emissions associated with power imports from other grids (tCO2)	3,039,328	3,003,157	0	6042485.897
		Table A5	Table A5		D5 = A5 + B5 + C5
6	Total CO2 emissions for calculation EF _{OM} (tCO2)	419,013,395	378,031,235	332,420,496	1,129,465,125
		A6 = A4 + A5	B6 = B4 + B5	C6 = C4 + C5	D6 = D4 + D5
7	EFOM (tCO2/MWh)	1.10197	1.12157	1.16148	1.12553
		A6 / A3	B6 / B3	C6 / C3	D6 / D3

**Table A3a. Calculation of thermal power supply to Central China Grid, 2005.**

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Jiangxi	30,000,000	6.48	28,056,000
2	Henan	131,590,000	7.32	121,957,612
3	Hubei	47,700,000	2.51	46,502,730
4	Hunan	39,900,000	5.00	37,905,000
5	Chongqing	17,584,000	8.05	16,168,488
6	Sichuan	37,202,000	4.27	35,613,475
7	Central China			286,203,305
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Data are from China Electric Power Yearbook 2006, p. 559-560, 568.

Table A3b. Calculation of thermal power supply to Central China Grid, 2006

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Jiangxi	34,449,000	6.17	32,323,497
2	Henan	151,235,000	7.06	140,557,809
3	Hubei	54,841,000	2.75	53,332,873
4	Hunan	46,408,000	4.95	44,110,804
5	Chongqing	23,487,000	8.45	21,502,349
6	Sichuan	44,193,000	4.51	42,199,896
7	Central China			334,027,226
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2007, p. 639. China Energy Statistics Book 2007.p42.

Table A3c. Calculation of thermal power supply to Central China Grid, 2007

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Jiangxi	42,100,000	7.72	38,849,880
2	Henan	177,300,000	7.55	163,913,850
3	Hubei	60,900,000	6.69	56,825,790
4	Hunan	54,200,000	7.18	50,308,440
5	Chongqing	28,800,000	9.2	26,150,400
6	Sichuan	45,100,000	8.68	41,185,320
7	Central China	408,400,000		377,233,680
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2008, p. 733-734



Table A4a. Calculation of CO2 emissions from fuels for thermal power production, Central China Grid, 2005.

Fuel	Unit	Jiangxi	Henan	Hubei	Sichuan	Hunan	Chongqing	Central	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								China Grid	(TJ/unit)	(Fraction)	(kgCO ₂ /TJ)	(tCO ₂)
								A	B	C	D	E = A*B*C*D/1000
Raw coal	10 ⁴ Tons	1,869.29	7,638.87	2,732.15	2,999.77	1,712.27	875.40	17,827.75	209.08	1	87,300	325,404,287.18
Clean coal	10 ⁴ Tons	0.02	0.00	0.00	0.00	0.00	0.00	0.02	263.44	1	87,300	459.97
Other washed coal	10 ⁴ Tons	0.00	138.12	0.00	0.00	0.00	89.99	228.11	83.63	1	87,300	1,665,408.07
Coke	10 ⁴ Tons	0.00	25.95	0.00	0.00	105.00	0.00	130.95	284.35	1	95,700	3,563,450.03
Coke oven gas	10 ⁸ m ³	0.00	0.00	1.15	0.00	0.00	0.36	1.51	1672.6	1	37,300	94,205.85
Other gas	10 ⁸ m ³	0.00	10.20	0.00	0.00	0.00	3.12	13.32	522.7	1	37,300	259,696.18
Crude oil	10 ⁴ Tons	0.00	0.82	0.36	0.00	0.00	0.00	1.18	418.16	1	71,100	35,082.79
Gasoline	10 ⁴ Tons	0.00	0.02	0.00	0.00	0.00	0.02	0.04	430.7	1	67,500	1,162.89
Diesel	10 ⁴ Tons	1.30	3.03	2.39	0.00	1.39	1.38	9.49	426.52	1	72,600	293,861.19
Fuel oil	10 ⁴ Tons	0.64	0.29	3.15	2.22	1.68	0.89	8.87	418.16	1	75,500	280,035.48
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	501.79	1	61,600	0.00
Refinery gas	10 ⁴ Tons	0.71	3.41	1.76	0.00	0.78	0.00	6.66	460.55	1	48,200	147,842.08
Natural gas	10 ⁸ m ³	0.00	0.00	0.00	3.00	0.00	0.00	3.00	3893.1	1	54,300	634,185.99
Other petroleum products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	418.16	1	75,500	0.00
Other coking products	10 ⁴ Tons	0.00	0.00	0.00	0.00	1.50	0.00	1.50	284.35	1	95,700	40,818.44
Other E (standard coal)	10 ⁴ Tce	0.00	2.88	0.00	0.00	1.74	32.80	37.42	292.7	1	0	0.00
Total												332,420,496.13
Data source: Fuel consumption data are from China Energy Statistical Yearbook 2006. Net calorific values are from the China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors are IPCC default values , see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy). Fuel emission coefficients is the lower limit of 95% confidence interval to reflect uncertainty.												$\Sigma(E_i)$

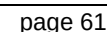


Table A4b. Calculation of CO2 emissions from fuels for thermal power production, Central China Grid, 2006.

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Sichuan	Chongqing	Central	NCV	Oxidation factor	Carbon coefficient	CO ₂ emissions
								China Grid	(TJ/unit)	(Fraction)	(kgCO ₂ /TJ)	(tCO ₂)
								A	B	C	D	E=A*B*C*D/1000
Raw coal	10 ⁴ Tons	1,926.02	8,098.01	3,179.79	2,454.48	3,285.22	1184.3	20,127.82	209.08	1	87,300	367,386,738.07
Clean coal	10 ⁴ Tons	0	0	0	0	0	5.79	5.79	263.44	1	87,300	133,160.23
Other washed coal	10 ⁴ Tons	4.51	104.12	0	8.59	0	79.21	196.43	83.63	1	87,300	1,434,115.59
Briquettes	10 ⁴ Tons	0	0	0	0	0.01	0	0.01	209.08	1	87,300	182.53
Coke	10 ⁴ Tons	0	17.23	0	0.32	0	0	17.55	284.35	1	95,700	477,575.78
Coke oven gas	10 ⁸ m ³	0	0.52	1.07	4.24	0.01	0.38	6.22	1672.6	1	37,300	388,053.24
Other gas	10 ⁸ m ³	12.69	3.95	0	1.7	0.01	4.36	22.71	522.7	1	37,300	442,770.28
Crude oil	10 ⁴ Tons	0	0.49	0	0	0	0	0.49	418.16	1	71,100	14,568.28
Gasoline	10 ⁴ Tons	0	0.01	0	0	0	0	0.01	430.7	1	67,500	290.72
Diesel	10 ⁴ Tons	0.91	2.23	1.41	1.78	0	0.96	7.29	426.52	1	72,600	225,737.42
Fuel oil	10 ⁴ Tons	0.51	1.26	1.31	0.8	3.49	0.57	7.94	418.16	1	75,500	250,674.38
LPG	10 ⁴ Tons	0	0	0	0	0	0	0.00	501.79	1	61,600	0.00
Refinery gas	10 ⁴ Tons	0.86	8.1	1	0.97	0	0	10.93	460.55	1	48,200	242,629.71
Natural gas	10 ⁸ m ³	0	0	0.28	0	18.63	0.16	19.07	3893.1	1	54,300	4,031,308.94
Other petroleum products	10 ⁴ Tons	0	0	0	0	0	0	0.00	418.16	1	75,500	0.00
Other coking products	10 ⁴ Tons	0	0	0	0	0.01	0	0.01	284.35	1	95,700	272.12
Other E (standard coal)	10 ⁴ Tce	17.45	37.36	31.55	18.29	0	29.35	134.00	292.7	1	0	0.00
Total												375,028,077.28

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2007, p.178-214. Net calorific values are from the China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy). Fuel emission coefficients is the lower limit of 95% confidence interval to reflect uncertainty.

Σ(E_i)

**Table A4c. Calculation of CO2 emissions from fuels for thermal power production, Central China Grid, 2007.**

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Central China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
									(TJ/unit)	(Fraction)	(kgCO2/TJ)	(tCO2)
									A	B	C	D
Raw coal	10 ⁴ Tons	1,863.80	6,948.50	2,510.50	2,197.90	875.5	2,747.90	17,144.10	209.08	1	87,300	410,829,403.68
Clean coal	10 ⁴ Tons	0	2.34	0	0	0	0	2.34	263.44	1	87,300	157,998.40
Other washed coal	10 ⁴ Tons	48.93	104.22	0	0	89.72	0	242.87	83.63	1	87,300	1,355,630.93
Briquettes	10 ⁴ Tons	0	0	0	0.92	0	0	0.92	209.08	1	87,300	182.53
Coke	10 ⁴ Tons	0	109.61	0	0	0	0	109.61	284.35	1	95,700	0.00
Coke oven gas	10 ⁸ m ³	0	0	1.68	0	0.34	0	2.02	1672.6	1	37,300	259,534.00
Other gas	10 ⁸ m ³	0	0	0	0	2.61	0	2.61	522.7	1	37,300	2,020,444.06
Crude oil	10 ⁴ Tons	0	0.86	0.22	0	0	0	1.08	418.16	1	71,100	12,784.41
Gasoline	10 ⁴ Tons	0	0.06	0	0	0.01	0	0.07	430.7	1	67,500	1,453.61
Diesel	10 ⁴ Tons	0.02	3.86	1.7	1.72	1.14	0	8.44	426.52	1	72,600	354,862.93
Fuel oil	10 ⁴ Tons	1.09	0.19	9.55	1.38	0.48	1.68	14.37	418.16	1	75,500	189,742.19
LPG	10 ⁴ Tons	0	0	0	0	0	0	0.00	501.79	1	61,600	0.00
Refinery gas	10 ⁴ Tons	3.52	2.27	0	0	0	0	5.79	460.55	1	48,200	291,022.47
Natural gas	10 ⁸ m ³	0	0	0	0	0	2.27	2.27	3893.1	1	54,300	501,006.93
Other petroleum products	10 ⁴ Tons	0	0	0	0	0	0	0.00	418.16	1	75,500	0.00
Other coking products	10 ⁴ Tons	0	0	0	0	0	0	0.00	284.35	1	95,700	0.00
Other E (standard coal)	10 ⁴ Tce	0	16.92	0	15.2	20.95	0	53.07	292.7	1	0	0.00
Total												415,974,066.13
												Σ(E _i)

Data source: Data source: Fuel consumption data are from China Energy Statistical Yearbook 2008, p.174-209. Net calorific values are from the China Energy Statistical Yearbook, 2008 p. 284; Oxidation factors are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy). Fuel emission coefficients is the lower limit of 95% confidence interval to reflect uncertainty.

**Table A5. Calculation of emissions associated with imports from North West Grid**

Year	Imports (MWh) A	Average emission factor (tCO ₂ /MWh) B	Associated CO ₂ emissions (tCO ₂) C = B * A
2006	3,028,950	0.820672818	2,485,777
2007	3,005,400	1.01129	3,039,328
		Table A6	Table A6

Note: the Central China Power Grid did not import electricity in 2004 and 2005

Table A6. Calculation of average emission factors of North West Power Grid

		2006	2007
1	Total power supply (MWh)	156,142,241	178,920,940
		Table A7	Table A8
2	Total CO ₂ Emissions (tCO ₂)	154,812,639	180,940,805
		Table A9a	Table A9b
3 = 2/1	Average emission Factor (tCO ₂ /MWh)	0.99148	1.01129

Table A7. Calculation of thermal power supply to North West Grid, 2006

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Shaanxi	54,482,000	6.97	50,684,605
2	Gansu	35,738,000	4.29	34,204,840
3	Qinghai	7,204,000	2.57	7,018,857
4	Ningxia	36,731,000	N.A.	36,731,000
5	Xinjiang	29,901,000	8.02	27,502,940
6	North West			156,142,241
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Original data are from China Electric Power Yearbook 2007, p. p. 559-560, 568.



Table A8. Calculation of total power supply to North West Grid, 2007

	Grid	Total Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Shaanxi	59,100,000	6.77	55,098,930
2	Gansu	42,400,000	5.89	39,902,640
3	Qinghai	9,700,000	7.19	9,002,570
4	Ningxia	43,500,000	0.00	43,500,000
5	Xinjiang	34,600,000	9.20	31,416,800
6	North West	214,201,000		178,920,940
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Original data are from China Electric Power Yearbook 2008, p. 733-734.

Table A9a. Calculation of CO2 emissions from fuels for thermal power production, North West Grid, 2006

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	North West China	NCV (TJ/unit)	Oxidation factor (Fraction)	Carbon coefficient (kg CO ₂ /TJ)	CO ₂ emissions (tCO ₂)
							A	B	C	D	E = A*B*C*D/1000
Raw coal	10 ⁴ Tons	2,834.44	1,660.92	421.86	1,833.72	1,547.69	8,298.63	209.08	1	87,300	151,472,271
Clean coal	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	263.44	1	87,300	0
Other washed coal	10 ⁴ Tons	0.00	0.00	0.00	112.70	8.45	121.15	83.63	1	87,300	884,504
Coke	10 ⁴ Tons	0.00	0.00	0.00	0.01	0.00	0.01	284.35	1	95,700	272
Coke oven gas	10 ⁸ m ³	0.20	0.00	0.00	0.00	0.08	0.28	1672.6	1	37,300	17,469
Other gas	10 ⁸ m ³	0.10	0.00	0.00	0.00	0.00	0.10	522.7	1	37,300	1,950
Crude oil	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.02	0.02	418.16	1	71,100	595
Gasoline	10 ⁴ Tons	0.01	0.00	0.00	0.00	0.00	0.01	430.7	1	67,500	291
Diesel	10 ⁴ Tons	1.14	0.24	0.61	0.00	1.25	3.24	426.52	1	72,600	100,328
Fuel oil	10 ⁴ Tons	0.00	0.60	0.00	0.00	0.11	0.71	418.16	1	75,500	22,415
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	501.79	1	61,600	0
Refinery gas	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	460.55	1	48,200	0
Natural gas	10 ⁸ m ³	1.59	0.56	1.06	0.00	7.49	10.70	3893.1	1	54,300	2,261,930
Other petroleum products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	418.16	1	75,500	0
Other coking products	10 ⁴ Tons	1.86	0.00	0.00	0.00	0.00	1.86	284.35	1	95,700	50,615
Other E (standard coal)	10 ⁴ Tce	33.57	8.81	0.00	0.00	2.20	44.58	292.7	1	0	0
Total											154,812,639
Data source: Fuel consumption data are from China Energy Statistical Yearbook 2006, p.126-246. Net calorific values are from the China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy											Σ(E _i)

Table A9b. Calculation of CO2 emissions from fuels for thermal power production, North West Grid, 2007

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	North West China	NCV (TJ/unit)	Oxidation factor (Fraction)	Carbon coefficient (kg CO ₂ /TJ)	CO ₂ emissions (tCO ₂)
							A	B	C	D	E = A*B*C*D/1000
Raw coal	10 ⁴ Tons	2,834.44	1,660.92	421.86	1,833.72	1,547.69	8,298.63	209.08	1	87,300	176,525,905
Clean coal	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	263.44	1	87,300	0
Other washed coal	10 ⁴ Tons	0.00	0.00	0.00	112.70	8.45	121.15	83.63	1	87,300	991,243
Coke	10 ⁴ Tons	0.00	0.00	0.00	0.01	0.00	0.01	284.35	1	95,700	64,432
Coke oven gas	10 ⁸ m ³	0.20	0.00	0.00	0.00	0.08	0.28	1672.6	1	37,300	0
Other gas	10 ⁸ m ³	0.10	0.00	0.00	0.00	0.00	0.10	522.7	1	37,300	89,215
Crude oil	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.02	0.02	418.16	1	71,100	289,526
Gasoline	10 ⁴ Tons	0.01	0.00	0.00	0.00	0.00	0.01	430.7	1	67,500	2,676
Diesel	10 ⁴ Tons	1.14	0.24	0.61	0.00	1.25	3.24	426.52	1	72,600	581
Fuel oil	10 ⁴ Tons	0.00	0.60	0.00	0.00	0.11	0.71	418.16	1	75,500	110,546
LPG	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	501.79	1	61,600	36,307
Refinery gas	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	460.55	1	48,200	0
Natural gas	10 ⁸ m ³	1.59	0.56	1.06	0.00	7.49	10.70	3893.1	1	54,300	132,969
Other petroleum products	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	418.16	1	75,500	2,697,404
Other coking products	10 ⁴ Tons	1.86	0.00	0.00	0.00	0.00	1.86	284.35	1	95,700	0
Other E (standard coal)	10 ⁴ Tce	33.57	8.81	0.00	0.00	2.20	44.58	292.7	1	0	0
Total											180,940,805
Data source: Fuel consumption data are from China Energy Statistical Yearbook 2008. Net calorific values are from the China Energy Statistical Yearbook, 2008 p. 284; Oxidation factors are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy). Fuel emission coefficients is the lower limit of 95% confidence interval to reflect uncertainty.											Σ(E _i)



Table A10. Calculation of the BM Emission Factor, Central China Grid

EF _{thermal} (tCO ₂ /MWh)	Share of thermal power in added capacity, 2006-2004	EF _{BM} (tCO ₂ /MWh)
A	B	C = A * B
0.82130	70.64%	0.5802
Table A11	Table A14	

Table A11. Calculation of EF thermal

		λ A	EF _{adv} B	EF _{thermal} calculation C = A * B
1	Coal	99.13%	0.82488189	0.8177
		Table A13	Table A12	
2	Gas	0.74%	0.39104	0.00289
		Table A13	Table A12	
3	Oil	0.13%	0.54371	0.00073
		Table A13	Table A12	
4	EF _{thermal}			0.82130

Table A12. Calculation of Emission factors of fuel using advanced technologies

Fuel	Efficiency (%) A	Carbon coefficient (kgCO ₂ /TJ) B	Oxidation factor C	EF _{adv} (tCO ₂ /MWh) D = (3.6/(A*1000000))*B*C
Coal	38.10%	87,300	1	0.8249
Gas	49.99%	54,300	1	0.3910
Oil	49.99%	75,500	1	0.5437

Source: Files downloaded and mentioned above.

**Table A13. Calculation of λ s for the calculation of the BM, Central China Grid.**

Fuel	Unit	Central	NCV	Total energy consumption	Oxidation factor	Carbon coefficient	CO2 emissions
		China Grid	(TJ/unit)	Central China	(Fraction)	(TC/TJ)	(tCO2)
		A	B	TJ	C	D	E = A*B*C*D/1000
Raw coal	10 ⁴ Tons	20,127.82	209.08	4,705,949.64	1	87,300	410,829,404
Clean coal	10 ⁴ Tons	5.79	263.44	1,809.83	1	87,300	157,998
Other washed coal	10 ⁴ Tons	196.43	83.63	15,528.42	1	87,300	1,355,631
Briquettes	10 ⁴ Tons	0.01	209.08	2.09	1	87,300	183
Coke	10 ⁴ Tons	17.55	284.35	0.00	1	95,700	0
Other coking products	10 ⁴ Tons	0.00	284.35	0.00	1		0
Coal, total				4,723,289.98			412,343,216
Coke oven gas	10 ⁸ m ³	6.22	1672.6	6,958.02	1		259,534
Other gas	10 ⁸ m ³	22.71	522.7	54,167.40	1	37,300	2,020,444
LPG	10 ⁴ Tons	0.00	501.79	0.00	1	37,300	0
Refinery gas	10 ⁴ Tons	10.93	460.55	6,037.81	1	61,600	291,022
Natural gas	10 ⁸ m ³	19.07	3893.1	9,226.65	1	48,200	501,007
Gas total				76,389.87	1	54,300	3,072,007
Crude oil	10 ⁴ Tons	0.49	418.16	179.81	1		12,784
Gasoline	10 ⁴ Tons	0.01	430.7	21.54	1	71,100	1,454
Diesel	10 ⁴ Tons	7.29	426.52	4,887.92	1	67,500	354,863
Fuel oil	10 ⁴ Tons	7.94	418.16	2,513.14	1	72,600	189,742
Other petroleum products	10 ⁴ Tons	0.00	418.16		1	75,500	0
Oil total				7,602.40			558,843
Total			1,809.83				415,974,066
							$\Sigma(E_i)$

Note: λ is calculated as the share of Coal, Gas respectively Oil in total CO₂ emissions.



Lambda	
Λ_{coal}	99.13%
Λ_{gas}	0.74%
Λ_{oil}	0.13%

Table A14. Calculation of the share of thermal power in recently added capacity

Installed capacity	2005 A	2006 B	2007 C	Capacity added in 2007-2005 D=C-A	Share in added capacity
Thermal (MW)	60,167.20	76,658.00	92,580.00	32,412.80	70.64%
Hydropower (MW)	48,205.20	52,518.00	61,650.00	13,444.80	29.30%
Nuclear (MW)	0.00	0.00	0.00	0.00	0.00%
Other (MW)	24.00	41.00	51.00	27.00	0.06%
Total (MW)	108,396.40	129,217.00	154,281.00	45,884.60	100.00%
Percentage of 2006 capacity	70.26%	83.75%	100.00%		

Source: China Electric Power Yearbook 2006-2008



Annex 4

MONITORING INFORMATION

Selection procedure:

The monitoring officer will be appointed by the general manager of Chongqing Youshui Hydropower Development Co. Ltd. The monitoring officer will be selected from among the senior technical or managerial staff.

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.
- **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 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.