

CHONGQING CHENGKOU COUNTY BASHAN HYDROPOWER STATION PROJECT

Document Prepared By Beijing Cronus Technology Consultancy Centre

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1 PROJECT DETAILS

1.2 Sectoral Scope and Project Type

The Project falls in the sectoral scope 1: energy industries (renewable-/non-renewable sources).
The Project is not a grouped project. The project is a newly built diversion type hydropower project with limited storage capacity.

1.3 Project Proponent

Chongqing Bashan Hydropower Development Co., Ltd (Project Owner)

Address: 54# Chenglan Road, Chengkou County, Chongqing Municipality, China, 405900

Tel: 86-235-9228222

Fax: 86-235-9226222

1.5 Project Start Date

19-06-2009, the date on which the project started commissioning.

1.6 Project Crediting Period

19-06-2009 to 30-06-2011, in total 742 days, covering 2 years and 12 days.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	
Large project	✓

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
2009 (19-06-2009 to 31-12-2009)	205,579
2010 (01-01-2010 to 31-12-2010)	382,839
2011 (01-01-2011 to 30-06-2011)	189,846
Total estimated ERs	778,264
Total number of crediting years	2.033
Average annual ERs	382,839

1.9 Project Location

The Project is located in Bashan town of Chengkou County, Chongqing Municipality, China. The GPS coordinates of dam are 32°06'11"N, 108° 27'44"E. The GPS coordinates of powerhouse are 32°06'12"N, 108° 26'20"E.

1.10 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is same as the baseline scenario as described below.

Electricity delivered by the project activity to the CCPG (Central China Power Grid) would have otherwise been generated in grid-connected fossil fuel based power plants resulting in Green House Gas (GHG) emissions in the absence of the project activity. The project activity therefore, by displacing relatively carbon intensive grid electricity (primary emission source with a Combined Margin Emission Factor of 0.85280 tCO₂/ MWh) with renewable hydroelectricity, reduces GHG emission that would have occurred in the baseline.

1.12 Ownership and Other Programs

1.12.1 Right of Use

The business license and operation license are evidences for right of use. The approval of EIA and PDR are evidences for legislative right. Besides, the purchasing contract of turbine generator and the power purchase agreement are the evidences for the ownership of the plant, equipment and process generating.

1.12.2 Emissions Trading Programs and Other Binding Limits

The project proponent choses a clear VCS crediting period from 19-06-2009 to 30-06-2011 which is not part of any emissions trading programs or any other binding limits. The CDM crediting period for this project is from 01-07-2011 to 30-06-2018.

1.12.3 Participation under Other GHG Programs

The Project has been registered as a CDM project in UNFCCC on 06-05-2011 with the crediting period from 01-07-2011 to 30-06-2018 and the registration number is 4750.

1.12.4 Other Forms of Environmental Credit

The project proponent chose a clear VCS crediting period from 19-06-2009 to 30-06-2011 which has not created another form of environmental credit.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

N.A.

Leakage Management

N.A.

Commercially Sensitive Information

N.A.

Further Information

N.A.

2 ANNEX 1– CDM PDD



PROJECT DESIGN DOCUMENT FORM (CDM PDD) – Version 03



CDM – Executive Board

page 1

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

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- C. Duration of the project activity / crediting period
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- Annex 1: Contact information on participants in the project activity
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan

**SECTION A. General description of project activity****A.1 Title of the project activity:**

Project title: Chongqing Chengkou County Bashan Hydropower Station Project

PDD Version: 6.0

Completion date PDD: 15/04/2011

Revision History:

Version 1.0: Submitted for host country approval

Version 2.0: Submitted for validation / global stakeholder comments

Version 3.0: Revised based on DOE's CARs & CLs

Version 4.0: Revised based on DOE's comments

Version 5.0: Revised based on DOE's comments

Version 6.0: Revised based on DOE's comments

A.2. Description of the project activity:

The Chongqing Chengkou County Bashan Hydropower Station Project (hereafter referred to "the project" or "project") involves the construction of a new hydro electric power project at the main stream of Ren River near Bashan town of Chengkou 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 hydropower station will have a total installed capacity of 140 MW with two sets of individual 70MW turbine / generator units and the total reservoir area at full capacity is 5,720,000 m² resulting in a power density of 24.5 W/m².

The project is a diversion type hydropower station which involves the construction of a 155 meters high rock-fill embankment dam with a concrete upper layer, including a water intake connected to a headrace tunnel of 2181.48 meters that lead the water into the power house downstream.

Average water flow at the project location is 44m³/s, while the water head available for power generation is 139 meters. The project is expected to operate for a total of 3,213 hours per year. The annual power generation is 449,820 MWh and expected net annual power supply to the grid is 448,920 MWh.

The scenario prior to the implementation of the project activity is continuation of the present situation i.e. electricity supplied from the grid, which is identical with the baseline scenario. Coal-fired power generation is currently the dominant power supply option within the Central China Power 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 382,839tCO₂e annually.

As the project is a new construction project, the baseline scenario is the same as the scenario prior to the start of the implementation of the project activity. The spatial boundary of the project involves the project and the power plants connected to the Central China Grid.



The project will be connected to the Chengkou 220 kV transformer station via an on-site transformer station. The Chengkou transformer is part of the Chongqing Municipality Power Grid, which belongs to the Central China Power Grid.

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)	Chongqing Bashan Hydropower Development Co., Ltd.	No
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:

Bashan town of Chengkou County

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

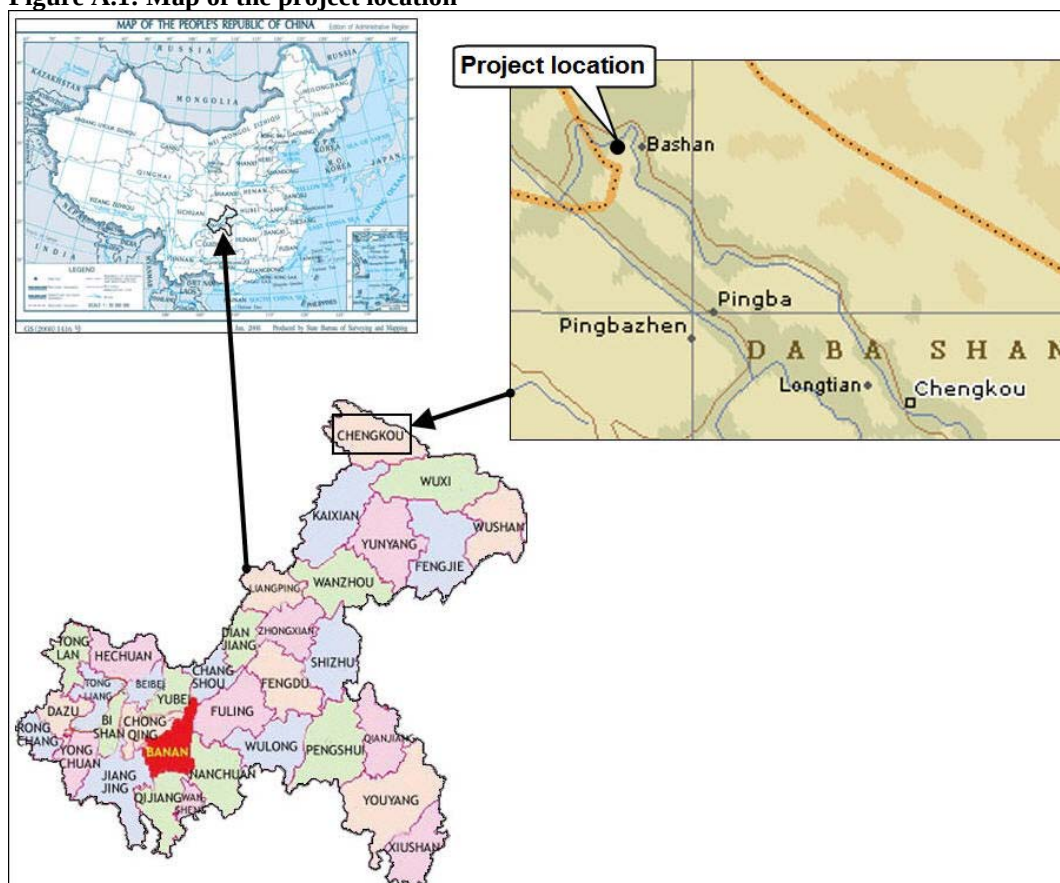
The Bashan hydropower station is located at the main stream of Ren River upstream of Bashan town of Chengkou County, Chongqing Municipality, China. It is 36 kilometers northwest of Chengkou County seat. The site location's approximate coordinates are:

Dam: east longitude of 108°27'44" and north latitude of 32°06'11"

Powerhouse: east longitude of 108°26'20" and north latitude of 32°06'12"

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 technology is standard hydropower technology sourced domestically and is appropriate for the development level of the region in which the project is located, so it does not relate to technology transfer.

The project is a new hydro-electric facility with a head of 139 meters with limited storage capacity. The



technology employed is a conventional diversion type design.

The structure consists of a dam with a maximum height of 155 meters including a water intake, headrace tunnel, surge shaft, two penstocks, powerhouse and tailrace.

The reservoir will have a total surface area of 5,720,000 m² at full capacity. The power density of the project is 24.5 W/m² (see section B.6.1 for the calculation).

The scenario prior to the start of 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 published by the designated Chinese authorities through the Electric Power Yearbook and the Energy yearly. By displacing coal-fired power generation with clean renewable energy, the project leads to the reduction of CO₂ emissions into the atmosphere. In accordance with the applied methodology, the greenhouse gases accounted for are CO₂ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the proposed project activity.

The project will be connected to Chengkou 220kV transformer station via an on-site step-up transformer and then to Chongqing Municipal Grid which is part of the Central China Grid.

This project generates electricity by using renewable hydropower and the energy transformation process, the proposed newly built equipment and system, the variables need to be monitored and the layout of the monitoring equipment of the project is shown in Figure B.1.

The choice of turbines for this project reflects the 139m water head nature of the project. The project installs two Francis turbine/generator sets with an individual capacity of 70MW. The units are manufactured by Chongqing Turbine Manufacture Co., Ltd.

Table A.2 Technical data of the turbine / generator units¹ (specifications are per unit)

Turbines	Type number	HLA855-LJ-255
	Main shaft arrangement	Vertical shaft
	Rated speed	333.3r/min
	Rated output	71.8MW
Generators	Type number	SF70-18/5700
	Rated power	70MW
	Rated voltage	10.5kV
	Power factor	0.85

Since the project is a newly constructed hydropower station, both turbines and generators are new and have a lifetime of at least 30 years. The load factor of the project is 36.68%.

The PLF is calculated as annual operational hours/8760hrs. The operational hours actually results from the ratio of the annual power generation and the installed capacity, while in the case of the proposed project activity, the power generation is calculated based on the 44 years hydrological data (1959-2002) by an independent qualified body in the FSR, which was approved by government authority on 5 January

¹ The specifications are based on equipment purchase contract.



2006. Therefore, we conclude that the PLF 36.68% (449,820MWh/140MW/8760hrs) is appropriate.

As a new construction project, the baseline scenario of the proposed project is the same as the scenario prior to the start of the implementation of the project activity. The spatial boundary of the proposed project involves the project itself and the power plants connected to the Central China Grid. Detailed information on the installed capacity and annual power generation of Central China Grid is in Annex 3.

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 of power generation within the Central China power Grid are provided in Table B.10, section B.6.1

Training and maintenance requirements:

The staff of the project activity will receive the appropriate training on the hydropower station operation and CDM before project commissioning.

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

A 7-year 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.3.

Table A.3 The estimation of the emission reductions in first crediting period

Year	The estimation of annual emission reductions (tCO₂e)
Year 1: 01/07/2011 – 30/06/2012	382,839
Year 2: 01/07/2012 – 30/06/2013	382,839
Year 3: 01/07/2013 – 30/06/2014	382,839
Year 4: 01/07/2014 – 30/06/2015	382,839
Year 5: 01/07/2015 – 30/06/2016	382,839
Year 6: 01/07/2016 – 30/06/2017	382,839
Year 7: 01/07/2017 – 30/06/2018	382,839
Total estimated reductions (tonnes of CO ₂ e)	2,679,873
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)	382,839

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:**

Approved consolidated baseline and monitoring methodology ACM0002 (Version 12.1.0): Consolidated baseline methodology for grid-connected electricity generation from renewable sources (approved on 58th CDM-EB conference)

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)
- Combined tool to identify the baseline scenario and demonstrate additionality (Version 02.2)
- 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 project involves the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant).
- The project activity is the installation of a hydro power plant.
- The project activity has a new reservoir with power density of 24.5W/m² which 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 12.1.0) 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.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table B.1 below.

**Table B.1 Emission sources included in or excluded from the project boundary**

	Source	Gas	Included?	Justification / explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project Activity	For hydro power plants, emissions of CH ₄ from the reservoir	CO ₂	No	Minor emission source
		CH ₄	No	Main emission source. Since the power density of the project activity is 24.5m ² /W, greater than 10m ² /W, the CH ₄ emissions can be ignored, equaling to zero.
		N ₂ O	No	Minor emission source

In line with the methodology, the greenhouse gases 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 electricity system should be based on the following considerations:

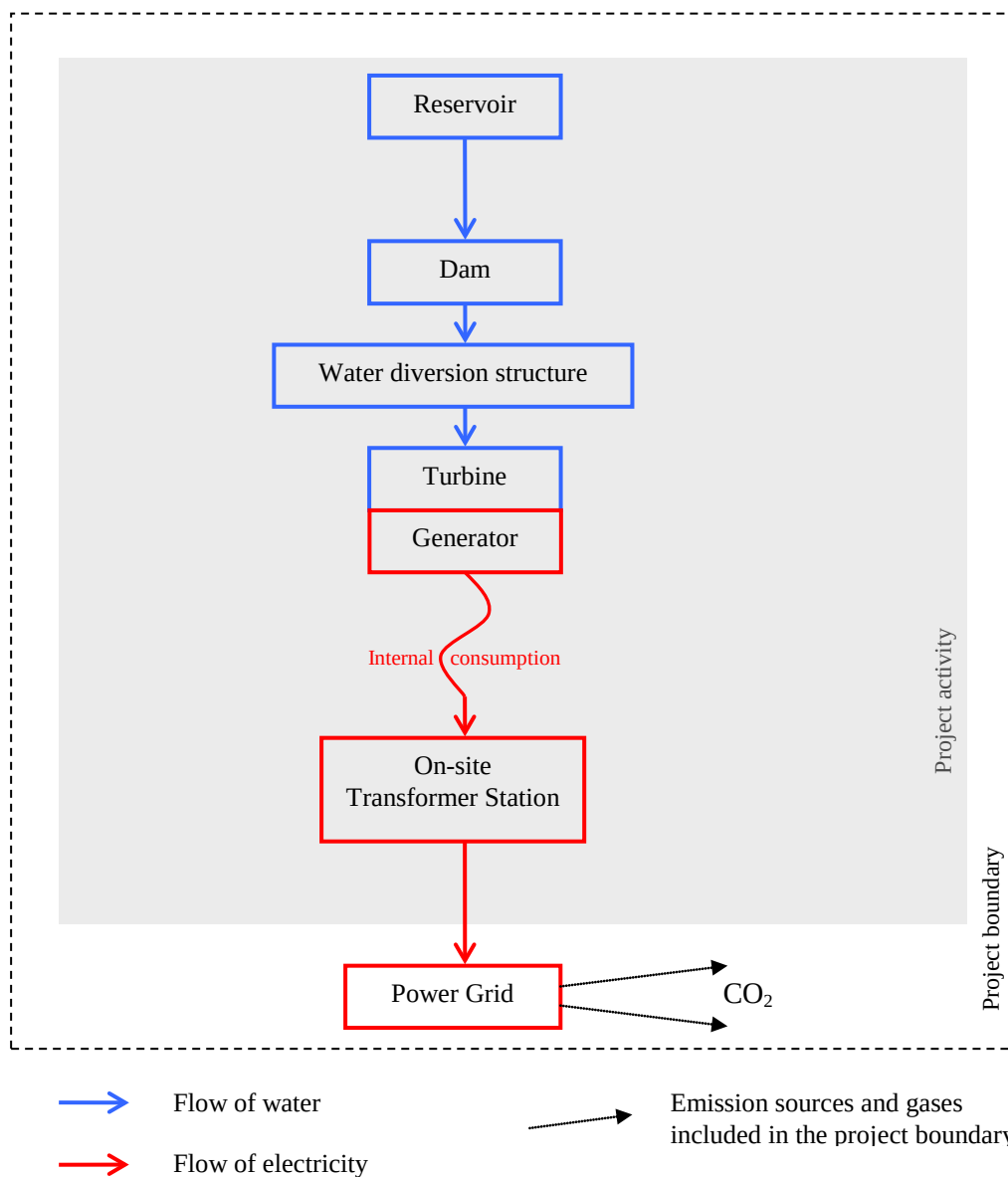
1. Use the delineation of the project electricity system and connected electricity system as provided by the DNA of the host country if available; or
2. Use, where DNA guidance is not available and the electricity system does not have spot markets for electricity or where it is impossible to determine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

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

In accordance with the above, the regional grid, as delineated by the Chinese DNA 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 Municipal Grid, which is part of the Central China Power Grid. Therefore, the Central China Power Grid is selected as the project electricity system. The Central China Power Grid includes provincial or municipal grids 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 Chengkou County Bashan 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

The methodology requires a number of sub-steps to provide realistic and credible alternatives to the project activity.

Sub-step 1a: Define 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 or other renewable energies
- Scenario 3: The proposed hydropower activity, without the support of CDM
- Scenario 4: The same service of power supply 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 Power Grid, both coal-fired power generation and hydropower are common options. In 2007, coal-fired power accounted for 64.5% of total installed capacity and hydropower accounted for 35.4% of total installed capacity.²

The diffusion of alternative renewable energies, such as wind or solar power, is negligible in greater part of the Central China Grid, due to ill-suited meteorological and topographical conditions.

Installed capacity of different power sources in Central China Grid from 2005 to 2006 are shown in Table B.2, from which we can see that only in 2007, 10MW wind power turbines were installed and up to 2007, only a total of 41MW of generators with other sources had been installed. So it's almost impossible to construct a power plant with same capacity from wind power or other renewable energy. Therefore, **Scenario 2 is excluded.**

Table B.2 Installed capacity of different power sources in Central China Grid (2005, 2006 and 2007)

<i>Year</i>	<i>Hydropower</i>	<i>Thermal power</i>	<i>Nuclear power</i>	<i>Wind power</i>	<i>Others</i>
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² China Electrical Power Yearbook 2008, page 733



2007	61,650MW	92,580MW	0	10MW	41MW
2006	52,519MW	76,658MW	0	0	41MW
2005	48,205MW	60,167MW	0	0	24MW

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

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

The second sub-step involves the confrontation of the alternatives with China's applicable laws and regulations. Since the annual utilization hours of a fossil fuel power plant is far higher than that of a hydropower project, therefore, the installed capacity should be below 140MW when a fossil fuel power plant with the same amount of annual electricity generation as the Project Activity is constructed. According to "Guidance on Industrial Structural Adjustment"³, that the construction of a conventional fossil fuel power unit with a single capacity below 300MW is restricted except for the regions of Tibet, Xinjiang and Hainan where connection to the larger power grid is not available. Therefore, **Scenario 1** is not in line with the national rule and therefore can be 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.

Further, in Step 2 we will demonstrate that the project activity without CDM support (Scenario 3) is not a financial feasible alternative.

Conclusion: We conclude that the only credible alternative to the project activity is **Scenario 4**.

Step 2. Investment analysis

Sub-step 2a: Determine appropriate analysis method

The analysis will be conducted 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 project entity is not considering investing in the construction of one of the other identified alternatives.
- 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.

Conclusion: We conclude that option III is applicable to the project activity.

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

³ Published by National Development and Reform Committee in 2005
http://www.ndrc.gov.cn/zcfb/zcfbl/zcfbl2005/t20051222_54304.htm

The project faces a barrier to implementation due to the poor returns on investment. To illustrate this, we performed a benchmark analysis in which calculate the Internal Rate of Return (IRR) of the project and compare the result with the benchmark set in the Feasibility Study of the Bashan Project at 8% which is also in accordance with the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*⁴. This benchmark IRR is defined as a project IRR based on cash in- and outflows only, and does not take into account the source of financing except for the determination of the income taxes.

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.3, which reflect the actual situation of the project.

Table B.3 Parameters used in the calculation of the IRR after tax

Proposed project		
<i>Parameters</i>	<i>Data</i>	<i>Source</i>
Installed capacity	140 MW	Feasibility Study Report
Static total investment	1,119,294,400 RMB	Feasibility Study Report
Annual power supply	448,920,000 kWh	Feasibility Study Report
Annual O & M Cost	23,270,000 RMB (for the first 10 operational years) 22,290,000 RMB (from the 11 th operational year till the end)	Feasibility Study Report
Investment horizon	35 years (5 years construction)	Feasibility Study Report
Power price (incl. VAT)	0.284 RMB/kWh	Actual highest price at the time of investment decision
VAT	17%	Feasibility Study Report
Income tax rate	33%	Feasibility Study Report
Urban construction and maintain fees	1%	Feasibility Study Report
Educational surtax	3%	Feasibility Study Report
Loan interest rate	6.12%	Feasibility Study Report
Depreciation rate	4.5%	Feasibility Study Report
Residual rate	5%	Highest value regulated by local accounting system
Expected CER price	8 EUR /tCO ₂ e	Market price

The investment analysis compares the internal rate of return (IRR) after tax of the project with the benchmark defined in sub-step 2b. The main results of the investment analysis are presented in Table B.4, where the IRR for the proposed project has been calculated with and without CDM revenues.

Table B.4 Main results of the IRR calculations

Scenario	IRR
Project without revenues from the sale of CERs	5.26%
Project with CER revenues	8.13%

⁴ 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 exists.



Without the revenues from the sale of CERs, the IRR is 5.26%, below the benchmark of 8%. With the revenues from the sale of CERs, the IRR exceeds 8%. From the results in Table B.4 it is clear that the return on investment for the Chongqing Chengkou County Bashan 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 revenues from CDM, through the sale of CERs, are necessary to make the project attractive. The detailed spreadsheet calculations are available to the validator.

The suitability of input values:*- Static total investment:*

The Feasibility Study report of the project was designed by East China Investigation and Design Institute under China Hydropower Engineering Consulting Group Corporation. All data used in IRR calculation are from the FSR which were prepared based on the *Economic Evaluation Method and Parameters for Project Construction*, the *Interim provisions concerning hydropower construction project financial assessment*, and the applicable national taxation regulations at the time, and approved by the Chongqing Municipality Development and Reform Commission on January 5, 2006.

As indicated in Audit Report 2009 published by Chongqing Wulian Certified Public Accountants, the actual investment cost incurred by the end of 2009 is 1,228,782,118.74RMB, which is higher than that of the FSR. Therefore, we consider the estimated total investment in the FSR is reasonable and conservative to be applied in IRR calculation.

- Power price:

The expected tariff in the Table B.3, 0.284RMB/kWh (incl. VAT) is the actual highest price at the time of investment decision for hydropower project, which is in accordance with the official document “*The Notice of Chongqing Price Bureau on Implementation of the Grid Tariff Adjustment Made by the NDRC*” and the statistical table made by the Regulatory Authority of Central China Grid⁵. Therefore, this tariff applied in IRR calculation is reasonable and conservative.

-Annual O&M cost:

The value of annual O&M cost applied in the IRR calculation is taken from the Feasibility Study Report of the proposed project. Variations in the annual O&M costs have an insignificant impact on the return of the project. Even if the annual O&M costs becomes zero, the project IRR is still below the benchmark, but it is impossible to happen at all.

- Depreciation value:

The depreciation value used in the IRR calculation is directly obtained from the FSR, which strictly follows the depreciation calculation approach defined in the *Interim provisions concerning hydropower construction project financial assessment* as below:

Depreciation value = fixed assets value * depreciation rate

Therefore, we consider depreciation value in the IRR calculation of the PDD is appropriate and reliable.

-Residual value rate

⁵ Evidence is available to the validator.



The fixed assets value is fully depreciated during operation period in the FSR. To be conservative, we applied 5% residual rate in the IRR calculation of the PDD.

-Loan interest rate

The loan interest value applied in the IRR calculation is from the FSR which is completed in October 2005. The loan interest rate used in the FSR is the valid rate issued by the People's Bank of China at the time of FSR compilation. So the loan interest rate applied in the FSR is reliable and credible.

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. The following parameters were used as critical assumptions:

- Static total investment
- Power price
- Annual power supply
- 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:

- Static total investment:

According to the data published by the National Bureau of Statistics of China in 2008⁶ below, it indicates that there is an increasing trend of the Producer Price Indices for Manufactured Goods from 2000 to 2007.

⁶ <http://www.stats.gov.cn/tjsj/ndsj/2008/indexeh.htm>

Table B.5 Producer Price Indices for Manufactured Goods

Item	(preceding year=100)							
	2000	2001	2002	2003	2004	2005	2006	2007
Total Industry Products	102.8	98.7	97.8	102.3	106.1	104.9	103.0	103.1
Means of Production	105.1	98.8	97.7	103.6	107.8	106.8	103.9	103.2
Mining & Quarrying Industry	124.9	100.1	101.9	113.3	118.8	125.8	114.1	103.8
Raw Materials Industry	108.4	99.7	98.0	106.7	110.2	109.8	106.6	105.6
Processing Industry	98.6	98.1	96.9	100.2	104.8	102.2	101.1	102.0
Consumer Goods	97.8	98.5	97.9	98.9	101.2	99.8	100.2	102.8
Food	96.0	100.5	99.7	100.9	105.2	100.9	100.5	107.0
Clothing	100.6	99.0	98.8	99.8	100.9	100.8	101.3	101.2
Articles for Daily Use	98.0	98.3	97.9	99.5	101.9	101.9	100.8	101.5
Durable Consumer Goods	96.4	95.3	94.7	95.6	96.2	96.8	98.0	99.0

According to the statistics published by the National Bureau of Statistics of China, the PPI for Manufactured Goods increased by 6.9%⁷ in 2008. So the total investment of the project is impossible to decrease over 10%. For conservativeness, we also made the cross calculation, when the total static investment decreases by 31%, the project IRR can reach the benchmark, which is clearly impossible as the actual investment cost incurred by the end of 2009 (Audit Report 2009) has already been higher than the value sourced from the FSR and applied in the IRR calculation of the PDD.

- Power price:

The expected tariff in the Table B.3, 0.284RMB/kWh (incl. VAT) is the actual highest price at the time of investment decision for hydropower project, which is in accordance with the official document “*The Notice of Chongqing Price Bureau on Implementation of the Grid Tariff Adjustment Made by the NDRC*” and the statistical table made by the Regulatory Authority of Central China Grid⁸. We make below assumption in the PDD to calculate the cross point on power price. Assuming the power price is increased to 0.386RMB/kWh (incl. VAT), or in other words, goes up by 36%, the project IRR after tax can reach the 8% benchmark. Furthermore, the assumed price is an ideal one based on the current financial situation, inflation or increase of all the costs is ideally and optimistically ignored. It is clear that there is no probability for tariff to be increased by 36% within the near future.

- Annual operation and maintenance cost:

Variations in the annual O&M costs have an insignificant impact on the return of the project. Even if the O&M costs becomes zero, the project IRR is still below the benchmark, but it is impossible to happen at all.

- Annual power supply:

Annual power supply is determined by the annual power generation, which is linked directly to the available water flow. Only if the annual power supply increases by 36%, the IRR would reach the benchmark. The projected power generation is designed based on 44 years of water flow statistics (1959-2002) in the FSR which was approved by the government authority on 5 January 2006, so the value derived from such long-run data should be stable over the lifetime of the project activity and it is

⁷ http://www.stats.gov.cn/english/newsandcomingevents/t20090226_402540784.htm

⁸ Evidence is available to the validator.

impossible for it to change by such a great variation. Moreover, the annual power supply estimated in the FSR is conservative as it only takes 0.2% auxiliary consumption into account but not considers effective coefficient and transmission losses.

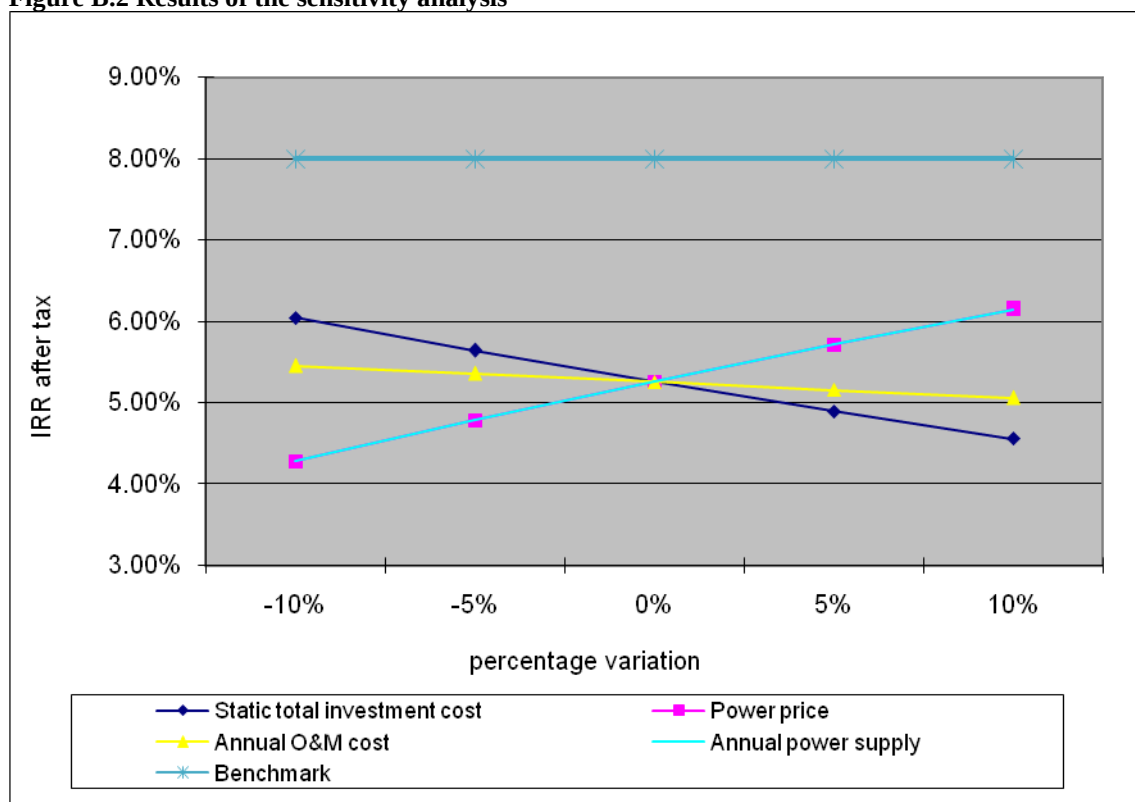
We furthermore conclude that the variations of $\pm 10\%$ in sensitivity analysis are reasonable and convincing.

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					
Static total investment	6.05%	5.64%	5.26%	4.90%	4.56%
Power price	4.28%	4.78%	5.26%	5.71%	6.15%
Annual power supply	4.28%	4.78%	5.26%	5.71%	6.15%
Annual O&M Cost	5.45%	5.36%	5.26%	5.16%	5.06%

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:

We have considered other hydropower projects in Chongqing Municipality with a capacity between 50 MW and 300MW which started construction activities since year 2002. 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.

First, the choice of Chongqing Municipality as geographic boundary is appropriate due to Chinese administrative districts, and topographic peculiarities. Chongqing Municipality is an administrative region clearly delineated in the Chinese laws, so it could give comparable environment with regarding to regulatory framework, investment climate, access to technology, access to financing, etc. to the projects of the same type in the municipality.

Second, projects between 50MW and 300MW are included in accordance with the *SL252-2000 Standard for Classification and Flood Control of Water Resources and Hydroelectric Project*⁹ which classifies projects between 50-300MW as middle-scale.

Third, projects that started construction before the 29 December 2002 reforms¹⁰ restructuring the power sector are not taken into account, since they did not benefit from comparable environment with regard to regulatory framework. Before the reforms, tariffs were determined either by the Ministry of Electric Power (prior to 1998), or by the State Economic and Trade Commission (after 1998) through provincial governments, and guaranteed investors with a sufficient return, according to cost-compensation principles.

Fourth, the similar projects also developed under CDM support are excluded as well.

Table B.7a Hydropower stations with capacity of 50-300MW in Chongqing Municipality from *Yearbook of China Water Resources 2006*

	Project name	Developer	Operation time	Capacity (MW)
1	Yujiankou hydropower station	Chongqing Yujiankou Hydroelectricity Co., Ltd	2004	60

⁹ The document has been provided.

¹⁰ China Electric Power Yearbook 2003, pages 13-14



2	Shiban hydropower station	Local government	1997 ¹¹	115
3	Dahekou hydropower station	Sichuan Wujiang electric power Co., ltd.	1996 ¹²	75

Furthermore, the projects on Renhe River in the Renhe Basin Plan are analyzed. However, no project meets the above criteria.

Table B.7b Hydropower stations with capacity of 50-300MW constructed on Renhe River

	Project name	Location	Capacity (MW)
1	Xiangshuigou Hydropower Station	Ziyang County, Shaanxi	58

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

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

For projects listed in Table B.7a, Shiban hydropower station and Dahekou hydropower station were developed before 2002. 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 Bashan hydropower station and Yujiankou hydropower station. First, although Yujiankou hydropower station was put into operation in 2004, the construction of it was started as early as July 2001¹³, before 2002. Second, Yujiankou project was developed by Chongqing Yujiankou Hydroelectricity Co., Ltd., which is invested by Asia Power Corporation Limited, a Singapore based company¹⁴. Third, Yujiankou hydropower station has a low investment per kilowatt of 6600RMB/kW, whilst the investment per kilowatt of Bashan project is 7994RMB/kW due to high compensation payment for resettlement and land expropriation. Therefore, it can't be considered similar to the proposed project since it was not developed in the similar investment environment to the proposed project.

For the project listed in Table B.7b, Xiangshuigou hydropower station is located in Shaanxi province, so it can't be considered similar to the proposed project.

We therefore conclude that no projects similar to the Bashan project have been implemented without the support of CDM and that the common practice analysis confirms the conclusions of the above additionality tests. Therefore, the project is additional.

Impact of CDM registration

Registration of the project as a CDM project would result in additional revenues for the project, significantly improving the economic attractiveness of the project. This is the most important contribution of CDM to the project realization, removing the crucial barrier towards its realization. The income through CDM will raise the IRR for the project from 5.26% to 8.13%, which is above the 8% benchmark.

¹¹ [http://www.mwr.gov.cn/weiyeshuili/gongcheng16\(1\).html](http://www.mwr.gov.cn/weiyeshuili/gongcheng16(1).html)

¹² <http://www.wjep.com/gb/aboutus/content.asp?id=218&style=7&title=%E5%A4%A7%E4%BA%8B%E8%AE%B0>

¹³ <http://emuch.net/journal/article.php?id=CJFDTotal-SCSL200403014>.

¹⁴ http://www.cqfd.gov.cn/www/news/web_show_32188.shtml

*Start of the project activity*

On 25 March 2006, the construction contract was signed. This date is the formal start of the project activity in accordance with the Glossary of CDM Terms and subsequent guidance from the EB as all other dates that could be considered real action or irreversible commitments from the side of the project entity are at a later stage. For example, the main equipment purchase contract was signed on 6 June 2006, and the approval to start actual construction activities was obtained on 19 May 2006.

Early and continued CDM consideration

Leaders of Chongqing Municipality Construction Investment Corporation, who took the majority shares of the project entity participated in a CDM training organized by the Chinese DNA in June 2005. After learning the poor financial performance of the proposed project, the Board of the project entity decided to apply for registration as a CDM project activity for the proposed project on 12 November 2005. This shows that the project entity was aware of the CDM incentive as a key element for the project's profitability and decided to develop the project as a CDM project activity before the start of project activity. Afterwards, the project entity kept contacting potential buyers and negotiating with them. Until 21 November 2008 was the ERPA successfully signed.

At the very beginning, the project entity, Chongqing Bashan Hydropower Development Co., Ltd. (hereafter referred to as "Bashan Hydropower Company") was co-invested by Chongqing Municipality Construction Investment Corporation who took up the 51% of the total shares and Chongqing Dingtai Group Co., Ltd., who took up the rest 49% shares. Both companies are shareholders of the project entity at that time. On 11 January 2006, Chongqing Dingtai Group transferred the shares in Bashan Hydropower Company to Chongqing Municipality Construction Investment Corporation. On 15 June 2006, Chongqing Municipality Construction Investment Corporation was changed to Chongqing Energy Investment Group after acquisition of Chongqing Gas Group. Therefore, at present, Chongqing Energy Investment Group is the sole shareholder of the project entity, Bashan Hydropower Company.

An overview of key events is given in Table B.8.

Table B.8 Overview of key events in the development of the project

Date	Event	Evidence
Oct. 2005	Feasibility study report was completed	FSR
12 Nov. 2005	Early CDM consideration - The financial incentive from the Clean Development Mechanism was acknowledged by the Board of Directors as a key element for the project's profitability.	Board Meeting Resolution
Dec. 2005	Environment impact assessment was completed	EIA
5 Jan. 2006	Project was approved	Approval
25 Mar. 2006	Start of project activity – Construction contract was signed	Contract
19 May 2006	Construction began	Start order
25 Jul. 2006	Bashan Hydropower Company set up an internal CDM team	Company document
19 Dec. 2006	In order to shorten CDM develop time and obtain more CER revenue, the CDM development department of parent company (Chongqing Energy Investment Group) would take charge of CDM development of proposed project.	Notice
22 Jan. 2007	A potential buyer visited the parent company and ERPA negotiation started.	Meeting minutes
30 Jun. 2007	ERPA negotiation with the potential buyer failed	ERPA draft



28 Sep. 2007	A CDM engagement agreement was signed	Engagement agreement
1 Mar. 2008	Stakeholder consultation meeting was held	Notice
May 2008	The parent company postponed NDRC application as agreement on ERPA clauses wasn't reached with the buyer	Email correspondence on ERPA negotiation
21 Nov. 2008	ERPA was signed	ERPA
31 Jul. 2009	PDD for host country approval was completed and submitted to NDRC	Application files
29 Oct. 2009	NDRC LoA was obtained	LoA

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

In accordance with the “ACM0002 methodology” (version 12.1.0), 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 (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” (tCO₂/MWh).

As the project involves the construction of a new grid-connected hydropower station at a site where no renewable power plant was operated prior to the implementation of the project activity, then $EG_{PJ,y} = EG_{facility,y}$ and formula B.1 can be expressed as:

$$BE_y = EG_{facility,y} \cdot EF_{grid,CM,y} \quad (B.2)$$

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 02 July 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/qjzfzj/t20090703_289357.htm

- Calculation of OM: <http://qhs.ndrc.gov.cn/qjzfzj/W020090703644238739485.xls>



- Calculation of BM: <http://ghs.ndrc.gov.cn/qjzjz/W020090703644239079814.doc>

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 based on IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. 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	CO ₂ emission factor
		(TJ/unit)	(TCO ₂ e/TJ)
Raw coal	10 ⁴ Tons	209.08	87,300
Clean coal	10 ⁴ Tons	263.44	87,300
Other washed coal	10 ⁴ Tons	83.63	87,300
Briquettes	10 ⁴ Tons	209.08	87,300
Coke	10 ⁴ Tons	284.35	95,700
Coke oven gas	10 ⁸ m ³	1,672.60	37,300
Other gas	10 ⁸ m ³	522.70	37,300
Crude oil	10 ⁴ Tons	418.16	71,100
Gasoline	10 ⁴ Tons	430.70	67,500
Diesel	10 ⁴ Tons	426.52	72,600
Fuel oil	10 ⁴ Tons	418.16	75,500
LPG	10 ⁴ Tons	501.79	61,600
Refinery gas	10 ⁴ Tons	460.55	48,200
Natural gas	10 ⁸ m ³	3,893.10	54,300
Other petroleum products	10 ⁴ Tons	418.16	75,500
Other coking products	10 ⁴ Tons	284.35	95,700
Other E (standard coal)	10 ⁴ Tons	0	0

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 at the lower limit of the uncertainty at a 95% confidence interval; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

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 system;
2. Choose whether to include off-grid power plants in the project electricity system (optional);
3. Select a method to determine the operating margin (OM);
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 electric power system

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. For the Bashan hydropower station project electricity system is defined as the Central China power grid.

Similarly, and following the delineation of the Chinese DNA, the connected electricity system consists of the North, East, South and Northwest Grids, as the Central China power Grid exports electricity to the North, East and South China power Grid and imports electricity from the Northwest China Power Grid.

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 provincial or municipal grids of Sichuan, Henan, Hubei, Hunan, Jiangxi and Chongqing.

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 the power grids under government control are mainly responsible for supplying and dispatching electricity. According to the *China Electric Power Yearbook 2008*, the total power generation by off-grid power plants took up only 0.053% of the total power generation by grid power plants in Central China Grid in 2007. 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)

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.10), we have selected the Simple OM method as the most appropriate method.

**Table B.10 Electricity generation of the Central China Power Grid, 2003-2007**

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	225,073	n.a.	559,100	40.26%
2007	408,400	224,300	200	632,800	35.48%

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, 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.

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, excluding the low-cost/must-run power plants/units.

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

- Data required for option A (based on data net electricity generation and a CO₂ emission factor of 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 Yearbook, 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, 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, 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. We calculate the Operation Margin Emission Factor as **1.1255 tCO₂e/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:

- (a) The set of five power units that have been built most recently, or
- (b) 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 AM0005 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 renewal of the crediting period. 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 we calculate the newly-added installed capacity and the share of each power generation technology in the total capacity. Second, we calculate the weights of each power generation technology in the newly-added installed capacity.¹⁵ 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.

¹⁵ 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.

Detailed steps and formulas are as below:

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

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (B.5)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (B.6)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (B.7)$$

Where:

- $F_{i,j,y}$ is the amount of the fuel i consumed in y year of j province (measured in a mass or volume unit);
- $NCV_{i,y}$ is the net calorie value of the fuel i consumed in y year (measured in GJ/mass or volume unit);
- $EF_{CO_2,i,j,y}$ is the emission factor of fuel i (measured in tCO₂/GJ), and;
- $COAL, OIL$ and GAS subscripts standing for the solid fuel, liquid fuel and gas fuel.

Second, we calculate the emission factor of the thermal power:

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

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, we 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 **0.5802** tCO₂e/MWh.

For details we 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 calculated emission factors, we calculate a combined margin Baseline Emission Factor of **0.85280** tCO₂e/MWh.

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:

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

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

Project emissions are calculated by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (B.11)$$

Where:

- PE_y is project emissions in year y (tCO₂e/yr)
- $PE_{FF,y}$ is project emissions from fossil fuel consumption in year y (tCO₂/yr)
- $PE_{GP,y}$ is project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO₂e/yr)

- $PE_{HP,y}$ is project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

The proposed project is a hydropower station without fossil fuel consumption on-site so that $PE_{FF,y} = 0$, $PE_{GP,y} = 0$.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (B.12)$$

Where:

- PD is power density of the project activity (W/m^2).
- Cap_{PJ} is installed capacity of the hydro power plant after the implementation of the project activity (W).
- Cap_{BL} is 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} is 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} is 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 project will create a new hydro power plant and a new reservoir. Therefore, the power density is determined as:

Total installed capacity: 140,000,000 W
Reservoir surface area at full reservoir level: 5,720,000 m^2
Power Density = 24.5 W/m^2

Consequently, and according to the methodology, the power density is greater than $10W/m^2$ therefore $PE_{HP,y} = 0$.

Project emissions equal to **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:

$$ER_y = BE_y - PE_y - LE_y \quad (B.13)$$



The project will install one on-site diesel generator with total capacity of 300kW which will be maintained for emergency purpose in case the power line which sends the power from the grid to the dam is cut off. For the emission factor of the diesel generator we refer to the AMS-I.F (version 01) 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. 1% of annual emission reductions of the proposed project is estimated to be 3,828.39tCO₂e, which means the diesel generator would run 5,317 hours per year. The load factor is over 60%, which is impossible at all. Therefore, it can be negligible.

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

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:	Methodology ACM0002 version 12.1.0
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:	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. For new reservoirs, this value is zero.
Source of data:	Methodology ACM0002 version 12.1.0
Value applied:	Zero
Justification of the choice of data or description of measurement methods and procedures actually applied:	The proposed project involves construction of a new reservoir and hence A _{BL} is zero.
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_{m,y}, EG_v, EG_{k,y} and EG_{n,h}
Data unit:	MWh (per annum)
Description:	Net electricity generated by power plant / unit <i>m</i> , <i>k</i> , or <i>n</i> in year <i>y</i> or hour <i>h</i>
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:	$FC_{i,m,y}$, $FC_{i,y}$, $FC_{i,k,y}$, $FC_{i,n,y}$, and $FC_{i,n,h}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by power plants / units m,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:	$\eta_{m,y}$ and $\eta_{k,y}$
Data unit:	%
Description:	Average net energy conversion efficiency of power unit m or k in year y
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: 38.10%; 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:	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:	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}
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 at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter of Vol.2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
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.
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:	Data used are IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter of Vol.2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
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.
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) and online at: http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm
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 448,920 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.11.

Table B.11 The estimation of baseline emissions during the 1st crediting period

Year	Year	Annual net power supply to the grid (EGy) (MWh)	Baseline emission factor (tCO ₂ /MWh)	Baseline emissions (tCO ₂ e)
1	01/07/2011 – 30/06/2012	448,920	0.85280	382,839
2	01/07/2012 – 30/06/2013	448,920	0.85280	382,839
3	01/07/2013 – 30/06/2014	448,920	0.85280	382,839
4	01/07/2014 – 30/06/2015	448,920	0.85280	382,839
5	01/07/2015 – 30/06/2016	448,920	0.85280	382,839
6	01/07/2016 – 30/06/2017	448,920	0.85280	382,839
7	01/07/2017 – 30/06/2018	448,920	0.85280	382,839
	Total			2,679,873
	Average	448,920		382,839

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

$$ER_y = BE_y - PE_y - LE_y = 382,839 \text{ tCO}_2/\text{y} - 0 - 0 = \mathbf{382,839 \text{ tCO}_2/\text{y}}$$

**B.6.4 Summary of the ex-ante estimation of emission reductions:****Table B.12 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: 01/07/2011 – 30/06/2012	0	382,839	0	382,839
Year 2: 01/07/2012 – 30/06/2013	0	382,839	0	382,839
Year 3: 01/07/2013 – 30/06/2014	0	382,839	0	382,839
Year 4: 01/07/2014 – 30/06/2015	0	382,839	0	382,839
Year 5: 01/07/2015 – 30/06/2016	0	382,839	0	382,839
Year 6: 01/07/2016 – 30/06/2017	0	382,839	0	382,839
Year 7: 01/07/2017 – 30/06/2018	0	382,839	0	382,839
Total	0	2,679,873	0	2,679,873
Average	0	382,839	0	382,839

B.7 Application of the monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**

Data / Parameter:	EG_{facility,y}
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data:	Project activity site
Measurement procedures (if any):	The quantity of net electricity generation supplied by the project to the grid 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 by project entity with national standard electricity metering instruments M2 (see Figure B.3). 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:	The data will be directly used for calculation of emission reductions. Measurement results of ES _y and ED _y will be cross-checked against the records of sold electricity to the grid (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_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Measurement procedures (if any):	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. Photographic evidence will be made available to the verifier.
Monitoring frequency:	Yearly
QA/QC procedures:	-
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:	Project site
Measurement procedures (if any):	The project entity will commission a third party to conduct the measurement. 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:	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:	-

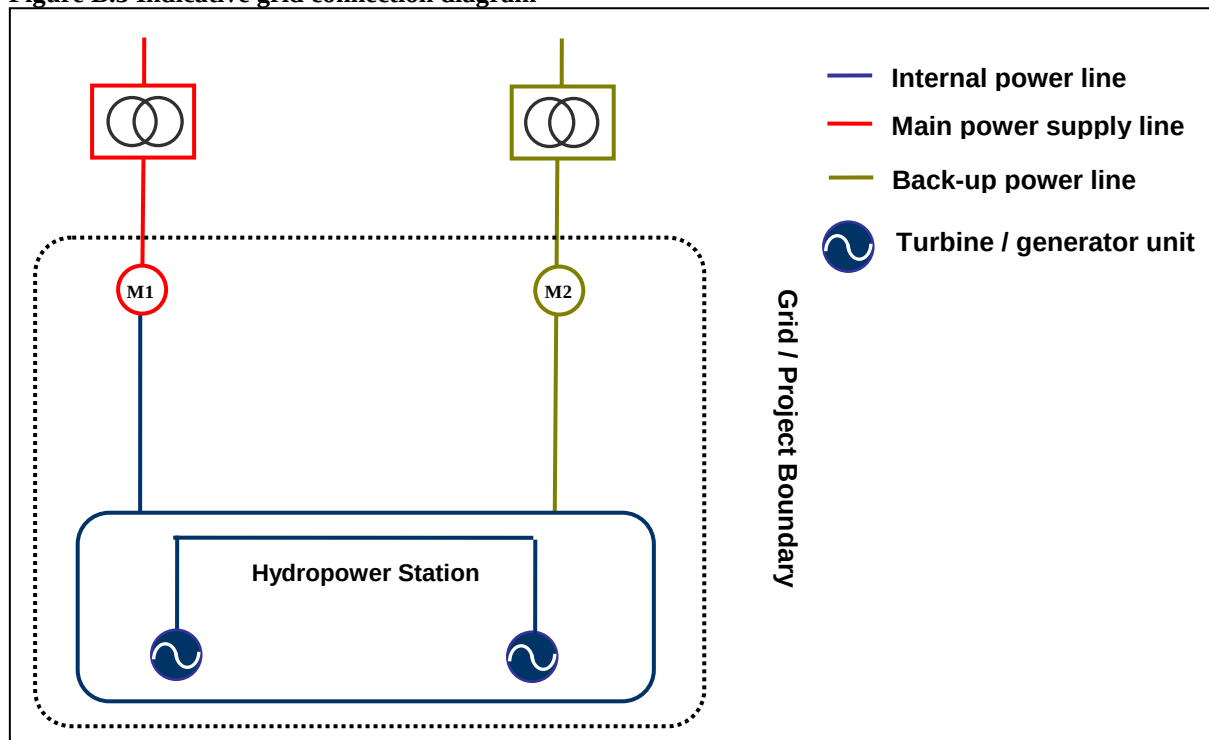
B.7.2 Description of the monitoring plan:

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 Municipal Power Grid via the 220kV Chengkou transformer station. A grid connection diagram (Figure B.3 below) indicates the principles for positioning of metering instruments that will be used in the monitoring of emission reductions. The project entity will ensure that the actual implementation of grid connection will not deviate from the procedures outlined in this section.

Figure B.3 Indicative grid connection diagram



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

▪ **Electricity supplied to the grid through main power line(s) (ES_y):**

As indicated in Figure B.3 the project is connected by one or multiple main power supply lines (indicated in red) which will supply power generated by the project to the grid. Power 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 in accordance with national regulations.

○ **Calibration:**

Calibrations are carried out annually by a certified company. If there are any substantial discrepancies between the readings of the metering instrument and the ENTs throughout the year, the metering instrument will be recalibrated.

The grid company will issue ETNs (Electricity Transaction Notes, hereinafter ETNs) regularly to the project entity where the monthly amount of electricity supply to the grid is mentioned. The measurement results of ES_y by M1 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.

In case that more main power line(s) are installed in the future measurement procedures will be the same as described above.

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



As M1 is bidirectional the electricity received by the project activity from the grid through the main power line will be measured by the project entity with M1.

As indicated in Figure B.3 the project is connected by one back-up emergency power line (indicated in brown 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 removed in the future as the electricity can be delivered from the grid through main power line. The metering instrument M2 will measure the power received by the project activity from the grid via the back-up power line. Calibrations of M2 will be carried out annually or by a certified company.

The grid company will issue ETNs (or statements if applicable) regularly. The measurement results of power received through M1 and M2 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 conservative value will prevail and be used for the purpose of claiming emission reductions.

In case that more back-up emergency line(s) are installed in the future measurement procedures will be the same as described above.

▪ **Installed capacity of the hydropower plant:**

In addition to the above, the installed capacity of the hydropower plant will be monitored yearly according to the applied methodology. The project entity will prepare photographic evidence of the installed equipment on the basis of the nameplates, which will be in accordance with domestic and international standards, or statements/documents by the manufacturer of the technology or the project entity.

▪ **Monitoring of reservoir surface area:**

The project entity will appoint qualified entity to carry out the measurement of the surface area of the reservoir when the project becomes operational. A measurement report of the reservoir surface area will be issued by this third party.

▪ **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, ETNs (sold electricity records) for power supplied to the grid and 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 of emission reductions. In case of discrepancies between the measurements records of the project entity and values on ETNs the conservative one will prevail for purpose of claiming emission reductions. All records of generation, power supply 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.13.



Table B.13 Details of metering instruments

Meter	Operated by	Electronic measurement	Recording	Calibration	Accuracy	Documentation
M1	Project entity	Continuous	Monthly	Annual calibration conducted by a certified company	Accuracy class of 0.5 or more accurate	Measurements records
M2	Project entity	Continuous				Measurements records

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 to the grid through the main power line(s) (in MWh) measured with M1 by the project entity and cross-checked against monthly ETNs. In case of discrepancies between values on ETNs and project entity measurement results, the conservative value will prevail.
- ED_y = Electricity delivered to the project from the grid through the main power line as well as the back-up power line. ED_y is measured with M1 (via main power line) and M2 (via back-up power line) by the project entity and cross-checked against monthly ETNs (or other evidence). In case of inconsistency between M1 and M2 measurement results and values on ETNs (or other evidence provided by the grid company) the conservative value will be used for emission reduction calculations.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES**Damages to metering equipment:**

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

- **In case metering equipment is damaged:**
The metering data evidenced by sales records will be used as record of net power supplied to the grid for the days for which no record could be recorded.
- **In case accuracy of metering equipment deviates from the required value:**
The metering data evidenced by sales records will be used as record of net power supplied to the grid for the days for which no accurate 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.

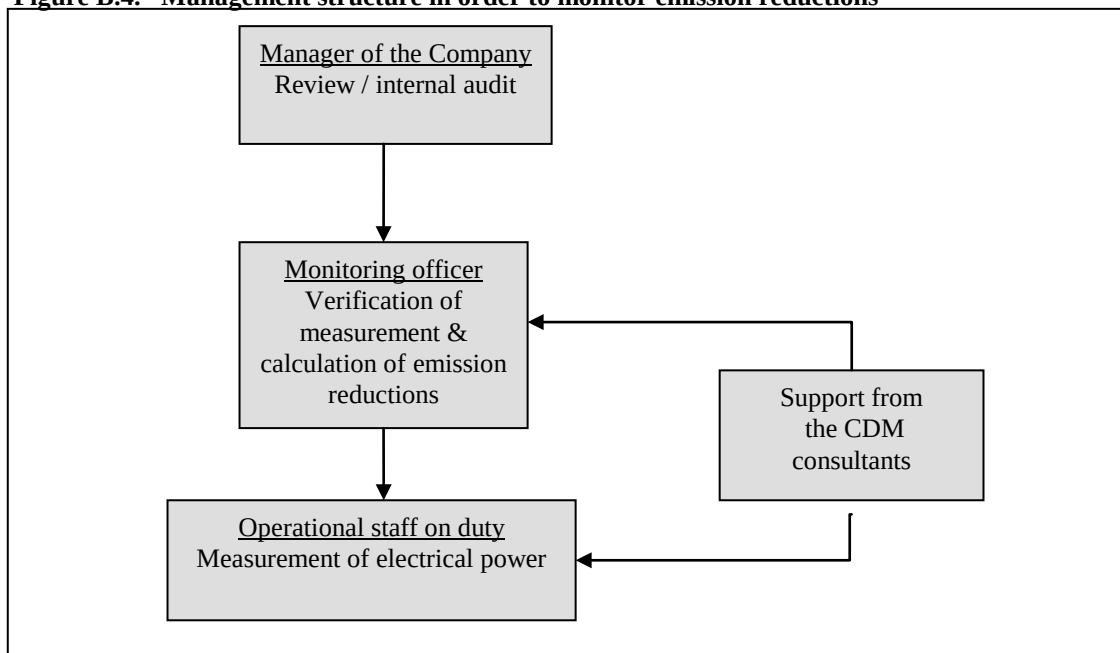
OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.4. The manager of the company 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 operational staff on duty.

The project owner will appoint a monitoring officer who will be responsible for verification of the measurement, collection of sales records, collection of grid statements 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 manager of the company.

The project entity will conduct maintenance of metering instruments periodically as well as oversee them so that instruments are not damaged. Maintenance records will be formulated.

Staff responsible for monitoring will obtain training from CDM consultants with respect to CDM monitoring requirements. Training materials will be kept.

Figure B.4. 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: 11/03/2011

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

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Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co. Ltd. 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:**

25/03/2006

This was the date when the construction contract was signed.

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

30 years 0 month

C.2 Choice of the crediting period and related information:**C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

01/07/2011

C.2.1.2. Length of the first crediting period:

7 years 0 month

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 13 April 2006. A summary of the main findings of the EIA is provided below.

SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT**1. Impacts during construction period**

The construction of the project will impact the water environment negatively. Adequate protection measures defined in the project design such as recycling all of the waste water must be enforced to mitigate impacts. Air pollution due to construction activities is limited to the construction site, and has no significant impacts on local environment. Residents living nearby may be temporarily affected by the transportation of materials.

2. Impacts due to the reservoir

Quantity of nutriment in the reservoir will increase temporarily, but the water quality is good at present, and there will be no possibility of eutrophication according to the calculation. However, to avoid any risk of eutrophication, it is necessary to strengthen the treatment of industry and sanitary wastewaters. Discharge from the Chengkou County sewage plant upstream of the reservoir dam will impact the water quality of the reservoir. The sewage plant should strictly control emissions of nitrogen and phosphor.

3. Biological environment*(a) Impact on local weather*

The reservoir temperature will have positive impact on surrounding vegetation.

(b) Impact on aquatic animals

The construction of the station will affect the fish population through the reduction of water level downstream of the dam. In addition, species will have to adapt to the change in water flow with the creation of the reservoir.

(c) Impact on terrestrial animals and plants

There are no endangered plants or animals within the reservoir or project construction area. Wild animals are abundant within the area and high mountains around the project ensure sufficient living space for animals after the reservoir is formed.

4. Resettlement

Living standards of the displaced families will steadily increase after agriculture activities are resumed. In the transition period, relocated families may face difficulties and therefore, it is recommended that government organizations support and supply work to families during the relocation process if necessary. Relocation will have generally low impact on vegetation. Transportation, power supply and transmission capacity will improve with the construction of Bashan station and have positive impact on the local economy and development.

5. Water and soil losses



Water and soil losses are estimated at 673,000 tons. Without sound environment protection measures, large quantity of waste slag will be lost during rainy season, which could cause flooding of the plowland and have negative impact on construction progress.

Environment protection measures

1. Environment protection measures in construction period

Domestic sewerage will be treated biologically, sewage from grit processing will be treated through sedimentation method, and cement processing wastewater will be treated by filtering. The oil waste from machines and vehicles will be collected in the filter then reused in the construction after treatment. Air and noise pollutions can be eliminated with adequate measures such as watering the road to the work site, applying dust removal and noise insulation tools, especially near Bashan Middle School, and arranging working hours rationally.

2. Biological environment protection measures

A minimum biological flow of 2.24m³/s must be ensured in the river section downstream of the dam until the powerhouse. Regarding aquatic organisms, the foundation pit drainage management must be strengthened. Fish monitoring and breeding stations over an area of 30mu will be established, preferably on Huangxi River or Yaojia River, to ensure sustainability. The project owner should assign a professional company to develop fish breeding facilities. Local forestry development scheme must be considered when executing plantation works. Newly-created forest land will exceed the area of forest land currently occupied by the project construction.

3. Environment protection in the resettlement zones

It is recommended that each residential area has specific sewage disposal site. The garbage will be collected and fired, or reused as fertilizer after disposal. The public health protection measures for local residents comprise: drinking water protection measures, environment protection measures, disease control measures and public health archiving system.

4. Water and soil preservation

Appropriate measures must be enforced at the construction site, access road and slag pit. 14.88hm² of land are under the water and soil preservation scheme. About 98% of the land affected by the project will be controlled and restored.

Conclusion

The project will have positive impact on the local economy and the development of tourism. Negative impacts will primarily affect the resettled population and the environment, such as water environment, aquatic animals, plant and animals and natural scenery. With appropriate measures, negative impacts will be mitigated. The assessment concludes that the project is feasible at the location.

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 February 18th to March 18th 2008, and consisted of the following elements:

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

Date / time: March 1st 2008, from 09:00 to 11:30

Location: Bashan Township Government 4th floor meeting room, Chengkou County

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
- Distribution of a questionnaire to attendees (See table E.2)
- Closing of the meeting

- **Distribution of questionnaires to the local population:**

The project entity distributed randomly 60 questionnaires at the meeting and 240 questionnaires in each of the 12 villages impacted by the Bashan project before the meeting. The main findings are available in table E.2.

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

- Newspaper announcement on February 18th, 2008, in the Chengkou News.
- Online announcement on the Chengkou County Public Information Site on February 17th, 2008.
- Bill postings in every village impacted by the project on February 18th 2008.

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	Chengkou County Government Office	Shen Xingyou
2	Chengkou County Government Office	Gou Shaofeng
3	Chengkou County Development and Reform Bureau	Feng Yong
4	Chengkou Environment Protection Bureau	Peng Wei
5	Chengkou County Water Conservancy Bureau	Liu Guobing
6	Chengkou County Land & House Property Bureau	Wang Lianhai
7	Chengkou County Resettlement Office	Wang Zhengguang
8	Longtian township government	Yang Qingyun
9	Bashan town government	He Wencai
10	Yuanba village	Ran Mingxing
11	Yuanba village	Xie Piaohua
12	Yuanba village	Wang Kexing
13	Yuanba village	Chen Yinghong
14	Datian village	Yang Zhichang
15	Datian village	Ran Minglu
16	Datian village	Chen Guokuan
17	Datian village	Ran Hongshun
18	Xingling village	Chen Qihong
19	Xingling village	Zhang Youbing
20	Xingling village	Tan Yanwu
21	Xingling village	Xiong Maohua
22	Longwang village	Luo Dongliang
23	Longwang village	Chen Bangxue
24	Longwang village	Liu Shiquan
25	Longwang village	Fang Mingxue
26	Fenfa village	Chen Ziju
27	Fenfa village	Chen Ziyun
28	Fenfa village	Luo Zefu
29	Fenfa village	Li Guangshou
30	Pingshang village	Chen Huaguang
31	Pingshang village	Wei Chuancai
32	Pingshang village	Zhang Anyun
33	Pingshang village	Chen Zhiguang
34	Nongmin village	Chen Yi'an
35	Nongmin village	Tang Youzheng
36	Nongmin village	Zhang Hai'an
37	Nongmin village	Chen Qiwan
38	Lianmeng village	Luo Zechao
39	Lianmeng village	Ran Yuankai
40	Lianmeng village	Chen Shengyou
41	Lianmeng village	Chen Xihong
42	Xingping village	Deng Xianzhang
43	Xingping village	Yuan Shengguo
44	Xingping village	Tong Guangzhou
45	Xingping village	Wang Zhengquan
46	Nuli village	Wen Xuechun
47	Nuli village	Xiao Shenglie
48	Nuli village	He Xiangtai
49	Nuli village	Xiao Guangfu



50	Zhong'an village	Yi Daipei
51	Zhong'an village	Wen Zehuai
52	Zhong'an village	Lv Guobing
53	Zhong'an village	Yuan Chengguang
54	Cangfang village	Xiong Liangfu
55	Cangfang village	Yan Mengjun
56	Cangfang village	Wen Yangang
57	Cangfang village	Ye Guilin
58	Huangxi township elementary school	Liu Zhaoguo
59	Nongtian Cangfang Hope school	Pang Xianli
60	Huangxi township sanitary office	Yuan Qizhi

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 Bashan Hydropower Development Co. Ltd.

- Mr. Tan Lei (Vice-general manager)
- Mr. Mao Xinghua (Office manager)

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

Name: Wang Zhengguang

Position / Affiliation: Chengkou County Resettlement Office

Comments:

Mr. Wang explains that the construction of the project will speed up social and economic development while improving living standards of the local population. He expresses his support to the Bashan hydropower development project.

Name: Peng Wei

Position / Affiliation: Environment Protection Bureau, Chengkou County

Comments:

Mr. Peng states that the Bashan project developer is doing well in terms of environment protection during construction period. He's confident that the same level of diligence will be applied during the operation period and the resettlement process.

Mr Tan Lei, from the project entity, gives supplementary explanation that appropriate monitoring plan will be designed for the operation period. In addition, the Environment Protection Bureau will pay regular visits on-site to ensure the reservoir does not impact the surrounding environment negatively.

Name: Feng Yong

Position / Affiliation: Development & Reform Committee, Chengkou County

Comments:

Mr. Feng says that the DRC supports the project as it is line with the State Policy. The Bashan station will reduce the power shortage in Chengkou County and benefit the local economy.



Name: Ran Minglu
Position / Affiliation: Resident, Datian village

Comments:

Although he wishes the compensation standards had been better, Mr. Ran reckons the project has more advantages than disadvantages, especially by solving drinking water problems and improving the stability of power.

Name: Luo Zefu
Position / Affiliation: Resident, Fenfa village

Comments:

Mr. Luo Ao notes that the impacts of the project are not so important and that compensation levels are somehow satisfactory.

Name: Wen Xuechun
Position / Affiliation: Resident, Nuli village

Comments:

For Mr. Wen, it is regrettable that compensation standards defined by the Government are not higher. Nevertheless, he believes people from Bashan town and Chengkou County will benefit from the hydropower station in the long-run.

Mr. Shen Xingyou, from the Chengkou County Government, ensures that the compensation will be distributed according to the standards and that the displacement process strictly abides by relevant State Laws. The Resettlement Bureau first performed an inventory of land and property impacted by the construction of the station. The whole process will be complete before operationalization. 800,000 RMB have already been distributed.

Name: Pang Xianli
Position / Affiliation: Nongtian Cangfang Elementary School

Comments:

Mr. Pang hopes the project owner could provide financial help to the schools located near the reservoir area.

Mr. Tan Lei from the project entity replies that since 2004, the Bashan Hydropower Development Co. Ltd has made donations to the Bashan Town middle school and to the local government. Moreover, he points out that the bridge built by the company considerably simplifies access to Bashan Town for the local residents.

Name: Chen Guokuan
Position / Affiliation: Resident, Datian village

Comments:

Mr. Chen confirms that the project has contributed to increase the villagers' revenues by creating employment opportunities during construction. He adds that there is no more need to go out of the County to find jobs. Finally, he explains that in the County, 60% of total revenues come from agriculture.

To be concluded, 100% of the attendees supported the project construction. Most of them believed the project would bring positive impacts, and no negative impact on economy, society, environment and living will take place. All attendees appreciated the positive impacts on economic development, energy



saving, employment opportunities, income level and personal life. Several attendees showed their concerns about the disturbance brought by the project construction to local residents and environment. Few attendees considered the compensation level for house expropriation low.

Through conversation with the attendees, we know that all attendees agreed the construction of Bashan hydropower station project. It is common understanding that construction of the project will provide sufficient power supply, promote economic development, improve local infrastructure such as public transportation, communications, power supply and drinking water, and increase employment opportunities. Regarding the villagers' concerns about the disturbance brought by the project construction to local residents and environment, the project owner promised that the construction would strictly abide by the local regulations on minimizing the impact on local residents and environment, and meanwhile, they would be willing to be supervised by local environment authority and villagers. As to the compensation level issue, the project owner as well as local government officers explained that the compensation standard of the project was approved by the government and they promised that the actual compensation will not be lower than the approved standard.

Questionnaire survey

Table E.2 below contains the main findings of the questionnaire survey distributed to local population. 60 questionnaires were handed out to attendees during the stakeholder meeting and 59 copies were collected back. 240 copies were dispatched into the 12 impacted villages outside the meeting and 232 copies were collected back. So in all, 300 questionnaires were handed out and 291 were collected back.

Table E.2. Main findings of the questionnaire

No.	The impact from project construction and operation			Poll	Total response	%
1.	Compensation	Whether the compensation to relocation complies with the state regulations	Yes	194	257	75.49
			No	17		6.61
			Not Clear	46		17.9
		Satisfied with the compensation to relocation		169	233	75.53
		Dissatisfied with the compensation to relocation		65		27.9
		Relocated people		225	291	77.3
		Whether the compensation to land expropriation complies with the national regulations	Yes	217	276	78.62
			No	13		4.71
			Not clear	52		18.84
		Satisfied with the compensation to land expropriation		218	269	81.04
		Dissatisfied with the compensation to land expropriation		51		18.96
		People whose land has been expropriated		259	291	89
2.	Economic Aspect	Boost economic development indirectly		218	236	92.37
		Boost livestock breeding		115		48.73
		Other positive impact		8		3.39



		No negative impact	154	176	87.5
		There is negative impact	22		12.5
3.	Social Aspect	Increase job opportunity	128	204	62.75
		Increase income	120		58.82
		Improve the unstable power	180		88.24
		Facilitate transportation	137		67.16
		Other positive impact	1		0.05
		No negative impact	147	171	85.96
		There is negative impact	24		14.04
4.	Environmental Aspect	Facilitate daily power use, relieve dependence on firewood and reduce trees' cutting down	215	221	97.29
		Replace other unclean energy and reduce the pollution from it	188		85.07
		No contaminative discharge	189		85.52
		No negative impact	158	174	90.8
		Negative impact	16		9.2
5.	Irrigating Aspect	Facilitate daily water obtaining	176	203	86.7
		Facilitate irrigation water obtaining	86		42.36
		No negative impact	160	163	98.16
		Negative impact	3		1.84
6.	Living Aspect	Improve living quality	188	269	69.89
		No impact	47		17.47
		Reduce living quality	34		12.64
7.	Support or not	Support	284	285	99.65
		Do not support	1		0.35

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

Table E.2 clearly shows that almost all attendees supported the construction of the project. Majority of the attendees believed the project construction wouldn't cause negative impacts on society, economy, and personal lives. Few villagers expressed their concerns on the impacts of noise and dust. At the meeting, the PO promised they would ask the builder to strictly follow the measures put forward in the EIA to minimize the impacts. These concerns were also expressed in the questionnaires that were distributed outside the meeting, and the PO made same explanation.

Expressed at the meeting as well as shown in the questionnaires, the main concerns focused on the compensation for land and buildings, the PO and the local government officer made detailed and patient explanation that the compensation standard of the project was approved by the government and the actual



compensation would strictly abide by the approved standard., and promised compensation would be paid on time and in full amount and effective measures would be taken to recover the environmental impact caused by the project construction to minimize its influence on irrigating and living conditions of local residents.

Considering the concerns on compensation to relocation and land expropriation, the government of Chengkou County agreed on adjusting the compensation standard of Bashan project by following the latest national provisions on 16 Aug. 2008¹⁶. The balance between old and new compensation standards was paid. The statement from the government confirmed that compensation contracts were accepted and signed by all affected people, and the compensation was also paid completely.

For the concerns about other aspects, after on-site validation, as validator required, some villagers with typical concerns in the questionnaires including the villager who chose “do not support” were visited again, and they expressed they were happy with the PO’s efforts in solving their concerns about the project and having known more about the project in detail, they believed that the project construction and operation is a good thing to local residents, which will raise their life quality and make local economy prosperous. They unanimously support the project.

¹⁶ Document is provided to validator.

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

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**The Purchasing Party:**

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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 Department of Climate Change of the National Development and Reform Commission. Full information on the calculation of the baseline and underlying data can be found at: http://qhs.ndrc.gov.cn/qjzjz/t20090703_289357.htm

-Calculation of OM: <http://qhs.ndrc.gov.cn/qjzjz/W020090703644238739485.xls>

-Calculation of BM: <http://qhs.ndrc.gov.cn/qjzjz/W020090703644239079814.doc>

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 A10c		
3	CM			0.85285
				D1 + D2

Table A2. Calculation of the Operating Margin Emission Factor

	Variable	2007 A	2006 B	2005 C	Total 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 EFOM (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 EFOM (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	Internal power consumption of power plants (%) 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: China Electric Power Yearbook 2006, p. 559, 568.

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

	Grid	Thermal Power generation (MWh) A	Internal power consumption of power plants (%) 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	Internal power consumption of power plants (%) 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			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 China Grid	NCV	Oxidation factor	Carbon coefficient	CO ₂ emissions
								A	(TJ/unit)	(Fraction)	(kgCO ₂ /TJ)	(tCO ₂)
									B	C	D	E = A*B*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 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	0	1	0	0.00
Total												332,420,496.13
												Σ(E _i)

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2006. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2008 p. 284; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).



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

Fuel	Unit	Jiangxi	Henan	Hubei	Sichuan	Hunan	Chongqing	Central China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
									(TJ/unit)	(Fraction)	(kgCO2/TJ)	(tCO2)
								A	B	C	D	E = A*B*D/1000
Raw coal	10 ⁴ Tons	1,926.02	8,098.01	3,179.79	2,454.48	3,285.22	1,184.30	20,127.82	209.08	1	87,300	367,386,738.07
Clean coal	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	5.79	5.79	263.44	1	87,300	133,160.23
Other washed coal	10 ⁴ Tons	4.51	104.12	0.00	8.59	0.00	79.21	196.43	83.63	1	87,300	1,434,115.59
Briquettes	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.01	0.00	0.01	209.08	1	87,300	182.53
Coke	10 ⁴ Tons	0.00	17.23	0.00	0.32	0.00	0.00	17.55	284.35	1	95,700	477,575.78
Coke oven gas	10 ⁸ m ³	0.00	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	0.00	1.70	0.01	4.36	22.71	522.7	1	37,300	442,770.28
Crude oil	10 ⁴ Tons	0.00	0.49	0.00	0.00	0.00	0.00	0.49	418.16	1	71,100	14,568.28
Gasoline	10 ⁴ Tons	0.00	0.01	0.00	0.00	0.00	0.00	0.01	430.7	1	67,500	290.72
Diesel	10 ⁴ Tons	0.91	2.23	1.41	1.78	0.00	0.96	7.29	426.52	1	72,600	225,737.42
Fuel oil	10 ⁴ Tons	0.51	1.26	1.31	0.80	3.49	0.57	7.94	418.16	1	75,500	250,674.38
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	0.86	8.10	1.00	0.97	0.00	0.00	10.93	460.55	1	48,200	242,629.71
Natural gas	10 ⁸ m ³	0.00	0.00	0.28	0.00	18.63	0.16	19.07	3893.1	1	54,300	4,031,308.94
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	0.01	0.00	0.01	284.35	1	95,700	272.12
Other E (standard coal)	10 ⁴ Tce	17.45	37.36	31.55	18.29	0.00	29.35	134.00	0	1	0	0.00
Total												375,028,077.28
												Σ(E_i)

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, 2008 p. 284; Oxidation factors and fuel emission coefficients are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).



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

Fuel	Unit	Jiangxi	Henan	Hubei	Sichuan	Hunan	Chongqing	Central China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								A	(TJ/unit)	(Fraction)	(kgCO2/TJ)	(tCO2)
									B	C	D	E = A*B*D/1000
Raw coal	10 ⁴ Tons	2,200.57	9,357.00	3,479.81	2,683.81	1,547.70	3,239.00	22,507.89	209.08	1	87,300	410,829,403.68
Clean coal	10 ⁴ Tons	0.00	3.07	0.00	0.00	3.80	0.00	6.87	263.44	1	87,300	157,998.40
Other washed coal	10 ⁴ Tons	0.04	87.16	0.00	2.06	96.42	0.00	185.68	83.63	1	87,300	1,355,630.93
Briquettes	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.01	0.01	209.08	1	87,300	182.53
Coke	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	284.35	1	95,700	0.00
Coke oven gas	10 ⁸ m ³	0.08	2.61	0.25	0.31	0.91	0.00	4.16	1672.6	1	37,300	259,534.00
Other gas	10 ⁸ m ³	29.17	25.79	0.00	24.69	0.00	23.98	103.63	522.7	1	37,300	2,020,444.06
Crude oil	10 ⁴ Tons	0.00	0.43	0.00	0.00	0.00	0.00	0.43	418.16	1	71,100	12,784.41
Gasoline	10 ⁴ Tons	0.00	0.00	0.00	0.04	0.01	0.00	0.05	430.7	1	67,500	1,453.61
Diesel	10 ⁴ Tons	0.98	3.21	2.51	2.83	1.93	0.00	11.46	426.52	1	72,600	354,862.93
Fuel oil	10 ⁴ Tons	0.42	1.25	1.33	0.63	0.64	1.74	6.01	418.16	1	75,500	189,742.19
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	1.43	10.01	0.97	0.70	0.00	0.00	13.11	460.55	1	48,200	291,022.47
Natural gas	10 ⁸ m ³	0.00	0.12	0.18	0.00	0.20	1.87	2.37	3893.1	1	54,300	501,006.93
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	0.00	0.00	0.00	284.35	1	95,700	0.00
Other E (standard coal)	10 ⁴ Tce	23.43	63.65	35.95	29.46	23.21	0.00	175.70	0	1	0	0.00
Total												415,974,066.13
Σ(E_i)												

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 and fuel emission coefficients are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

**Table A5. Calculation of emissions associated with imports from Northwest 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	0.99148	3,003,157
2007	3,005,400	1.01129	3,039,328
		Table A6	Table A6

Note: The Central China Power Grid did not import electricity in 2005

Table A6. Calculation of average emission factors of Northwest 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 Northwest Grid, 2006

	Grid	Thermal Power generation (MWh) A	Internal power consumption of power plants (%) 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. 559-560, 568.

Table A8. Calculation of thermal power supply to Northwest Grid, 2007

	Grid	Total Power generation (MWh) A	Internal power consumption of power plants (%) 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			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, Northwest Grid, 2006

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Northwest China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								(TJ/unit)	(Fraction)	(kgCO2/TJ)	(tCO2)
							A	B	C	D	E = A*B*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	0	1	0	0
Total											154,812,639
											$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2007. Net calorific values are from the China Energy Statistical Yearbook, 2008 p. 284; Oxidation factors and fuel emission coefficients are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).



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

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Northwest China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
							(TJ/unit)	(TJ/unit)	(Fraction)	(kgCO2/TJ)	(tCO2)
							A	B	C	D	E = A*B*D/1000
Raw coal	10 ⁴ Tons	3,303.44	1,969.03	470.85	2,165.80	1,762.11	9,671.23	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	3.73	0.00	0.00	124.31	7.73	135.77	83.63	1	87,300	991,243
Briquettes	10 ⁴ Tons	3.53	0.00	0.00	0.00	0.00	3.53	209.08	1	87,300	64,432
Coke	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.00	0.00	284.35	1	95,700	0
Coke oven gas	10 ⁸ m ³	0.52	0.65	0.00	0.00	0.26	1.43	1672.6	1	37,300	89,215
Other gas	10 ⁸ m ³	14.14	0.71	0.00	0.00	0.00	14.85	522.7	1	37,300	289,526
Crude oil	10 ⁴ Tons	0.00	0.00	0.00	0.00	0.09	0.09	418.16	1	71,100	2,676
Gasoline	10 ⁴ Tons	0.02	0.00	0.00	0.00	0.00	0.02	430.7	1	67,500	581
Diesel	10 ⁴ Tons	1.12	0.26	0.42	0.00	1.77	3.57	426.52	1	72,600	110,546
Fuel oil	10 ⁴ Tons	0.01	1.05	0.04	0.00	0.05	1.15	418.16	1	75,500	36,307
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	5.99	5.99	460.55	1	48,200	132,969
Natural gas	10 ⁸ m ³	1.68	0.49	1.93	0.00	8.66	12.76	3893.1	1	54,300	2,697,404
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	0.00	0.00	0.00	0.00	0.00	0.00	284.35	1	95,700	0
Other E (standard coal)	10 ⁴ Tce	94.36	9.73	0.00	0.00	0.00	104.09	0	1	0	0
Total											180,940,805
											$\Sigma(E_i)$

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 and fuel emission coefficients are IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

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

EF _{thermal} (tCO ₂ /MWh)	Share of thermal power in added capacity, 2007-2005	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 (%)	CO2 coefficient (kgCO2/TJ)	Oxidation factor	EF _{adv} (tCO2/MWh)
A	B	C	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 China	NCV	Total energy consumption Central China	Oxidation factor	Carbon coefficient	CO2 emissions
		Grid	(TJ/unit)	TJ	(Fraction)	(kgCO2/TJ)	(tCO2)
		A	B		C	D	E = A*B*D/1000
Raw coal	10 ⁴ Tons	22,507.89	209.08	4,705,949.64	1	87,300	410,829,404
Clean coal	10 ⁴ Tons	6.87	263.44	1,809.83	1	87,300	157,998
Other washed coal	10 ⁴ Tons	185.68	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	0.00	284.35	0.00	1	95,700	0
Other coking products	10 ⁴ Tons	0.00	284.35	0.00	1	95,700	0
Coal, total				4,723,289.98	1		412,343,216
Coke oven gas	10 ⁸ m ³	4.16	1672.6	6,958.02	1	37,300	259,534
Other gas	10 ⁸ m ³	103.63	522.7	54,167.40	1	37,300	2,020,444
LPG	10 ⁴ Tons	0.00	501.79	0.00	1	61,600	0



Refinery gas	10 ⁴ Tons	13.11	460.55	6,037.81	1	48,200	291,022
Natural gas	10 ⁸ m ³	2.37	3893.1	9,226.65	1	54,300	501,007
Gas total				76,389.87	1		3,072,007
Crude oil	10 ⁴ Tons	0.43	418.16	179.81	1	71,100	12,784
Gasoline	10 ⁴ Tons	0.05	430.7	21.54	1	67,500	1,454
Diesel	10 ⁴ Tons	11.46	426.52	4,887.92	1	72,600	354,863
Fuel oil	10 ⁴ Tons	6.01	418.16	2,513.14	1	75,500	189,742
Other petroleum products	10 ⁴ Tons	0.00	418.16	0.00	1	75,500	0
Oil total				7,602.40			558,843
Total							415,974,066
							Σ(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 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 2007 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 Bashan 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.
- **Collect 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.
- **Calculate 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.
- **Prepare 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.