CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Project title: Sichuan Tongjiang Gaokeng Hydropower Station Project
PDD Version: 2.0
PDD completion date: 27/08/2007

Revision History:
Version 1.0: First draft
Version 1.1: Second draft, submitted for Host Country Approval
Version 2.0: Minor editorial changes; submitted for validation / global stakeholder comments

A.2. Description of the small-scale project activity:

The Sichuan Tongjiang Gaokeng Hydropower Station Project (hereafter referred to as 'the project' or 'project') involves the construction of a run-of-river type hydropower station at the main stream of the Tongjiang River in Tongjiang county of Sichuan Province, China.

The purpose of the project is to generate electricity from clean renewable hydro power in Sichuan Province and contribute to the sustainability of power generation of the Central China Grid.
The power generated by the project will displace part of the electric power in Central China grid, which is predominantly based on coal-fired thermal power. Therefore greenhouse gas emissions will be reduced. The estimated annual emission reduction is 45,485 tCO2e.

The project is a hydropower station consisting of an integrated dam/powerhouse design with a maximum height of 27.1 meters, and total crest length of 118.5 meters. The dam will include 8 floodgates and a water intake that will lead water into the powerhouse through two penstocks. The hydropower station will install 2 turbine / generator units with an individual installed capacity of 7.5 MW, amounting to a total installed capacity of 15 MW.

The expected operating hours are 3,989 hrs annually, expected annual power generation is 59.84 million kWh, and net expected annual power supply to the grid is 50.56 million kWh.

Power generated by the project will be routed to the Sichuan Provincial Grid through The Tongjiang transformer station. The Sichuan Provincial Grid is part of 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 replacing coal-fired power plants with clean, renewable power;
- Reducing the adverse health impacts from air pollution;
- Reducing the local power shortage in Tongjiang county
- 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:

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)
People's Republic of China (host)	Private entity: Sichuan Yili Energy Investment Development Co., ltd. (as the Project Entity)	No
Switzerland	Private entity: Cargill International SA (as the Purchasing Party)	No

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

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Sichuan Province

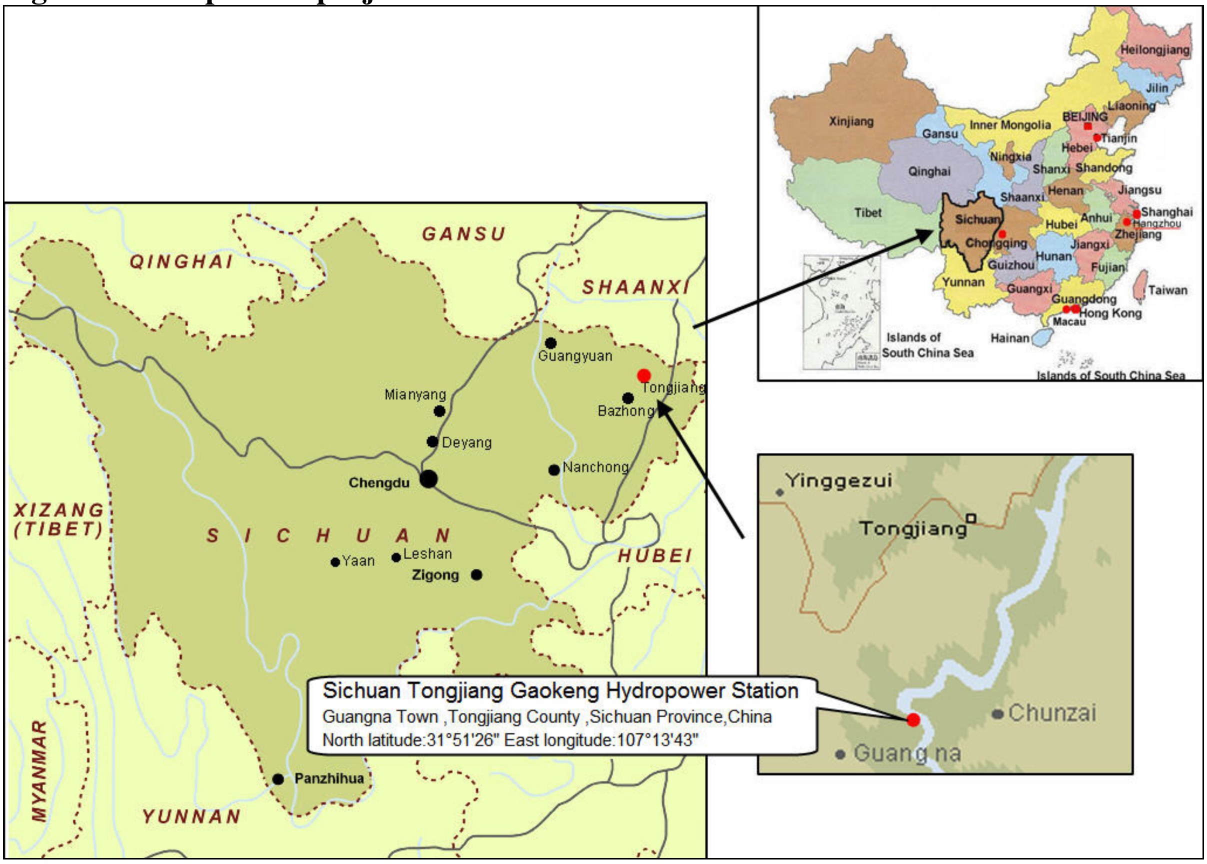
A.4.1.3. City/Town/Community etc:

Tongjiang county of Bazhong city

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

Gaokeng hydropower station project is located at the main stream of Tongjiang river in Tongjiang county of Bazhong city, Sichuan province and it is 12.8 kilometres away from Tongjiang County Seat. The site location's approximate coordinates are east longitude of 107º13'43" and north latitude of 31º51'26". Figure A.1 shows the location of the project.

Figure A1: Map of the project location



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Sectoral Scope I: Energy Industries.
Category: I.D Grid connected renewable electricity generation

The project activity utilizes the hydro potential for power generation. Thus, the project type is renewable energy. Since the capacity of the proposed project is 15 MW, it satisfies the requirement that the capacity of the project should be at most 15 MW and the project activity can be regarded as a small scale CDM project activity. The power generated is exported to the grid. Thus, according to the small-scale CDM modalities, the project activity falls under Type – I – Renewable Energy Projects and category I.D – Renewable Electricity Generation for a grid.

The project will not expand beyond 15 MW. For technical reasons, the project cannot expand beyond the current installed capacity; additionally, the approval of the Chinese authorities is based on the current technical design of the project; in other words, expansion beyond the current capacity would not be possible without further government approvals.

Technology:
The design has been prepared by the Hydraulic and Hydroelectric Construction Survey Design Institute of Zigong city in Sichuan province. All technologies employed in the project are in accordance with the hydrological conditions and have been used in China before.

The project design consists of a run-of-river scheme with a low head of 14 meters, including a dam, water intake, penstocks, powerhouse, tailrace, stilling pond and a switching station. The dam comprises three sections, i.e. two water retaining sections and one main dam section with 8 flood gates, a sand sluice and a water intake. The structure will be constructed from concrete and kept in place by gravity. The powerhouse will be built in the riverbed. The surface area of the reservoir is 190,300 m^2 at full capacity, and the power density is 78.8 W/m^2.

The project will be connected to Tongjiang 110 KV transformer station via an on-site transformer station. The Tongjiang transformer is part of the Sichuan Provincial Grid, which belongs to the Central China Grid.

Two turbine/generator units with an individual capacity of 7.5MW will be installed. The specific technical data are listed in Table A.2.

Table A.2 Basic technical data of the turbine / generator units

Main Technical Data		Value (per unit)
Turbines	Units	2
	Type number	ZZK160-LH-310
	Type	Kaplan turbine
	Nominal capacity	7.772 MW
	Nominal flow rate	60.7 m^3/s
	Maximum head	16.63 m
	Nominal head	14 m
Generators	Units	2
	Type number	SF7500-36/5500
	Type	Three pole, vertical axes
	Capacity	7.5 MW
	Nominal revolutions	166.7 rpm
	Power factor	0.8

The turbine/generator units and other auxiliary facilities are manufactured by Fujian Nanping Nandian Hydropower Equipments Manufacturing Co. Ltd. Domestic technology is applied, so it does not lead to technology transfer.

An indicative schedule of the project's implementation is provided by table A.3 which lists the main past and future events of construction.

Table A.3 Implementation schedule of the proposed project

Period / date	Main activity
December 2005	Start of construction activities
Dec. 2005 – Mar. 2008	Construction of the dam
Dec. 2005 – Nov. 2007	Construction of the powerhouse
Nov. 2007 - March 2008	Construction of on-site transformer
Nov. 2007 - March 2008	Installation & testing of 1st turbine and generator
March 2008- June 2008	Installation & testing of 2nd turbine and generator
June 2008	Operationalization

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

A 7-year renewable crediting period (renewable twice) is selected for the proposed project activity. The estimation of the emission reductions in the first crediting period is presented in Table A.4.

Table A.4 Estimation of the Emission Reductions in the First Crediting Period

Years	Annual estimation of emission reductions (tCO_2e)
1 June 2008 – 31 May 2009	45,485
1 June 2009 – 31 May 2010	45,485
1 June 2010 – 31 May 2011	45,485
1 June 2011 – 31 May 2012	45,485
1 June 2012 – 30 May 2013	45,485
1 June 2013 – 30 May 2014	45,485
1 June 2014 – 30 May 2015	45,485
Total estimated reductions (tCO_2e) of the first crediting period	**318,395**
Total number of the first crediting period years	7
Annual average reductions over the first crediting period (tCO_2e)	45,485

A.4.4. Public funding of the small-scale project activity:

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

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project is a small-scale project activity of category I.D, because the capacity of the hydropower station is 15 MW. The project will not expand beyond 15 MW. Proof is that the project entity does not have government approval to expand the project above 15 MW; in other words, expansion beyond the current capacity would not be possible without further government approvals.

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; And
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

A proposed small-scale project activity shall not be deemed to be a debundled component of a large project activity if one of the criteria mentioned above does not apply to the project. It is possible to demonstrate that the project is not a debundled component of a larger project activity, because the project entity is not operating, developing or planning to develop another project in the direct vicinity of the project boundary.

Therefore, there is no other registered CDM project activity or another application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

Therefore, the project is not a debundled component of a larger project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories: I.D 'Grid connected renewable electricity generation' (version 12)
Date of approval: 10 August 2007.
Reference: The methodology can be found at:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

The AMS-I.D. methodology refers to the ACM0002 methodology (Version 6) for the calculation of baseline emissions. This methodology can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2 Justification of the choice of the project category:

The AMS-I.D. methodology is applicable to small-scale project activities, under the following restrictions (see version 12 of AMS.I.D):

1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.
3. Combined heat and power (co-generation) systems are not eligible under this category.
4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[1] from the existing units.
5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.

The proposed project activity satisfies these applicability criteria:

- The project is a small-scale project activity; see Section A of this PDD. The project has an installed capacity of 15 MW. Therefore, the project will not surpass the threshold of 15 MW for the applicability of the AMS.I.D methodology. (Satisfying the general precondition for the use of an AMS methodology)
- The project involves hydro energy resources, one of the renewable energy generation technologies listed (see restriction 1 above).

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[1] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

- The project provides power to the power grid. The existing power grid mainly utilizes fossil fuels as a power source, as described in Section A.2 and Section B.6 (see restriction 1 above).
- The project does not have a non-renewable component, meaning that the restrictions mentioned under point 2 above are not applicable.
- The project does not involve combined heat and power systems, meaning that the restrictions mentioned under point 3 above are not applicable.
- The project does not involve the addition of renewable energy generation units at an existing renewable power generation facility, meaning that the restrictions mentioned under point 4 above are not applicable.
- The project does not seek to retrofit or modify an existing facility for renewable energy generation, meaning that the restrictions mentioned under point 5 above are not applicable.

We therefore conclude that the project satisfies all conditions for the application of small-scale methodology AMS.I.D.

B.3. Description of the project boundary:

The project boundary, as stated in Appendix B of the simplified modalities and procedures for small-scale CDM project activities, is limited to the physical project activity. Project activities that displace energy supplied by external sources shall earn certified emission reductions (CERs) for the emission reductions associated with the reduced supply of energy by those external sources.

The physical project boundary of the project includes the area occupied by the components of the hydropower station until the connection with the grid, which includes:

- Small reservoir at the dam site
- Dam structure including flood gates and water retaining section
- Water diversion structure including water intake, water diversion tunnel and penstocks
- Power house including turbines/generators and auxiliary equipment
- On-site switching / transformer station (owned by the project entity)
- transmission lines to the grid

The AMS.I.D methodology does not provide guidance on how the system boundary of the project is to be determined. We therefore have applied the guidance available for the ACM0002 methodology. According to the ACM0002 (version 6) methodology, the relevant grid definition should be based on the following considerations:

1. Use the delineation of grid boundaries as provided by the DNA of the host country if available; or
2. Use, where DNA guidance is not available, the following definition of boundary:
   In large countries with layered dispatch system (e.g. state/provincial/regional/national) the regional grid definition should be used.

According to above requirements, the regional grid (Central China Grid) is selected as the project boundary.

As mentioned above, the boundary of the project is marked by the point where the project connects to the grid. The project is connected to the Sichuan Grid, which is part of the Central China Power grid, which includes the Sichuan, Henan, Hubei, Hunan, and Jiangxi and Chongqing city power grids. The geographical boundaries for the determination of the baseline emissions are therefore defined as the Central China Grid and direct emissions from all generation sources serving the grid.

B.4. Description of baseline and its development:

The baseline scenario of proposed project is the continued operation of the existing power plants in the system and the addition of new generation sources to meet electricity demand. The project activity involves a construction of a zero-emission power source.

Leakage associated with the project does not have to be taken into account as the project employs new turbines / generators and does not involve the transfer of equipment from another activity. Furthermore, the project is a run-of-river hydropower station with no significant water storage capacity. In fact, the power station has a power density of 78.8 W/m^2. Therefore, in accordance with the Executive Board decision on “Thresholds and criteria for the eligibility of hydroelectric power plants with reservoirs as CDM project activities” (EB23), the project emissions from the reservoir can be ignored. Thus, the emission reductions are equal to the baseline emissions.

In accordance with the small scale methodology I.D, baseline emissions are equal to power generated by the project activity and delivered to the grid, multiplied by the baseline emission factor. According to the small scale methodology I.D the baseline emission factor is calculated as either the “average of the approximate operating margin and the build margin”, or the “weighted average emissions (in kg CO2/kWh of the current generation mix)”. Power consumption in the Central China Grid is growing rapidly, which requires the construction of additional generating capacity. The Sichuan Tongjiang Gaokeng Hydropower Station is therefore expected to displace predominantly new capacity that is added to the grid and power generated by plants at the operating margin. Therefore, the baseline emission factor has been calculated as the average of the approximate operating margin and the build margin.

The small scale methodology I.D refers to the ACM0002 methodology for the calculation of the operating margin and the build margin. We therefore refer to this methodology in the calculation of the baseline emission factor.

Detailed baseline calculations can be found in Annex 3 of this PDD.

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 small-scale CDM project activity:

Additionality

Hydropower has made significant contributions to the expansion of power supply in Sichuan Province over the last few decades. However, new hydropower additions to the grid, in particular small hydropower stations, experience increasingly unattractive economic returns on investment. The reasons for this are that the most suitable locations for hydropower projects have already been used, and new projects are located in remote areas driving up the costs of hydropower per kWh. In addition, the engineering costs in China are rapidly rising. In the absence of the project activity, the Central China Grid is expected to expand through the least-cost expansion, which in the case of Central China is through predominantly coal-fired thermal power generation, excluding the proposed project activity.

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities the following categories of barriers are recognized as a basis for the additionality argument:

1. Investment barriers

2. Technological barriers
3. Barriers due to prevailing practice
4. Other barriers

The additionality argument is based on the proposition that the project faces an investment barrier that prevents the implementation of this type of project activity. The investment barrier is argued on the basis of two separate strands of argument: the project faces a barrier due to 1) poor economic return on investment, and 2) limited access to financial resources.

Return on investment

The project faces a barrier to implementation due to the poor returns on investment. To illustrate this, we performed a benchmark analysis in which we compare the Internal Rate of Return (IRR) of the proposed project activity to an industry benchmark. The parameters used in the calculation are presented in Table B.1.

Table B.1 Parameters used in the investment analysis.

Gaokeng hydropower station (15MW)			
No.	Item	Value	Data source
1	Static total investment	104.8471 million RMB	Preliminary Design Report
2	Expected annual power supply	50.5604 million kWh	Preliminary Design Report
3	Annual Operation and Maintenance costs	2.9455 million RMB	Preliminary Design Report
4	Expected power price (net)	0.266 RMB/kWh	Preliminary Design Report
5	Investment horizon	20 years	Primary design
6	Expected CER price	8 EUR	Market price
7	Crediting period of CER	7 years	

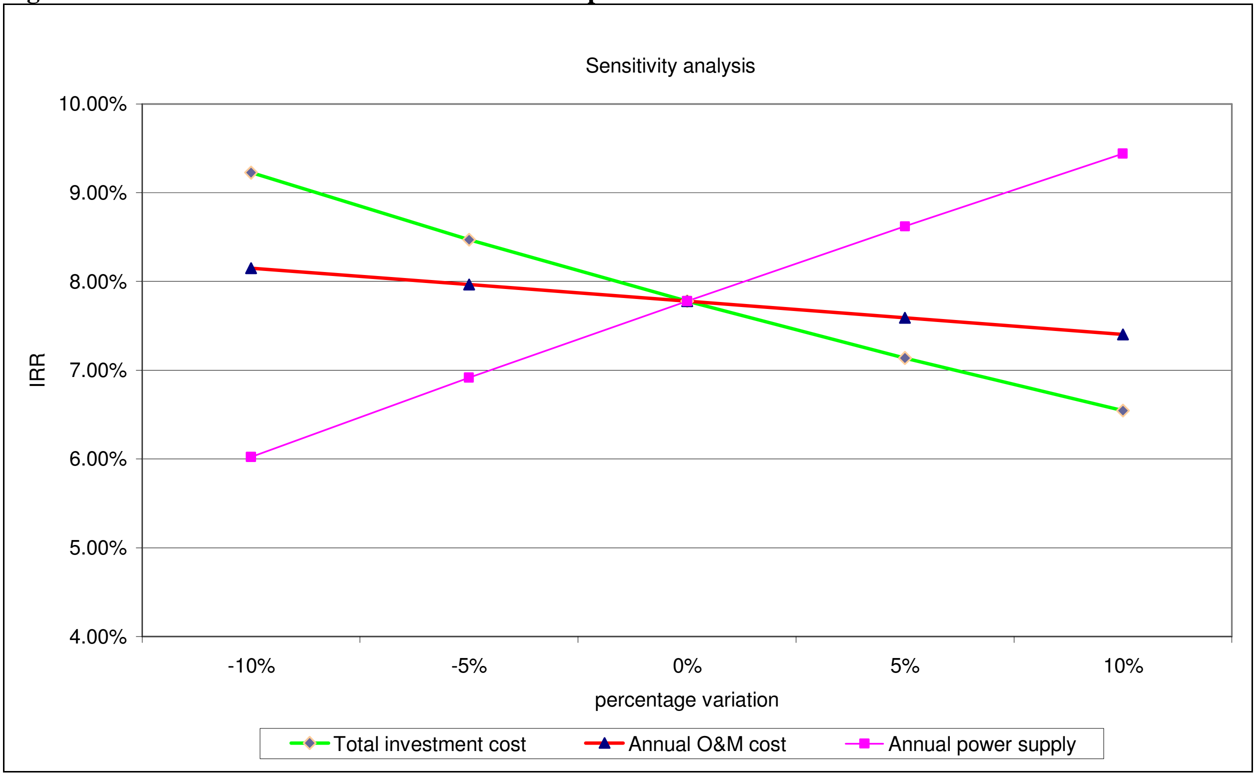
The investment analysis compares the project on the basis of internal rate of return (IRR) to an industry benchmark for hydropower projects, which in the case of small-scale hydropower projects in China is set at 10% (see Economic Evaluation Code for Small Hydropower Projects, 1995). The results of the analysis for the Gaokeng hydropower station are provided in Table B.2.

Table B.2 Results of economic analysis

Gaokeng hydropower station		
Internal rate of return (IRR), over a 20 year period	Without CDM revenues	7.78%
	With CDM revenues	12.17%

The results clearly indicate that the return on investment of the Gaokeng hydropower station is below the 10% benchmark. To confirm this we have considered variation of 10% in the critical assumptions. Figure B.2 shows the results of variations in critical assumptions on the IRR with and without CDM revenues.

Figure B.2 Result of variations in the critical assumptions



The sensitivity analysis confirms that the project's IRR without CDM revenues is substantially below the benchmark and that revenues from the sale of CERs are required to make the project financially attractive. Therefore, the proposed project activity faces an investment barrier due to its commercial unattractiveness.

<u>Access to financial resources:</u>

The Gaokeng hydropower station project also faces an investment barrier due to the limited access to financial resources. The financial services sector of Sichuan Province is not well developed and lacks the instruments to deal with financing of high-risk projects. In addition to the poor economic return on investment as argued above, the project also faces several other obstacles that make it difficult to attract financial resources. The revenues through CDM are therefore considered to be an essential part in arranging financing for the project. The barriers to attract financial resources are discussed below:

- **Project location:** The project is located in Tongjiang County, a very poor and remote area of China, and designated as a national poverty county. Industry in Tongjiang County is not developed and there are very few companies with sufficient financial resources to develop a hydropower station, and few companies exist outside of the County that are willing to invest in hydropower projects in Tongjiang County.

- **Adverse lending policies by banks:** The banking sector is reluctant to extend loans to small hydropower stations unless special circumstances apply. The high risks and poor returns associated with small hydropower projects make it difficult for project developers to receive loans without putting up a high share of equity capital.

> The risk-adverse attitude of the banking sector was formalized in the summer of 2004, when under the guidance of the National Development and Reform Commission many banks adopted policies under which hydropower stations with a capacity under a certain threshold will not receive any loans or extensions of loans.[2]

The above-mentioned obstacles present a prohibitive barrier to attract financing. To conclude, the project faces an investment barrier due to the unattractive return on investment and problematic access to financial resources. The additional revenues from registration of the proposed project activity as a CDM activity help overcome this barrier.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

In accordance with the small scale methodology I.D, baseline emissions are equal to power generated by the project activity and delivered to the grid, multiplied by the baseline emission factor. According to the small scale methodology I.D the baseline emission factor is calculated as either the "average of the approximate operating margin and the build margin", or the "weighted average emissions (in kg CO2/kWh of the current generation mix)". Power consumption in Central China Grid is growing rapidly, which requires the construction of additional generating capacity. The Sichuan Tongjiang Gaokeng Hydropower Station is therefore expected to displace predominantly new capacity that is added to the grid and power generated by plants at the operating margin. Therefore, the baseline emission factor has been calculated as the average of the approximate operating margin and the build margin.

The combined margin emission factor is in this particular case calculated *ex ante* on the basis of the latest additions to the grid.

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA on 9 August 2007. We will refer to these emission factors as the 'published emission factors'.

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

- Calculation result of the baseline emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1361.pdf
- Calculation process of the baseline OM emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
- Calculation process of the baseline BM emission factor of Chinese power grid: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1359.pdf

We calculate the OM and BM Emission Factors on the basis of the published emission factors but deviate at some points by using data published in the China Energy Statistical Yearbook and China Electric Power Yearbook which results in a lower emission factor and is therefore more conservative. The description below focuses on the key elements in the calculation of the published emission factors

[2] A statement from the Industrial and Commercial Bank of China confirming that their restrictive policies were implemented from 2004 is available to the validator.

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, CO2 emission factors and oxidation rates 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, CO2 emission factors, and oxidation rates. In the calculation files of the published emission factors, the net calorific values are based on the China Energy Statistical Yearbook, and the oxidation rates 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; the CO2 emission factor has been obtained by multiplying with 44/12. Rounded figures have been reported but exact figures have been used in the calculations in this PDD.

Table B.3. Default values used for net calorific values, oxidation factors, and CO2 emission factors of fuels

Fuel	Unit	NCV	Oxidation factor	Carbon emission factor	CO2 emission factor
		(TJ/unit)	(Fraction)	(TC/TJ)	(TCO2/TJ)
Raw coal	10^4 Tons	209.08	1	25.8	94.6
Clean coal	10^4 Tons	263.44	1	25.8	94.6
Other washed coal	10^4 Tons	83.63	1	25.8	94.6
Briquettes	10^4 Tons	83.63	1	26.5	97.2
Coke	10^4 Tons	284.35	1	29.2	107.1
Coke oven gas	10^8 m^3	1672.6	1	12.1	44.4
Other gas	10^8 m^3	522.7	1	12.1	44.4
Crude oil	10^4 Tons	418.16	1	20	73.3
Gasoline	10^4 Tons	430.7	1	18.9	69.3
Diesel	10^4 Tons	426.52	1	20.2	74.1
Fuel oil	10^4 Tons	418.16	1	21.1	77.4
LPG	10^4 Tons	501.79	1	17.2	63.1
Refinery gas	10^4 Tons	460.55	1	15.7	57.6
Natural gas	10^8 m^3	3893.1	1	15.3	56.1
Other petroleum products	10^4 Tons	383.69	1	20	73.3
Other coking products	10^4 Tons	284.35	1	25.8	94.6
Other E (standard coal)	10^4 Tce	292.7	1	0.0	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, 2004 p. 302;
- Oxidation factors: IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories,
- Carbon emission factors: IPCC default values see 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
- CO2 emission factors: calculated from carbon emission factors

<u>Description of the calculation process</u>

The key methodological steps are:

1. Calculation of the Operating Margin (OM) Emission Factor
2. Calculation of the Build Margin (BM) Emission Factor
3. Calculation of the Baseline Emission Factor

4. Calculation of the Baseline emissions
5. Calculation of Emission Reduction

The methodology is applied to the Central China Power grid which is defined as including the grids of Jiangxi, Hunan, Henan, Hubei, Chongqing and Sichuan, as discussed in Section B.3. Section B.3 also describes how the project boundary is defined.

Step 1. Calculation of the Operating Margin Emission Factor

The ACM0002 methodology offers several options for the calculation of the OM emission factor. Of these, the methodologically preferred one, 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 cannot be used, because low cost/must run resources (hydropower and windpower) constitute less than 50% of total grid generation (see Table B.4). Therefore, the calculation method of simple OM is suitable for this project activity.

Table B.4 Installed capacity and electricity generation of the Central China Power Grid, 2001-2005

Year	Installed capacity (MW)					Electricity generation (GWh)				
	Thermal	Hydro	Others	Total	% Low cost/must run	Thermal	Hydro	Others	Total	% Low cost/must run
2001	42,569.2	30,397	0	72,966.2	41.66	178,156	103,554	0	281,710	36.76
2002	43,303.2	31,034.7	0	74,337.9	41.74	200,347	112,440	0	312,787	35.95
2003	46,893.5	36,557	0	83,450.5	43.81	240,839	126,448	0	367,287	34.43
2004	53,744.7	42,342	0	96,086.7	44.07	270,846	169,094	725	440,665	38.54
2005	60,167.2	48,205.2	0	108,372.4	44.48	303,976	187,734	10	491,720	38.18

Source China Electric power yearbooks 2006-2002

Accordingly, the OM emission factor is calculated as the generation-weighted average emissions per unit of electricity (measured in tCO_2/MWh) of all generating sources serving the system, excluding the low-operating cost and must run power plants.

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

With:

- $F_{i,j,y}$ the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*. *j* refers to the power sources delivering electricity to the grid, not including low operating costs and must-run power plants, and including imports to the grid[3].
- $COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of fuels used by relevant power sources *j* and the percentage oxidation of the fuel in year(s) *y*;

[3] The Central China Grid is a net exporter of power and therefore imports have not been included in the calculations.

- $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO2 emission coefficient is equal to the net calorific value of fuel i, multiplied by the oxidation factor of the fuel and the CO2 emission factor per unit of energy of the fuel i.

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad \text{(B.2)}$$

With:

- NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*,
- $OXID_i$ is the oxidation factor of the fuel,
- $EFC_{O2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Data vintage selection

In accordance with the ACM0002 methodology and the choice for an ex ante calculation of the OM Emission Factor, the formula (B.1) is applied to the three latest years for which data are available, and a full-generation weighted average value is taken for the OM Emission Factor.

Choice of aggregated data sources

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the CO2 emission factor and the oxidation rate. According to the ACM0002 methodology, the selection of aggregated data for the calculation of the emission factors should be used, but the disaggregated data needed for all three more preferred methodological choices is not publicly available in China.

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 2003, 2004 and 2005 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 1.29093 tCO2/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.

<u>Step 2. Calculation of the Build Margin Emission Factor</u> ($EF_{BM,y}$)

The Build Margin Emission Factor is, according to ACM0002, calculated as the generation weighted average emission factor (measured in tCO_2/MWh) of a sample of *m* power plants:

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

$F_{i,m,y}$, $COEF_{i,m}$ *and* $GEN_{m,y}$ in the formula above are analogous to those in equation 1, except for the fact that the index *m* is over specific power plants rather than types of power plants, and that low cost/must run sources are not excluded. The sample, 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, whatever is the greater.

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 ACM0002 methodology as 1) the AM0005 methodology has been discontinued and the ACM0002 methodology incorporates in terms of scope projects that would have been eligible to use AM0005, 2) the ACM0002 methodology is based, among others, on NM0023, which was the basis for AM0005, and thus ACM0002 among its possible calculation methods incorporates the AM0005 methodology, and 3) the AMS-1.D methodology refers to the ACM0002 methodology for the baseline emission factor calculation method.

The calculation of the published BM Emission Factor is based on this approach and is described below:

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[4] . Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology, IPCC default oxidation factors 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 CO_2 emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

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

Detailed steps and formulas are as below:

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4 Newly added capacity is determined as follows. First, the latest year (2005) for which data on total installed capacity are available is identified. Then, the last year is identified in which the total installed capacity was below 80% of the total installed capacity in 2005. 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.

First, we calculate the share of CO_2 emissions of the solid, liquid and gaseous fuels in total emissions respectively .

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{B.4}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{B.5}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

with:

- $F_{i,j,y}$ the amount of the fuel i consumed in y year of j province (measured in tce;
- $COEF_{i,j,y}$ the emission factor of fuel i (measured in tCO2/tce) while taking into account the carbon content and oxidation rate of the fuel *i* consumed in year *y*;
- *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

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \tag{B.7}$$

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

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \tag{B.8}$$

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

The λs are calculated on the basis of the weight of CO2 emissions of each type of fuel in the total CO2 emissions from thermal power. Recalculation of the λs on the basis of publicly available data yields a different result than the data published by the DNA. In addition, a small difference exists between the official statistics (i.e. China Electric Yearbook) and the data used to calculate the published emission factors. Subsequent calculation of the Build Margin emission factor yields a baseline emission factor of 0.50830 tCO2/MWh.

For details we refer to Annex 3.

The calculation of the BM emission factor 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 3. Calculation of the Baseline Emission Factor (EF_y)

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

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

The latest version of ACM0002 (version 6) provides the following default weights: Operating Margin, $w_{OM} = 0.5$; Build Margin, $w_{BM} = 0.5$

Applying the default weights and the published emission factors, we calculate a Baseline Emission Factor of **0.89961** tCO2 / MWh.

Step 4. Calculation of Baseline Emissions

Baseline Emissions are calculated by multiplying the Baseline Emission factor by annual power generation.

$$BE_y = (EG_y - EG_{baseline}) \cdot EF_y \quad \text{(B.10)}$$

With:

- BE_y the baseline emissions in year *y*, EG_y the electricity supplied by the project activity to the grid,
- $EG_{baseline}$, the baseline electricity supplied to the grid in the case of modified or retrofit facilities and
- EF_y the emission factor in year *y*, calculated according to formulas (B.1)-(B.5). As the project involves the construction of a new hydropower station, $EG_{baseline}$ is zero and formula B.10 can be simplified as:

$$BE_y = EG_y \cdot EF_y \quad \text{(B.11)}$$

The estimated baseline emissions (see Section A.4.4) are based on expected power generation and an *ex ante* calculation of the emission factor, and will hence be revised during the implementation of the project activity on the basis of actual power supply to the grid. The baseline emission factor, however, is left unchanged during the first crediting period.

Step 5. Calculation of emission reductions

Emission reductions are calculated according to the following formula:

$$ER_y = BE_y - PE_y - L_y \quad \text{(B.12)}$$

With:

- ER_y, emission reductions in year y,
- BE_y, baseline emissions in year *y*,
- PE_y, project emissions in year *y*,
- L_y, leakage in year *y*

The project does not involve project emissions or leakage as further explained in section B.6.3, and therefore project emissions are equal to baseline emissions. Using the results of the preceding sections, we can calculate the emission reductions using formula B.13

$$ER_y = EG_y * 0.89961 \qquad \text{(B.13)}$$

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

Data / Parameter:	**Power generation by source**
Data unit:	GWh (per annum)
Description:	Provincial level power generation data by source
Source of data used:	China Electric Power Yearbook (Editions 2003, 2004, 2005 and 2006)
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:	**Internal power consumption of power plants**
Data unit:	Percentage
Description:	Internal consumption of power by source
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Electric Power Yearbook (Editions 2004, 2005 and 2006)
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 and most recent data available, and use the same data publication (although more recent editions) as the calculation of the emission factors published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Primary fuel input for thermal power supply**
Data unit:	10^4 tons, 10^8 m^3, 10^4 tce, depending on the specific fuel. We refer to Annex 3 for details.
Description:	Physical amount of fuel input, for 17 different fuels
Source of data used:	China Energy Statistical Yearbook 2006, 2005 and 2004 Editions

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

Data / Parameter:	**Efficiency of advanced thermal power plant additions**
Data unit:	%
Description:	
Source of data used:	See the downloadable files mentioned above for the full data set. Data are based on the best technologies available in China.
Value applied:	Coal: 35.82%; Oil: 47.67%; Gas: 47.67%
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 2003, 2004 and 2005 in the Central China Grid. Calculated by summing provincial data.
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
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 17 different fuels
Source of data used:	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 :	
Any comment:	

Data / Parameter:	**Fuel Emission Coefficients**
Data unit:	Tons C/TJ
Description:	Carbon emission factors for 17 different fuels
Source of data used:	Data used are IPCC default values. See 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 :	
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 2004, 2005 and 2006)
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:	The Central Power Grid does not import electricity; imports are zero

Data / Parameter:	**Net Calorific Value**
Data unit:	$TJ/10^4$ tons; $TJ/10^4$ tce; $TJ/10^8 m^3$
Description:	Net calorific values of 17 different fuels in TJ per unit.
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Energy Statistical Yearbook, (2004) p. 302.
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The annual net power supply to the Central China Grid is estimated to be 50,560.4 MWh.

Application of the formulae presented in Section B to the baseline data presented in Annex 3 yields the following results:
EF_{OM} = 1.29093 t CO2/MWh
EF_{BM} = 0.50830 t CO2/MWh
EFy = 0.5*1.29093 + 0.5*0.50830 = 0.89961 tCO2/MWh

The annual net power supply to the Central China Grid is estimated to be 50,560.4 MWh.

The annual baseline emissions BE_y are thus calculated to be 45,485 tCO2. We obtain the values for the baseline emissions during the first crediting period provided in Table B.5:

Table B.5 The estimation of the emission reductions in crediting period

Year	Year	Annual net power supply to the grid (EGy) (MWh)	Baseline emission factor (tCO_2/MWh)	Baseline emissions (tCO_2e)
1	01/06/2008 – 31/05/2009	50,560.4	0.89961	45,485
2	01/06/2009 – 31/05/2010	50,560.4	0.89961	45,485
3	01/06/2010 – 31/05/2011	50,560.4	0.89961	45,485
4	01/06/2011 – 31/05/2012	50,560.4	0.89961	45,485
5	01/06/2012 – 31/05/2013	50,560.4	0.89961	45,485
6	01/06/2013 – 31/05/2014	50,560.4	0.89961	45,485
7	01/06/2014 – 31/05/2015	50,560.4	0.89961	45,485
	Total			**318,395**
	Average			45,485

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:

$$ER_y = BE_y - PE_y - L_y$$

Leakage:

The project activity involves the construction of a new hydropower station with a power density greater than 10 W/m2 and therefore emissions from the reservoir do not have to be taken into account.
In accordance with the ACM0002 methodology, leakage and project emissions are equal to zero, and hence, the emission reductions due to the project are equal to the baseline emissions. The emission reductions will be calculated *ex post* on the basis of actual power supply to the grid, using the baseline emission factor presented above in Section B.6.1.

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

Table B.6 provides the annual emission reductions in tabular form.

Table B.6 *Ex-ante* estimate of emission reductions due to the project

Year	Project Emissions (tCO2)	Baseline emissions (tCO2)	Leakage (tCO2)	Emission Reductions (tCO2)
Year 1: 01/06/2008 - 31/05/2009	0	45,485	0	45,485
Year 2: 01/06/2009 - 31/05/2010	0	45,485	0	45,485
Year 3: 01/06/2010 - 31/05/2011	0	45,485	0	45,485
Year 4: 01/06/2011 - 31/05/2012	0	45,485	0	45,485
Year 5: 01/06/2012 - 31/05/2013	0	45,485	0	45,485
Year 6: 01/06/2013 - 31/05/2014	0	45,485	0	45,485
Year 7: 01/06/2014 - 30/11/2015	0	45,485	0	45,485
Subtotal	**0**	**318,395**	**0**	**318,395**
Average	0	45,485	0	45,485

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

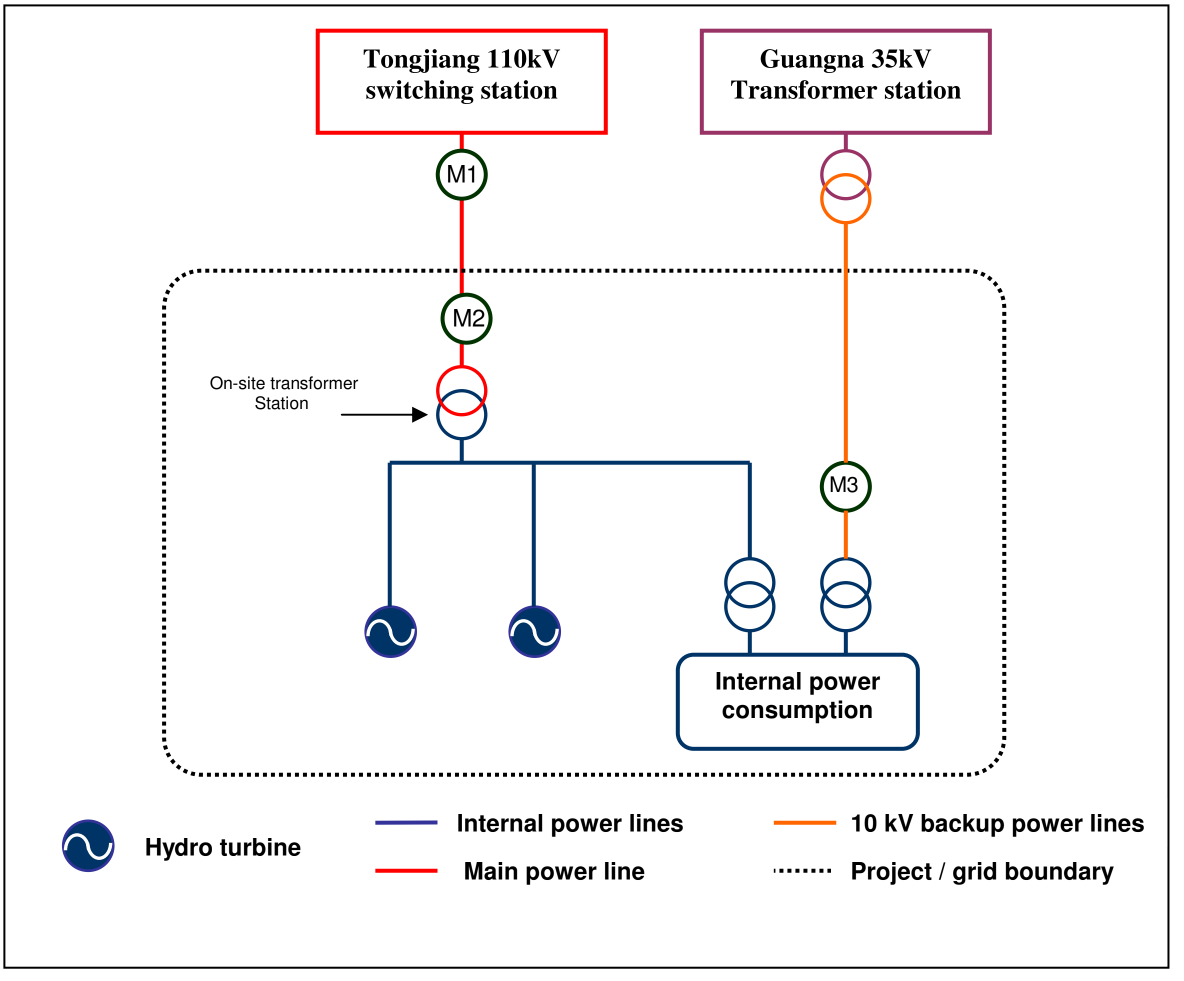
B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Electricity supplied to the grid by the project
Source of data to be used:	Directly measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50,560.4 MWh
Description of measurement methods and procedures to be applied:	The net supply of power to the grid by the Sichuan Tongjiang Gaokeng Hydropower Station Project Project is measured through national standard electricity metering instruments. The metering instruments will be calibrated annually in accordance with the *"Technical administrative code of electric energy metering (DL/T448 —2000)"*. The net amount of power supplied is measured and recorded monthly.
QA/QC procedures to be applied:	These data will be directly used for calculation of emission reductions. Sales record to the grid and other records are used to ensure the consistency.
Any comment:	The measured electricity supply will be double checked by receipts of sales to the grid. (see also Section B.7.2 for more details)

B.7.2 Description of the monitoring plan:

The project is connected to the grid through an on-site transformer station. The project connects to Tongjiang 110kV transformer, which functions as a switching station to connect the project to the grid. The power supplied to the grid is metered by the project entity at a point after power has been transformed (see figure B.3). Therefore, no further transformer losses will occur before the project is connected to the grid.

Figure B.3. Simplified electrical grid connection diagram



The net power supply of the project to the grid through the main power line will be metered by the project entity with meter M2, which is located at the high-voltage side of the step-up transformer station that will be constructed at the project site. The metering instrument M2 will record two readings, i.e. power delivered to the grid and power received from the grid. The project entity will log both readings and the difference, i.e. power delivered minus power received, will be taken as net power supply through this connection. The grid company will also meter the net power supply to the grid with its own metering equipment, i.e. meter M1. The regulations of the grid company require annual calibrations of both metering instruments. Calibrations are carried out by the grid company. After calibration, meters M1 and M2 will be sealed. The accuracy of the metering instruments M1 and M2 is Accuracy Class 0.2S. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, both instruments will be recalibrated. In case of emergencies, the project will receive electricity from the Guangna 35kV Transformer station. Power received from the grid will be metered by meter M3 (located on-site) which is owned by the grid company. Meter M3 will also be calibrated annually by the grid company. The accuracy class is 0.5S.

The project entity will collect the sales receipts for power supplied to the grid and billing receipts for power received from the grid as evidence for the readings of meter M1 and M3. The net supply (i.e. gross supply minus supply by the grid to the project) will be used in the calculations. In case of discrepancies between the metering instruments of the grid company and the project entity, the readings of the grid company will prevail. All records will be collected in a central place by the project entity.

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. Data record will be archived for a period of 2 years after the crediting period to which the records pertain. An overview of the recording frequency, calibration procedures and available documentation is provided in Table B.11. The numbering of the metering equipment refers to Figure B.3 which shows the location of each meter.

Finally, the project entity will monitor the surface area of the reservoir by collecting photographic evidence of the surface level when the project becomes operational. This photographic evidence will be compared with the design reservoir dimensions to confirm whether or not the actual surface area substantially deviates from the design surface area.

Table B.11 Details of metering instruments

Meter	Operated by	Electronic measurement	Manual measurement	Recording	Calibration	Accuracy	Documentation
M1	Grid company	-	-	Monthly	Grid Company (Annually)	Accuracy Class 0.2S or more accurate	Monthly sales receipts (for power delivered to grid) and billing invoices (for power received from the grid) provided by the grid company
M2	Project entity	Continuous	Daily (optional)[5]	Monthly	Grid Company (Annually)	Accuracy Class 0.2S or more accurate	Print out of electronic record and optional paper log. Data will consist of two readings, i.e. power delivered to the grid and power received from the grid.
M3	Grid company	-	-	Monthly	Grid Company (Annually)	Accuracy Class 0.5S or more accurate	Monthly billing receipts (for power received from the grid) provided by the grid company.

5 The project entity intends to log the readings of meters M2 manually in daily logs, but these logs will not form a formal requirement during verification. The ACM0002 methodology only requires hourly electronic measurement and these manual log records will only be maintained for back-up purposes. The project entity may deviate from this procedure during actual operation of the project.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

Damages to metering equipment:

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

1. **In case metering equipment operated by project entity is damaged only:**
   The metering data logged by the grid company, evidenced by sales receipts will be used as record of net power supplied to the grid for the days for which no record could be recorded.
2. **In case both metering equipment operated by project entity and grid company is damaged:**
   The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating
   ► the background to the damage to metering equipment
   ► the assumptions used to estimate net supply to the grid for the days for which no record could be recorded
   ► the estimation of power supplied to the grid
   The statement will be signed by both a representative of the project entity as well as a representative of the grid company.
3. **In case the metering equipment operated by the grid company for metering of emergency power consumption is damaged:**
   The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating
   ► the background to the damage to metering equipment
   ► the assumptions used to estimate net supply to the grid for the days for which no record could be recorded
   ► the estimation of power supplied to the grid
   The statement will be signed by both a representative of the project entity as well as a representative of the grid company.

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 following procedure for declaring the emergency period to be over:

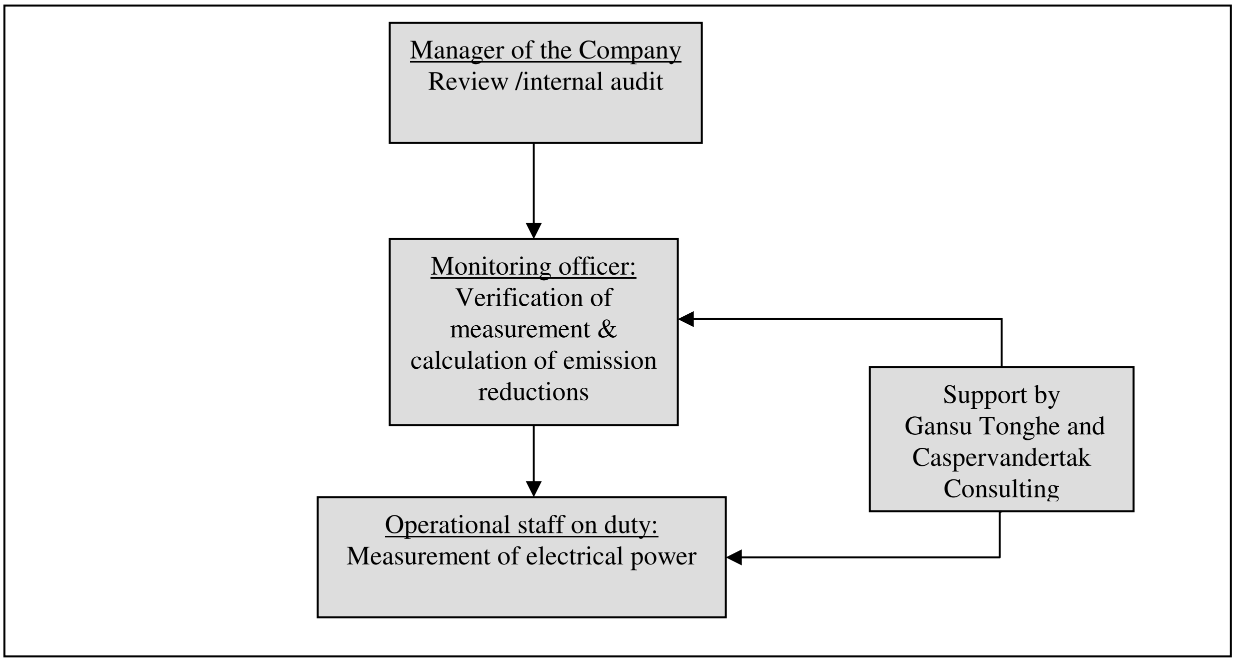
1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have 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 receipts, collection of billing receipts of the power supplied by the grid to the hydropower plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the hydropower station including operating periods, power generation, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by the manager of the company.

Figure B.4. Management structure in order to monitor emission reductions



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

Date of completion of the baseline study and monitoring methodology: 02/07/2007

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

Caspervandertak Consulting

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-Zhao Yonghong:	Consultant:	mei.yang@126.com
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Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd. are both 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:

07/12/2005 (this day marked the start of construction activities)

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

25 years 0 months

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

C.2.1. Renewable crediting period

A renewable crediting period will be used.

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

01/06/2008

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Not applicable, a renewable crediting period will be applied.

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

An Environmental Impact Assessment (EIA) was carried out and was accepted by the Environmental Protection Bureau of Sichuan Province on the 13th of December 2004 A summary of the main findings of the EIA is provided below:

SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT

The area under assessment lies in the Northeast of the Sichuan basin. Located near Daba Mountains, the valley is deep; the riverbed is flat, about 140 to 250 meters wide. The climate is semi-tropical with an average temperature of 16.6 degrees Celsius. The top of the mountains in the project area is covered with Chinese red pine tree forests. There are no rare or endangered plants or animals under National protection in the project area. There are no migratory fish in the river. Before construction, water and air quality meet environmental standards. Noise pollution exceeds the standards, due to the heavy traffic on the Tongguang road nearby.

Main positive impacts

1) The project replaces the use of fuel and coal, improving local energy resources and protecting the forests, vegetation and environment. Furthermore, with appropriate soil & water conservation measures, the vegetation ratio in the area will be increased.
2) The construction of the project can provide electricity and therefore improve the sustainability of power generation in the area.

Main negative impacts

1) Project construction
   The main source of water pollution is sewage from gravel and sand mixture, which cannot be discharged directly into the river and must be disposed timely in order to meet discharge standards. The noise, generated mainly by explosions, machines, concrete processing, and vehicles during the construction period, could exceed the standard and impact construction staff as well as surrounding environment. Vehicles will also produce gas (mainly SO_2, CO and NO_x) and dust, which will affect the air quality.
2) Reservoir flooding and relocation:
   The vegetation in the area is widely dispersed so the impact of the reservoir on natural environment is minor. The displaced residents will be relocated within the ambient area, where agricultural conditions are comparatively developed. Consequently, production levels and living standards will not be negatively impacted. After the reservoir is filled up, the water flow will decrease but water quality will not be affected, even though humidity may increase in some areas.

Environmental protection measures

1) During construction period, with regard to the production sewage, domestic sewage and domestic garbage, the following measures will be enforced to meet environment protection requirements:
   - Production sewage from gravel & sand treatment will be distilled
   - Sewage from concrete mixture will be filtered
   - Sewage containing oil will be disposed through grease trap
   - Domestic sewage will be collected for irrigation or fertilizing.

- Domestic garbage will be disposed either at landfill or transported to the town garbage treatment facilities.

Regarding soil erosion, a comprehensive prevention & control system will be constituted. This system combines permanent measures with temporary measures. It consists of:
- A retaining wall of the slag disposal pit
- Slope protection
- Drainage project
- Landscape engineering and other water conservation measures

The soil erosion control ratio will reach 90% and the general environment within the project area will be improved.
Waste gas from vehicles should satisfy the standard. The ground will be watered to reduce dust.
Noise protection measures will be enforced for construction staff and local residents exposed will be compensated.

2) Reservoir and relocated residents
Only few residents will be displaced, so the impact is limited. Regarding public health, appropriate measures will be taken, such as epidemic situation prevention & control system.
In order to protect ambient environment it is forbidden to open polluting enterprises within the reservoir area. During operation, water quality will be controlled to meet the requirements for water quality of level III.

Conclusion:
The construction of Gaokeng hydropower station complies with the Industrial policy and general development plan of Tongjiang County and the location is suitable.
The results of the assessment show that the project has economic as well as environmental benefits. The main negative impacts are during construction period and can be minimized with appropriate measures.
The project is feasible from an environmental point of view.

Recommendations:
- Favourable policies will be implemented in the relocation area to support business activities (ex: tax rebates) and to protect environment (ex: ban on cutting trees or land development to avoid soil erosion).
- After construction of the project, it is forbidden to set up any enterprise that would pollute the water resources, to preserve water quality in the reservoir.

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 Form (EIA) was approved by the Environment Protection Bureau of Sichuan Province on the 13th of December 2004.

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 the 20th of March to the 20th of April of 2007, and consisted of the following elements:

- **Establishment of a website:**
  The website (http://www.cdmasia.org/CDMprojects.htm) contained information on the project, CDM, the stakeholder consultation process and provided an opportunity to post comments by e-mail or by telephone.
- **Organization of a stakeholder consultation meeting near project site:**
  Date / time: 30th of March 2007, from 9:00am till 11:30am.
  Location: Second floor meeting room of Kaiyuan Hotel of Tongjiang 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
  - Closing of the meeting

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

- Newspaper announcement on March 20th, 2007, in the Bazhong Daily (County's leading daily newspaper)
- Online announcement on the Tongjiang County Government Site: www.sctj.gov.cn on the 20th of January, 2007.

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	Position
1	CPPCC Tongjiang commission	Zhao Hongbing	Vice chairman
2	Local government of Tongjiang county	Deng Qi	Vice secretary of the Party
3	Agricultural bank Tongjiang branch	Liu Dali	Director
4	Agricultural bank Tongjiang branch	Xu Zhixin	Project manager
5	Jintang village of Tongjiang county	Li Zhilan	Secretary of the Party
6	Jintang village of Tongjiang county	Zhao Lingde	Director of the village commission
7	Jintang village of Tongjiang county	Li Shaohong	Villager
8	Jintang village of Tongjiang county	Li Yong	Villager
9	Jintang village of Tongjiang county	Zhao Qianlie	Villager
10	Jintang village of Tongjiang county	Zhao Kezheng	Villager
11	Land resource bureau, Tongjiang county	Shao Zhihong	Director
12	Land resource bureau, Tongjiang county	Zhang Xiaoming	Representative
13	Environment Prot. Bureau, Tongjiang county	Li Guo	Representative
14	Guangna town at Tongjiang county	Zhang Zhiwen	Mayor of the town
15	Merchants bureau of Tongjiang county	Zhu Zhaoxuan	Representative
16	Poverty alleviation bureau, Tongjiang county	Wang Lixin	Director
17	CVDT consulting	Christophe Assicot	Consultant
18	Gansu Tonghe Investment project consulting	Zhao Yonghong	Project manager
19	Gansu Tonghe Investment project consulting	Wang Chunyun	Consultant
20	Sichuan Yili Energy Investment Development Co., ltd.	Chen Tianfu	Vice general manager
21	Sichuan Yili Energy Investment Development Co., ltd.	Chen Jie	General manager

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 Sichuan Yili Energy Investment Development Co., ltd.:
- Mr. Chen Jie (General Manager)
- Mr. Chen Tianfu (General Vice-Manager)

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

Name: Zhao Hongbing
Position / Affiliation: Vice-chairman of the CPPCC Tongjiang commission
Comments:
Mr. Zhao explains that the Gaokeng station will offer employment opportunities for local residents both during construction and operation period. After implementation, the power supplied to the grid will contribute to local development. He adds that there are no negative impacts on environment: No migrant fish, a design that takes into account a “once every 500 years” flooding probability, majority of flooded land is riverbed land.

Name: Deng Qi
Position / Affiliation: Vice-secretary of the Party's commission, Tongjiang County
Comments:
Mr. Deng says that the local Government strongly supports the project because it is environment-friendly. The surface expropriated is small and only one family will be relocated. There's a power shortage at present in Tongjiang County and power cuts are frequent. Therefore, Tongjiang County will undoubtedly benefit from the project.
Mr. Chen Jie, from the project entity made further explanation that the relocated family will be so only for safety purposes. Thus, the original house won't be flooded by the reservoir but is located below the "once every 10 years" flood level. The family will simply be displaced on a higher part of the land.
Name: Li Shaohong
Position / Affiliation: Villager, Jintang village
Comments:
Mr. Li confirms that the villagers are satisfied with the compensation. He reckons the project will facilitate land irrigation since the water level will be raised.

Question asked by Mr. Christophe Assicot, from CVDT consulting: Where do the villagers get drinking water from?
Mr. Li replied that all drinking water comes from spring water in the mountains.

Name: Zhao Qianlie
Position / Affiliation: Villager, Jintang village
Mr. Zhao notes that local residents use donkeys for grain grinding at present. He believes that, when the project is finished, people will use electric grinding machines.

Name: Mr. Zhao Yonghong
Position / Affiliation: Project Manager Gansu Tonghe Investment Project Consulting Co., ltd.
Comments:
Mr. Zhao Yonghong wanted to know which village accounts for most land expropriations, and how the villagers' life is changing after land expropriation?

Response by Mr. Shao Zhihong (general director of land resource bureau, Tongjiang County)
Jintang village is most impacted village with 3.15mu of land expropriated, most of this land being riverbed land. The population in the village is 1,000 and the plowland is amounts to 1,000mu.

Response by Mr. Li Zhilan (Jintang village leader)
Mr. Li assures there is no significant change in living standards because only 24% of the village's income comes from agriculture. In addition, the output of expropriated land was low compared to remaining plowland.

Name: Mr. Zhao Zhihong
Position / Affiliation: Land resource bureau, general director, Tongjiang County
Comments:
Mr. Shao brings forward that expropriation work is executed in accordance with the law. The expropriated land is mostly riverbed or abandoned land. Only a limited part is actual plowland.

Name: Mr. Chen Jie
Position / Affiliation: General Manger, Project entity
Comments:
Mr. Chen explains that the hydropower station doesn't comprise a water diversion structure; therefore the volume excavated is relatively small. Restoration work such as tree & grass planting will start after construction.

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

Given the generally positive (or neutral) nature of the comments received, no action will been taken to solve the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The project entity:

Organization:	Sichuan Yili Energy Investment Development Co., ltd.
Street/P.O.Box:	The third floor of Xiozu garden on Chengnan road.
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City:	Tongjiang county seat
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E-Mail:	
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Title:	vice manager and financing supervisor
Salutation:	Mr
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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

The baseline uses basically the same methodology as used in the calculation of the OM and BM emission factors published by the Chinese authorities for climate change on the internet. Full information on the calculation of the baseline and underlying data can be found at:

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1361.pdf : calculation result of the baseline emission factor of Chinese power grid.
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls: calculation process of the baseline OM emission factor of Chinese power grid
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1359.pdf: calculation process of the baseline BM emission factor of Chinese power grid

Note: We recalculated the Operating Margin (OM) and Build Margin (BM) emission factors on the basis of the publicly available data quoted in the calculation of the published emission factors. We have also used the most recently published data from the China Electric Power Yearbook 2006 and the China Energy Statistical Yearbook. For these reasons, the calculated emission factors differ from the emission factors published by the Chinese authorities.

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 A	Value and Source B	Weight C	Weighted value D = B * C
1	EF_{OM}	1.29093 Table A2	0.5	0.64546
2	EF_{BM}	0.50830 Table A5	0.5	0.25415
3	CM			0.89961 D1 + D2

Table A2. Calculation of the Operating Margin Emission Factor

	Variable	2003 A	2004 B	2005 C	Total D
1	Supply of thermal power to Central China grid (MWh)	225,987,719 Table A3c, C7	249,074,186 Table A3b, C7	286,203,305 Table A3a, C7	761,265,210 D1 = A1 + B1 + C1
2	Imports of power from other grids (MWh)	0 Files cited above	0 Files cited above	0 Files cited above	0 D2 = A2 + B2 + C2
3	Total power supply for	225,987,719	249,074,186	286,203,305	761,265,210

	calculation EF_{OM} (MWh)	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)	276,371,085	346,043,286	360,323,575	982,737,946
		Table A4c, E	Table A4b, E	Table A4a, E	D4 = A4 + B4 + C4
5	CO2 emissions associated with power imports from other grids (tCO2)	0	0	0	0
		Table A9c, E	Table A9b, E	Table A9a, E	D5 = A5 + B5 + C5
6	Total CO2 emissions for calculation EF_{OM} (tCO2)	276,371,085	346,043,286	360,323,575	982,737,946
		A6 = A4 + A5	B6 = B4 + B5	C6 = C4 + C5	D6 = D4 + D5
7	EFOM (tCO2/MWh)	1.22295	1.38932	1.25898	1.29093
		A6 / A3	B6 / B3	C6 / C3	D6 / D3

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

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

Source: China Electric Power Yearbook 2006, p. 559, 568.

Table A3b. Calculation of thermal power supply to Central China Grid, 2004

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Jiangxi	30,127,000	7.04	28,006,059
2	Henan	109,352,000	8.19	100,396,071
3	Hubei	43,034,000	6.58	40,202,363
4	Hunan	37,186,000	7.47	34,408,206
5	Chongqing	16,520,000	11.06	14,692,888
6	Sichuan	34,627,000	9.41	31,368,599
7	Central China			249,074,186
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2005, p. 472-474.

Table A3c. Calculation of thermal power supply to Central China Grid, 2003

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Jiangxi	27,165,000	6.43	25,418,291
2	Henan	95,518,000	7.68	88,182,218
3	Hubei	39,532,000	3.81	38,025,831
4	Hunan	29,501,000	4.58	28,149,854
5	Chongqing	16,341,000	8.97	14,875,212
6	Sichuan	32,782,000	4.41	31,336,314
7	Central China			225,987,719
				C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2004, p. 670, p. 709.

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

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Central China	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								Grid	(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,869.29	7,638.87	2,732.15	1,712.27	875.40	2,999.77	17,827.75	209.08	1	25.8	352,614,496.76
Clean coal	10^4 Tons	0.02	0.00	0.00	0.00	0.00	0.00	0.02	263.44	1	25.8	498.43
Other washed coal	10^4 Tons	0.00	138.12	0.00	0.00	89.99	0.00	228.11	83.63	1	25.8	1,804,669.00
Briquettes	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.63	1	26.5	0.00
Coke	10^4 Tons	0.00	25.95	0.00	105.00	0.00	0.00	130.95	284.35	1	29.2	3,986,695.05
Coke oven gas	10^8 m^3	0.00	0.00	1.15	0.00	0.36	0.00	1.51	1672.6	1	12.1	112,053.61
Other gas	10^8 m^3	0.00	10.20	0.00	0.00	3.12	0.00	13.32	522.7	1	12.1	308,896.88
Crude oil	10^4 Tons	0.00	0.82	0.36	0.00	0.00	0.00	1.18	418.16	1	20	36,184.78
Gasoline	10^4 Tons	0.00	0.02	0.00	0.00	0.02	0.00	0.04	430.7	1	18.9	1,193.90
Diesel	10^4 Tons	1.30	3.03	2.39	1.39	1.38	0.00	9.49	426.52	1	20.2	299,797.78
Fuel oil	10^4 Tons	0.64	0.29	3.15	1.68	0.89	2.22	8.87	418.16	1	21.1	286,959.09
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	501.79	1	17.2	0.00
Refinery gas	10^4 Tons	0.71	3.41	1.76	0.78	0.00	0.00	6.66	460.55	1	15.7	176,572.11
Natural gas	10^8 m^3	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3893.1	1	15.3	655,208.73
Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	383.69	1	20	0.00
Other coking products	10^4 Tons	0.00	0.00	0.00	1.50	0.00	0.00	1.50	284.35	1	25.8	40,349.27
Other E (standard coal)	10^4 Tce	0.00	2.88	0.00	1.74	32.80	0.00	37.42	292.7	1	0	0.00
Total												360,323,575.39
												$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2006, p. 226-245. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories,; fuel emission coefficients are IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A4b. Calculation of CO2 emissions from fuels for thermal power production, Central China Grid, 2004.

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Central China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
									(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,863.80	6,948.50	2,510.50	2,197.90	875.5	2,747.90	17,144.10	209.08	1	25.8	339,092,605.29
Clean coal	10^4 Tons	0	2.34	0	0	0	0	2.34	263.44	1	25.8	58,316.13
Other washed coal	10^4 Tons	48.93	104.22	0	0	89.72	0	242.87	83.63	1	25.8	1,921,441.23
Briquettes	10^4 Tons	0	0	0	0.92	0	0	0.92	83.63	1	26.5	7,475.96
Coke	10^4 Tons	0	109.61	0	0	0	0	109.61	284.35	1	29.2	3,337,011.41
Coke oven gas	10^8 m^3	0	0	1.68	0	0.34	0	2.02	1672.6	1	12.1	149,899.53
Other gas	10^8 m^3	0	0	0	0	2.61	0	2.61	522.7	1	12.1	60,527.09
Crude oil	10^4 Tons	0	0.86	0.22	0	0	0	1.08	418.16	1	20	33,118.27
Gasoline	10^4 Tons	0	0.06	0	0	0.01	0	0.07	430.7	1	18.9	2,089.33
Diesel	10^4 Tons	0.02	3.86	1.7	1.72	1.14	0	8.44	426.52	1	20.2	266,627.32
Fuel oil	10^4 Tons	1.09	0.19	9.55	1.38	0.48	1.68	14.37	418.16	1	21.1	464,893.14
LPG	10^4 Tons	0	0	0	0	0	0	0.00	501.79	1	17.2	0.00
Refinery gas	10^4 Tons	3.52	2.27	0	0	0	0	5.79	460.55	1	15.7	153,506.38
Natural gas	10^8 m^3	0	0	0	0	0	2.27	2.27	3893.1	1	15.3	495,774.61
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0.00	383.69	1	20	0.00
Other coking products	10^4 Tons	0	0	0	0	0	0	0.00	284.35	1	25.8	0.00
Other E (standard coal)	10^4 Tce	0	16.92	0	15.2	20.95	0	53.07	292.7	1	0	0.00
Total												346,043,285.70
												$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2005, p. 302-314. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories; fuel emission coefficients are IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A4c. Calculation of CO2 emissions from fuels for thermal power production, Central China Grid, 2003.

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Central China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
									(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,427.41	5,504.94	2,072.44	1,646.47	769.47	2,430.93	13,851.66	209.08	1	25.8	273,971,539.89
Clean coal	10^4 Tons	0	0	0	0	0	0	0.00	263.44	1	25.8	0.00
Other washed coal	10^4 Tons	2.03	39.63	0	0	106.12	0	147.78	83.63	1	25.8	1,169,146.40
Briquettes	10^4 Tons	0	0	0	0	0	0	0.00	83.63	1	26.5	0.00
Coke	10^4 Tons	0	0	0	1.22	0	0	1.22	284.35	1	29.2	37,142.18
Coke oven gas	10^8 m^3	0	0	0.93	0	0	0	0.93	1672.6	1	12.1	69,013.15
Other gas	10^8 m^3	0	0	0	0	0	0	0.00	522.7	1	12.1	0.00
Crude oil	10^4 Tons	0	0.5	0.24	0	0	1.2	1.94	418.16	1	20	59,490.23
Gasoline	10^4 Tons	0	0	0	0	0	0	0.00	430.7	1	18.9	0.00
Diesel	10^4 Tons	0.52	2.54	0.69	1.21	0.77	0	5.73	426.52	1	20.2	181,015.94
Fuel oil	10^4 Tons	0.42	0.25	2.17	0.54	0.28	1.2	4.86	418.16	1	21.1	157,229.00
LPG	10^4 Tons	0	0	0	0	0	0	0.00	501.79	1	17.2	0.00
Refinery gas	10^4 Tons	1.76	6.53	0	0.66	0	0	8.95	460.55	1	15.7	237,285.34
Natural gas	10^8 m^3	0	0	0	0	0.04	2.2	2.24	3893.1	1	15.3	489,222.52
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0.00	383.69	1	20	0.00
Other coking products	10^4 Tons	0	0	0	0	0	0	0.00	284.35	1	25.8	0.00
Other E (standard coal)	10^4 Tce	0	11.04	0	0	16.2	0	27.24	292.7	1	0	0.00
Total												276,371,084.63
												$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2004, p. 246-261. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories; fuel emission coefficients are IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories..

Table A5. Calculation of the BM Emission Factor, Central China Grid

$EF_{thermal}$ (tCO2/MWh)	Share of thermal power in added capacity, 2005-2003	EF_{BM} (tCO2/MWh)
A	B	C = A * B
0.95434	53.26%	0.50830
Table A6	Table A9	

Table A6. Calculation of EF thermal

		λ A	EF_{adv} B	$EF_{thermal}$ calculation C = A * B
1	Coal	99.48%	0.95678	0.95179
		Table A8	Table A7	
2	Gas	0.35%	0.44952	0.00156
		Table A8	Table A7	
3	Oil	0.17%	0.57012	0.00099
		Table A8	Table A7	
4	$EF_{thermal}$			0.95434

Table A7. Calculation of Emission factors of fuel using advanced technologies

Fuel	Efficiency (%) A	Carbon coefficient (tc/TJ) B	Oxidation factor C	EF_{adv} (tCO2/MWh) D=(3.6/(A*1000))*B*C*44/12
Coal	35.82%	26.0	1	0.95677827
Gas	47.67%	16.2	1	0.449523224
Oil	47.67%	20.6	1	0.570120626

Source: Files downloaded and mentioned above.

Table A7a. Weighted average carbon coefficient (tc/TJ)

	Weighted average carbon coefficient (tc/TJ)
Coal	26.0
Gas	16.2
Oil	20.6

Source: Table A8

Table A8. Calculation of λs for the calculation of the BM, Central China Grid.[6]

Fuel	Unit	Central China Grid	NCV	Total energy consumption Central China	Oxidation factor	Carbon coefficient	CO2 emissions
			(TJ/unit)	TJ	(Fraction)	(TC/TJ)	(tCO2)
		A	B		C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	17,827.75	209.08	3,727,425.97	1	25.8	352,614,497
Clean coal	10^4 Tons	0.02	263.44	5.27	1	25.8	498
Other washed coal	10^4 Tons	228.11	83.63	19,076.84	1	25.8	1,804,669
Briquettes	10^4 Tons	0.00	83.63	0.00	1	26.5	0
Coke	10^4 Tons	130.95	284.35	37,235.63	1	29.2	3,986,695
Other coking products	10^4 Tons	1.50	284.35	426.53	1	25.8	40,349
Coal, total				***3,784,170.24***	1		***358,446,709***
Coke oven gas	10^8 m^3	1.51	1672.6	2,525.63	1	12.1	112,054
Other gas	10^8 m^3	13.32	522.7	6,962.36	1	12.1	308,897
LPG	10^4 Tons	0.00	501.79	0.00	1	17.2	0
Refinery gas	10^4 Tons	6.66	460.55	3,067.26	1	15.7	176,572
Natural gas	10^8 m^3	3.00	3893.1	11,679.30	1	15.3	655,209
Gas total				***24,234.55***	1		***1,252,731***
Crude oil	10^4 Tons	1.18	418.16	493.43	1	20	36,185
Gasoline	10^4 Tons	0.04	430.7	17.23	1	18.9	1,194
Diesel	10^4 Tons	9.49	426.52	4,047.67	1	20.2	299,798
Fuel oil	10^4 Tons	8.87	418.16	3,709.08	1	21.1	286,959
Other petroleum products	10^4 Tons	0.00	383.69	0.00	1	20	0
Oil total				***8,267.41***			***624,136***
Total							***360,323,575***
							$\Sigma(E_i)$

λcoal	99.48%
λgas	0.35%
λoil	0.17%

Note: We have used the results of the above calculation for λ for the respective fuels in subsequent calculation of the BM. This is conservative. The carbon emission factor of the fuel groups (coal, gas and oil) have been calculated as a weighted average with the share of the fuels in terms of energy contents as weights. This yields slightly lower carbon emission factors and is conservative

6 Data are from Table A4a.

Table A9. Calculation of the share of thermal power in recently added capacity

Installed capacity	2001	2002	2003 A	2004 B	2005 C	Capacity added in 2001-2004 D=C-A	Share in added capacity
Thermal (MW)	42569.2	43303.2	46893.5	53744.7	60167.2	13273.7	53.26%
Hydropower (MW)	30397	31034.7	36557	42342	48205.2	11648.2	46.74%
Nuclear (MW)	0	0	0	0	0	0	0.00%
Other (MW)	0	0	0	0	0	0	0.00%
Total (MW)	72966.2	74337.9	83450.5	96086.7	108372.4	24921.9	100.00%
Percentage of 2005 capacity	67.33%	68.59%	77.00%	88.66%	100%		

Source: China Electric Power Yearbooks 2006-2005-2004-2003-2002

Annex 4

MONITORING INFORMATION

Selection procedure:
The monitoring officer will be appointed by the general manager of Sichuan Yili Energy Investment Development Co., ltd. The monitoring officer will be selected from among the senior technical or managerial staff. Before he/she commences monitoring duties, he/she will receive training on monitoring requirements and procedures by Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd.

The selection of the initial monitoring officer has taken place and the following person was appointed:
Name: Chen Tianfu
Position: Vice general manager of Sichuan Yili Energy Investment Development Co., ltd.

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

- **Supervise and verify metering and recording:**
  The monitoring officer will coordinate with the plant manager to ensure and verify adequate metering and recording of data, including power delivered to the grid.
- **Collection of additional data, sales / billing receipts:**
  The monitoring officer will collect sales receipts for power delivered to the grid, billing receipts for power delivered by the grid to the hydropower station and additional data such as the daily operational reports of the hydropower station.
- **Supervise preparation of photographic evidence reservoir surface area**
  The monitoring officer will ensure that photographic evidence of the reservoir surface area is prepared and will provide the design dimensions of the reservoir to a DOE to allow for comparison
- **Calculation of emission reductions:**
  The monitoring officer will calculate the annual emission reductions on the basis of net power supply to the grid. The monitoring officer will be provided with a calculation template in electronic form by the project’s CDM advisors.
- **Preparation of monitoring report:**
  The monitoring officer will annually prepare a monitoring report which will include among others a summary of daily operations, metering values of power supplied to and received from the grid, copies of sales/billing receipts, a report on calibration and a calculation of emission reductions.

Support:
The monitoring officer will receive support from Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd in his/her responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions
- Continuous advice to the monitoring officer on a need basis
- Review of monitoring report