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

CONTENTS

Annexes

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:

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Project: Qielong 1.2MW Hydro Power Project
Version: 03
Date of submission: 27/12/2011

Date	Version of PDD	Submission Details
23/12/2010	01	First submitted to GS
09/08/2011	02	After validation
27/12/2011	03	Submission for registration

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

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Qielong 1.2MW Hydro Power Project (hereafter referred to as "the project") is at the downstream of Qielong Gully, a branch of Daxia River, in the Madang Township, Xiahe County, Gannan Tibetan Autonomous Prefecture, Gansu Province, P.R.China.

It is developed by Xiahe Xingxin Hydropower Development Co., Ltd., involves the construction and operation of run-of-river hydro power plant that utilizes the water resources of Qielong river for power generation. Its construction includes mainly an intake gate, a flushing gate, an overflow weir, diversion canals, a forebay, and a power house. The project construction commenced in September 2007 and finished in November 2009. The hydropower station is equipped with two sets of turbines (0.4MW+0.8MW) to generate 6,050MWh electricity every year, and the annual feed-in electricity is 5,808MWh. The generated electricity will be connected to the nearby Madang Substation via a 10KV transmission line, and to replace the same amount of electricity from North West China Power Grid (NWCPG) that mainly dominated by fossil fuel-fired power plants and thus greenhouse gas (GHG) emissions will be reduced. It is estimated to reduce 4,843tCO_2e per year during the first crediting period.

As a hydro power project, the proposed project will exert positive social, environmental and economic impact and contribute to the local sustainable development through following perspectives:

1. Social wellbeing

The proposed project helps to balancing the power supply and demand in the local area by generating renewable electricity. Apart from the project construction, the project owner also paved a path to ease the local transportation, and built up a water mill and a water channel for irrigation for the local residents.

2. Economic wellbeing

This project triggers new investment in the rural region where the ethnic minorities lives. It not only provides financial return on local entities but also provides direct and indirect employment opportunities, which will lead to economic well-being of local residents. About dozens of jobs will be available during the construction period and 8 permanent jobs during the operation period.

3. Environmental wellbeing

The project utilizes local water resource to generate electricity, which will offset the equivalent amount of the electricity that is originally generated through fossil fuel-based power plants, thus helping reduce greenhouse gas emission. In addition, local vegetation will be recovered after construction period to reduce soil and water loss.

The project activity contributes to sustainable development in the ethnical minority area based on indicators of local environmental sustainability, social sustainability & development, and economic& technological development. The matrix is presented in Table A-1. Please see Annex 5 for more details.

Table A-1: Sustainable Development Indicators Matrix for the Gold Standard

Component • Indicators	Score (- to +)
Local/regional/global environment	
• Water quality and quantity	0
• Air quality (emissions other than GHGs)	0
• Other pollutants (including, where relevant, toxicity, radioactivity, POPs, stratospheric ozone layer depleting gases)	0
• Soil condition (quality and quantity)	0
• Biodiversity (species and habitat conservation)	0
Sub total	**0**
Social sustainability and development	
• Employment* (including job quality, fulfillment of labor standards)	+
• Livelihood of the poor* (including poverty alleviation, distributional equity, and access to essential services)	+
• Access to energy services*	+
• Human and institutional capacity* (including empowerment, education, involvement, gender)	+
Sub total	+
Economic and technological development	
• Employment* (numbers)	+
• Balance of payments (sustainability)	0
• Technological self reliance (including project replicability, hard currency liability, skills development, institutional capacity, technology transfer)	0
Sub total	+
TOTAL	+

A.3. Project participants:

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Name of Party involved ((host) indicates a host	Private and/or public entity(ies) project participants (as	Kindly indicate if the Party involved wishes to be

Party)	applicable)	considered as project participant（Yes/No）
People's Republic of China (host)	Xiahe Xingxin Hydropower Development Co., Ltd. (project owner)	No
The United Kingdom	Climate Bridge Ltd. (Buyer)	No

Detailed information on participants is included in Annex 1.

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

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

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Gansu Province

A.4.1.3. City/Town/Community etc:

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Madang Township, Xiahe County, Gannan Tibetan Autonomous Prefecture

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

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The proposed project is sited on downstream of Qielong Gully, a branch of Daxia River, within the administrative boundary of Madang Township, Xiahe County, Gannan Tibetan Autonomous Prefecture, Gansu Province, P.R.China.The geographical coordinates of the power house are east longitude 102.8100 and north latitude 35.3278. Figure A-1 below shows the location of the proposed project.

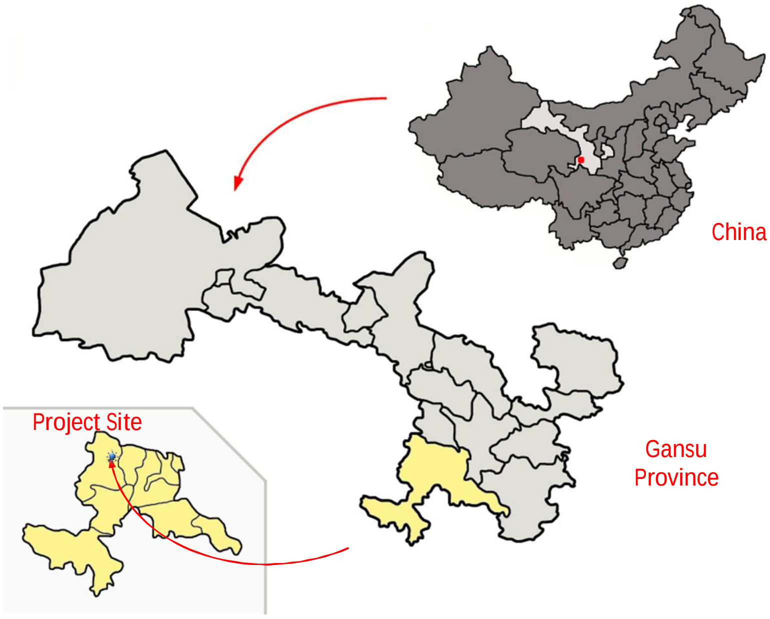

Figure A-1 Location of the Project Site

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

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The project falls in the category of Renewable Energy, according to Appendix A.1 of Gold Standard VER Project Developer's Manual.

The project adopts run-of-the-river hydro power technology which utilizes water as clean and renewable resource to generate electricity without a reservoir. The project mainly consists of an intake gate, a flushing gate, an overflow weir, diversion canals, a forebay, and a power house. Water from the Qielong River is first diverted through the water diversion system to the powerhouse to spin the turbines of associated generators for electricity generation. The installed capacity of the project is 1.2 MW, with two sets of turbines and associated generators with 0.4MW and 0.8MW respective. It is projected to deliver annually 5,808 MWh of electricity to the North West China Power Grid (NWCPG). The dispatched electricity partly replaces fossil fuel consumption in electricity generation and thus reduces CO_2 emissions The anticipated annual emission reductions would be 4,843tonnes of CO_2 equivalent over the crediting period of seven years. In the absence of the project activity, the equivalent amount of annual electricity output supplied by and purchased from the grid (NWCPG) which the proposed project is supposed to be connected into. Table A-2 below shows the technical parameters of the project.

Table A-2 Key Technical Parameters of the project

	Turbine 1	Turbine 2
Model	HLD41-WJ-65	HLD113-WJ-55
Rated Power	800KW	400KW
Manufacturer	Sichuan hongya hydroelectric generator works	Sichuan hongya hydroelectric generator works

	Generator 1	Generator 2
Model	SFW800-8/1180	SFW400-8/1180

Rated Capacity	1000kVA	500kVA
Rated Voltage	10500V	10500V
Manufacturer	Lanzhou Electric Corporation	Lanzhou Electric Corporation

No technology transfer from other countries is involved in the project activity.

The project activity is environmental safe and the PO has claimed that the project complies with local environmentally regulations.

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

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The ex-ante estimated amount of annual emission reductions over the first crediting period are 4,843tCO_2e. The renewable crediting period of 7 years × 3 is chosen. In the first crediting period from 01/01/2010 to 31/12/2016 the total emission reductions are estimated to be 33,901CO_2e.

Table A-3 Ex-ante estimated amount of emission reductions over the first crediting period

Years	**Estimation of annual emission reductions in tonnes of CO_2e**
2010	4,843
2011	4,843
2012	4,843
2013	4,843
2014	4,843
2015	4,843
2016	4,843
Total estimated reductions (tCO_2e)	33,901
The length of the crediting period(years)	7×3
Annual average of the estimated emission reductions in the crediting period (tCO_2e)	4,843

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

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The project activity does not involve public funding from Parties included in Annex I of the UNFCCC.

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

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The project participants confirm that there is no registered small-scale GS-VER project activity or an application to register another small-scale GS-VER 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.

SECTION B. APPLICATION OF A BASELINE AND MONITORING METHODOLOGY

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

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The approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.2.0) is used for the proposed project.

In line with application of the methodology the proposed project draws on the "Tool for the demonstration and assessment of additionality" (Version 05.2) and "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

For more information regarding the methodology, please refer to

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The project activity is a grid-connected renewable power generation project activity using run-of-river hydro power technology that installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant). It satisfies the applicability conditions of the methodology ACM0002 (Version 12.2. 0) as follows:

1. The project activity is the installation of hydro power plant;
2. The project has no reservoir
3. The project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activities.

Therefore, the methodology is applicable to the project activity.

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

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According to ACM0002(Version 12.2.0), the spatial extend of the project boundary shall include the project power plant and all power plants connected physically to the electricity system that the project power plants is connected to. The electricity system is defined in accordance to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

The project activity will transfer the electricity generated to the NWCPG, so the spatial extent of the project boundary encompasses all power plants that physically connect to the NWCPG, which includes Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uygur Autonomous Region in the case of NWCPG, according to the guideline by China DNA[1]. The flow diagram of the project boundary is shown in Figure B-1 below.

[1] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

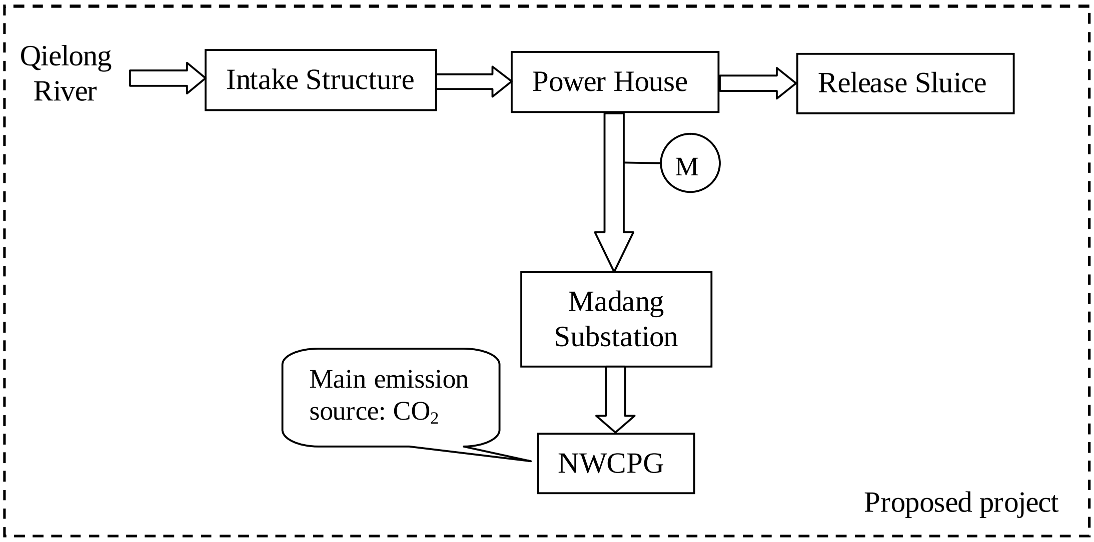

Figure B-1 Diagram of the project boundary

The main emission sources and types of GHGs in project boundary are listed in Table B-1 below:

Table B-1 Emission sources included or excluded from the project boundary

	Source	GHG	Included?	JUSTIFICATION / EXPLANATION
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	Qielong 1.2MW Hydro Power Project	CO_2	No	Minor emission source.
		CH_4	No	Main emission source
		N_2O	No	Minor emission source.

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

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As the project activity is the installation of new grid-connected hydropower plant and the electricity generated will be transmitted to the NWCPG. In accordance to ACM0002(Version 12.2.0), the baseline scenario of the proposed project is electricity delivered to the NWCPG by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The baseline emissions are equal to power generated by the project activity delivered to NWCPG, multiplied by the grid's baseline emission factor which is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). The detailed calculation for emission reductions are specified in B.6 and Annex 3.

The key parameters used for calculating baseline emissions of the project are listed in Table B-2:

Table B-2 Key parameters for calculation of baseline emission

Parameter	Value	Data Source
The OM of the NWCPG	1.0246 tCO_2e/MWh	China's DNA: 2009 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
The BM of the NWCPG	0.6433 tCO_2e/MWh	China's DNA: 2009 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
The CM of the NWCPG	0.83395 tCO_2e/MWh	China's DNA: 2009 Baseline Emission Factors for Regional Power Grids in China. (See details in Annex3)
Net electricity supplied to the grid ($EG_{facility,y}$)	5,808 MWh	FSR

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 GS-VER project activity (assessment and demonstration of additionality):

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The "*Tool for the demonstration and assessment of additionalit*y" (Version 05.2) is used to demonstrate the additionality of the project activity through the following steps:

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

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

The realistic and reliable alternatives available to the proposed project that provide outputs or services comparable with the proposed project activity include:

Alternative 1: The proposed project activity undertaken without being registered as a carbon fund project activity;

Alternative 2: Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity output or installed capacity;

Alternative 3: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity output or installed capacity; and

Alternative 4: Provision of equivalent amount of annual power output by the grid (NWCPG) where the proposed project is connected to.

For Alternative 1, without carbon fund revenues, the FIRR of total investment of the project is 8.46%, which is lower than the benchmark rate 10%. Therefore, the project not undertaken as a carbon fund project activity satisfies China's regulations, but is not economically attractive, and the Alternative 1 is not feasible. Refer to step 2 for more details of FIRR.

For Alternative 3, other renewable energy resources (such as wind power, solar power, biomass power etc.) are either relatively rare or with extremely high cost in the project site, and also meets with the difficulties and barriers of technology and investment in China. For example, the solar power is considered to be too cost intensive to generate the equivalent annual output[2] ; biomass power plants face such barriers as high investment, lacking of experience, or of low profit[3] . Therefore, alternative 3 is not feasible as a realistic and credible alternative scenario.

Outcome of Step 1a: The realistic and credible alternative scenarios to the project activity are Alternative 2 and 4.

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

The installed capacity of the project is 1.2MW. Considering the same amount of annual electricity generation, the alternative for the project should be a fuel-fired power plant with an installed capacity lower than 1.2MW. However, according to China's regulations, construction of fuel-fired power plants with the installed capacity lower than 135MW[4] is prohibited. Therefore, Alternative 2 does not comply with Chinese relevant laws and regulations and is not a feasible alternative.

Outcome of Sub-step 1b: Alternative 4 is practical and feasible, so the baseline scenario is the provision of an equivalent amount of annual power output by the NWCPG into which the project is connected.

Step 2 Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the *"Tool for the demonstration and assessment of additionality"* (Version 05.2) there are three options for applying the investment analysis:

Option I: Simple cost analysis;

Option II: Investment comparison analysis or

Option III: Benchmark analysis

The proposed project will generate electricity sales in addition to carbon fund revenues, so Option I not applicable. The investment comparison analysis (Option II) is only applied when the baseline is an invested project. In the case of the proposed project, the alternative scenario is for the NWCPG to produce the same amount of electricity, which is not a newly invested project. Therefore, the investment comparison analysis (Option II) is not appropriate. As benchmark FIRR (Financial Internal Return Rate) is available, **Option III** is chosen to demonstrate the additionality.

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

According to the "Classification & Design Safety Standard of Hydropower Projects"[5] (DL5180-2003) by the Economics and Trade Commission of People's Republic of China, small scale hydropower projects refer to those with an installed capacity of less than 50MW.

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[2] http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=5884

[3] http://www.86ne.com/Biomass/200712/Biomass_103227.html

[4] http://www.gov.cn/gongbao/content/2002/content_61480.htm

[5] http://www.bjwater.gov.cn/Portals/flfg/files/7-06-1%20D5180-2003.PDF

According to the "Economic Evaluation Code for Small Hydropower Projects"[6] (SL16-95), the benchmark FIRR on total investment for Chinese small hydropower projects is 10%. The benchmark analysis is applicable to the project, since the proposed project is the newly built hydropower project with the installed capacity of 1.2MW; therefore, the proposed project selects 10% as its FIRR benchmark of total investment.

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

Based on the above-mentioned benchmark, the calculation and comparative analysis of financial indicators for the proposed project are carried out as follows:

Table B-3 Key parameters for the calculation of financial indicators

Item	Unit	Value	Data Source
Installed Capacity	MW	1.2	Feasibility Study Report (FSR)
Operating Hours at Full Capacity	Hours	5,042	FSR
Total Electricity Generation	MWh	6,050	FSR
Net Electricity Generation	MWh	5,808	FSR
Electricity Tariff (including VAT)	CNY/kWh	0.227	FSR
Total Static Investment	CNY	8,500,000	FSR
Operation & Maintenance Expenses	CNY	205,288	FSR
1. Salary	CNY	72,000	FSR
2. Welfare	CNY	24,480	FSR
3. Repair Fee	CNY	85,000	FSR
4. Maintenance Fee	CNY	5,808	FSR
5.Others	CNY	18,000	FSR
Value Added Tax Rate	%	6	FSR
Surcharge for Education	%	3	FSR
City Maintenance & Construction Tax	%	5	FSR
Income Tax Rate	%	25	FSR
Expected Project lifetime	Years	20	Economic Evaluation Code for Small Hydropower Project (SL16-95)

[6] The Ministry of Water Resources of P. R. China, Hydropower [Decree 1995] No. 186

Original copies of Major parts of FSR, FSR Approval, and the financial plan are attached in Annex 10, 11 and 13 respectively.

Table B-4 below shows the project IRR with and without the income from the carbon fund revenues.

Table B-4 Comparison of FIRR for the proposed project and the financial benchmark

Item	Without the income from carbon fund revenues	Benchmark rate	With the income from carbon fund revenues
FIRR of total investment	8.46%	10%	12.74%

Since the FIRR of the proposed project is 8.46% which is lower than the benchmark FIRR of 10%, the proposed project is not considered as financially attractive. With the carbon revenue, the project FIRR will go up to 12.74%. A sensitive analysis is conducted to test whether the project FIRR is robust to the reasonable variations of the following parameters:

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

The sensitive analysis is conducted to check whether, under variation of ±10%, the project IRR remains below the benchmark. The four main factors affecting the financial indicators of the project are:

- Total Static Investment
- Electricity Tariff (including VAT)
- Annual O&M Cost
- Annual Net Electricity Delivered to the Grid

Table B-5 summarizes the results of the sensitivity analysis and Figure B-2 provides a graphic depiction.

Table B-5 Sensitivity Analysis

	-10%	**-5%**	**0%**	**5%**	**10%**
Total Static Investment	9.88%	9.14%	8.46%	7.83%	7.26%
Electricity Tariff	6.99%	7.73%	8.46%	9.17%	9.87%
Annual O & M Cost	8.70%	8.58%	8.46%	8.34%	8.22%
Annual Electricity Delivered to the Grid	7.00%	7.74%	8.46%	9.17%	9.87%

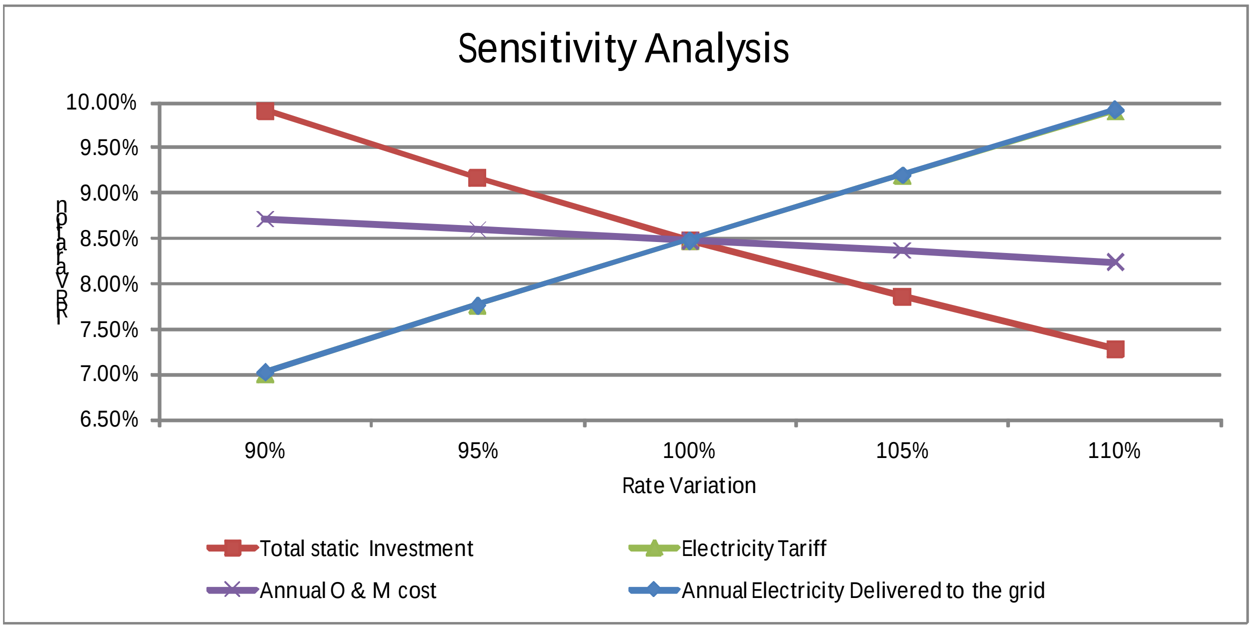

Figure B-2 Sensitivity analysis of the proposed project

Total Static Investment

With a decrease in the total static investment by 10%, the FIRR is still 9.88%, below 10%. Nonetheless, such a splash on budget would not happen in reality, because the material cost[7] and labour cost[8] keeps increasing year by year since 2007. As the project has been finished, and investment costs for the project were 8,922,400 RMB, a decrease of total static investment is impossible.

Electricity Tariff

The above sensitivity analysis shows the IRR for the project will only reach 9.87% if the tariff increases by 10%. In fact, the tariff for hydropower in China is not established on the market mechanism but regulated by the government. The actual tariff approved by the Gansu Price Bureau on 2 Dec 2009 for the project is 0.227 CNY/kWh[9]. This is the tariff applied in the financial analysis, and can therefore be considered reasonable.

Annual O&M Cost

As shown in the chart, this factor has weak impact on the FIRR. When it decreases by 10%, the FIRR only rises by as little as 0.24%. Therefore, the FIRR is very unlikely to reach the benchmark by reducing annual O&M cost. The annul O&M cost are mainly composed of the machine maintenance fee, staff salary, welfare fund, staff insurance, and other costs. These activities involve employing staff, both external and internal, and in recent years wages in China have increased rather than decreased.[10] Therefore a decrease in O&M cost that makes the project's IRR cross the benchmark is highly unlikely.

[7] http://www.stats.gov.cn/tjsj/ndsj/2009/html/I0815e.htm

[8] http://www.stats.gov.cn/tjsj/ndsj/2009/html/E0426e.htm

[9] Notice on Tariff of Certain Hydro Power Companies Issued by Gansu Price Bureau GanJiaDianLi[2009] no.273

[10] National Bureau of Statistics data, http://www.stats.gov.cn/tjsj/ndsj/2009/indexeh.htm

Annual Electricity Delivered to the Grid

Electricity generation is determined by annual operation hours, which is based on historical hydraulic data as stated in FSR. Therefore, the amount of electricity generated by the project is unlikely to change over a wide range. As is shown in the sensitivity analysis, even if the annual electricity delivered to the grid increases by 10%, the IRR remains lower than the benchmark. The actual annual electricity generation from Dec. 2009 to Nov. 2010 is 3007 MWh which is lower than the estimated value in the PDD, hence the IRR above the benchmark is impossible.

Outcome of Step 2:

The sensitivity analysis shows that without carbon fund revenues, FIRR of the project can hardly reach the benchmark, which supports the conclusion that the proposed project is unlikely to be financially attractive.

Step 3: Barrier analysis

"*Tool for the demonstration and assessment of additionality*" (Version 05.2) states that project participants may choose to apply Step 2 (Investment analysis) OR Step 3 (Barrier analysis) to demonstrate the additionality of the project. Given the low FIRR of the project, Step 3 is not used to demonstrate the additionality of the proposed project.

Step 4: Common practice analysis

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

"Tool for the demonstration and assessment of additionality" (Version 05.2) specifies that projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

For the common practice analysis, we consider hydro projects that are located in Gansu Province (in the same region), have installed capacity less than 10MW (broadly similar technology), and operated after 2002 (a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing), similar to the proposed project for the following reasons:

1. Projects at county level in Gansu province are considered suitable for identifying similar projects for common practice, because on one hand, there are too many small hydro power projects in Gansu Province and reliable statistics of small hydropower project are rarely publicized; on the other hand, policies, regulations and investment environment varies at the county level as the regional government authority implements centralized regulation by taking the local situation into consideration.

2. According to "*Classification & Design Safety Standard of Hydropower Projects*" (DL5180-2003), hydropower plants with an installed capacity less than 10MW are classified as small (type 2) scale projects. Hydropower projects with a similar installed capacity are selected for analysis.

3. The year 2002 marked a milestone for the China power sector. Before the year 2002 the electricity tariff of each power plant was determined based on the principle of full-cost recovery according to the "*Notice on Implement methods of Various Power Tariff*"[11]. In other words, project developers can obtain sufficient return guaranteed by provincial government. Therefore, only projects operated after 2002 are considered in the common practice analysis.

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[11] http://www.scicpa.org.cn/html/hyfw/default.asp?id=46&vid=4795

The table B-6 listed 3 similar hydropower projects in Xiahe County, Gannan Tibetan Autonomous Prefecture, Gansu Province, and they all started operation after 2002.

Table B-6 Similar Implemented Hydropower Projects in Gansu Province

Project Name	Installed Capacity (MW)	Project Status
Xiaohe	9.6MW	CDM registered[12]
Qianguangtan	9.6MW	CDM registered[13]
Fuhuang II	2.4MW	GS-VER applying

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

As other similar projects in Xiahe Coutny are either registered as CDM projects or applying GS-VER to overcome the financial barriers, the proposed project is not a common practice.

To summarize, the project passed the criteria of "Tool for the demonstration and assessment of additionality". It is financially unattractive without carbon fund revenues. Therefore, the project is sufficiently additional.

Carbon Fund Consideration and Implementation

Table B-7 below shows the timeline of the project key events which indicates when carbon fund revenue was considered and how it is incorporated into the project implementation.

Table B-7 Timeline of Milestone Events in the Project Development

Time	**Milestones in the project development**
August 2007	Completion of Project Feasibility Study Report (FSR)
24 August 2007	Completion of Project Environmental Impact Assessment (EIA)
10 September 2007	Approval of EIA
12 September 2007	Sign of Project Construction Contract
15 September 2007	Approval of FSR
12 November 2009	Sign of Power Purchase Agreement
Time	**Carbon fund revenues Consideration**
15 August 2007	Board Resolution with Decision of Implementing Carbon Fund Activity
8 May 2008	Sign of Emission Reduction Purchase Agreement (ERPA) with Climate Bridge Ltd.
19 September 2008	Draft PDD Submission for Gold Standard Pre-assessment
30 January2009	Memorandum of Understanding (MoU) between the Gold Standard Foundation & Climate Bridge for Qielong 1.2MW Hydro Power Project China
9 March 2009	Submission of Memorandum of Understanding (MOU)
24 June 2010	Local stakeholder consultation meeting

Before initiating the proposed project, the project developers heard about the Carbon Fund from other hydropower project owners. As a company funded by private individuals, the project developer faced prohibitive barriers related to the access to financing, so the carbon fund revenue was firstly considered in

[12] http://cdm.unfccc.int/Projects/DB/DNV-CUK1158580010.94/view

[13] http://cdm.unfccc.int/Projects/DB/RWTUV1259834352.76/view

the Feasibility Study Report (FSR) to improve poor financial indicators. A board meeting was held on 15 August 2007 when all board members agreed on the application of Carbon Fund. In order to secure the carbon fund application, the project developer signed an Emission Reduction Purchase Agreement contract with Climate Bridge Ltd. on 8 May 2008. Then, a draft PDD completed by Climate Bridge Ltd. was submitted for GS-VER pre-assessment on 19 September 2008. Memorandum of Understanding (MoU) between the Gold Standard Foundation and Climate Bridge for this project was agreed on 30 January2009 and submitted to Gold Standard Foundation on 9 March 2009. The local stakeholder consultation meeting was held on 24 June 2010 to collect feedback from the local community.

The above table shows that the project owner took the potential of Carbon Fund into consideration before the project initial construction and it will play a crucial role in overcoming the barriers towards the implementation of the proposed project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions (PE_y)

Since the project activity involves a micro scale hydro power station, which is a renewable energy source, the project CO_2 emissions are assumed to be zero, according to ACM0002(Version 12.2.0), $PE_y=0$ tCO_2e.

Baseline Emissions (BE_y)

According to ACM0002(Version 12.2.0), baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, and shall be calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh)

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

Where:

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

The “combined margin” emission factor of the electricity system (CM) is calculated based on the estimation of the “operating margin” (OM) and the ‘build margin’ (BM), according to ‘Tool to calculate the emission factor for an electricity system' (Version 02.2.1). The following six steps are applied to determine OM, BM, and CM used for calculating the project baseline emissions:

Step 1: Identify the relevant electricity systems

According to the delineation of the project electricity system and connected electricity systems published by China NDRC (China's DNA)[14], the project electricity system for the proposed project is Northwest China Power Grid (NWCPG) which covers the grids of Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uygur Autonomous Region.

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

Option I: Only grid power plants are included in the calculation.

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

Based on China's real situation, data of off-grid power plants are unavailable, therefore Option I is selected and only grid power plants are included in the calculation.

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

The calculation of operating margin emission factor ($EF_{grid,OM,y}$) can be based on one of four options listed as follows:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, Option (b) and Option (c) cannot be possibly used for the proposed project. For the most recent 5 years (2004-2008), the low-cost/must run resources constituted less than 50% of total power generation of NWCPG and the relevant ratios are respectively were 19.92%, 25.36%, 24.71%, 23.15%, 21.86% for 2004, 2005, 2006, 2007 and 2008. Hence, the low operating cost/must run sources is much less than 50% of the total grid generation, which complies with the defined condition of Option (a), but not Option (d). Based on these reasons, **Option (a)** is selected to calculate the Operating Margin emission factor of the proposed project.

The Simple OM emission factor can be calculated using either of the two following data vintages for year(s) y:

- **Ex ante option:** If the *ex ante* option is chosen, the emission factor is determined once at the validation stage. Thus, no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VER-PDD to the DOE for validation, or
- **Ex post option:** If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor

[14] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239

of the previous year y-1 may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

This PDD uses **Ex ante Option** for $EF_{grid,simple\ OM,\ y}$ calculation to be in accordance with the baseline emissions factor calculation for regional power grids published by China DNA.

<u>Step 4: Calculate the operation margin emission factor according to the selected method</u>

The simple OM emission factor is calculated as the generation-weighted average CO_2 emission per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation.

As the data required by option A is not available in China, and the nuclear and renewable power generation are considered as low-cost/must0run power sources and the quantity of electricity supplied to the grid by these sources is known in china, and off-grid power plants are not included in the calculation. Therefore, Option B is used for calculating project OM as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

(3)

Where:

$EF_{grid,\ OMsimple,\ y}$	=	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FC_{i,\ y}$	=	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,\ y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{co2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year *y*
y	=	The relevant year as per the data vintage chose in Step 3

Based on the latest available data at the time of this PDD submission, the $EF_{grid,OM\ simple,y}$ is estimated to be **1.0246** tCO_2e/MWh. Please refer to Annex 3 for detailed calculation.

Step 5 Calculate the build margin(BM) emission factor

In terms of vintages of data, project participants can choose between one of the following two options:

Option 1 For the first crediting period, Calculate the Build Margin Emission Factor $EF_{grid\ BM\ y}$, *ex-ante* based on the most recent information available on units already built for sample group m at the time of VER-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2 For the first crediting period, the build margin emission factor shall be updated annually, *ex post,* including those units built up to the year of registration of the project activity or, if information up to year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geqslant 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geqslant 20\%}$, in MWh);

(c) From $SET_{5\text{-}units}$ and $SET_{\geqslant 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geqslant 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

(e) Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample-CDM}$->10yrs).

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants supply electricity to the grid that comprise 20% of the annual electricity generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the following deviations are adopted to calculate the BM[15]:

First, to calculate the newly added installed capacity and the contribution component of other various power generation technologies, then calculate of the weight of newly added installed capacity of each power generation technology, and finally, to calculate BM emission factor using the commercially optimal efficiency level of each power generation technology.

According to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available. The calculation equation is as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \tag{4}$$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2e/MWh)
m	= Power units included in the build margin
y	= Most recent historical year for which power generation data is available.

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can't be separated from the existing statistical data, the following measures are taken for the calculation:

First, based on the available data of the latest year, determine the ratio of CO_2 emissions from coal, oil, and gas consumption for power generation to the total CO_2 emission; Second, to calculate the emission factor of the thermal power based on the weight of CO_2 emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20% of the newly added capacity.

[15] http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

Sub-Step 1: Calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total CO_2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad \textbf{(5)}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad \textbf{(6)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad \textbf{(7)}$$

Where:

$F_{i,j,y}$	=	the amount of fuel *i* (tce) consumed by plants in province *j* in year *y*
$NCV_{i,y}$	=	the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{co2,i,j,y}$	=	the CO_2 emission factor of fossil fuel type i in province *j* in year *y*

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-Step 2: Calculate the emission factor of thermal power ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad \textbf{(8)}$$

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

Sub-Step 3: Calculation of BM in the grid.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y}$$

(9)

Where:

$CAP_{thermal,,y}$	=	the added installed capacity of thermal power generation sources (MW) in year *y*
$CAP_{total,\ y}$	=	the total added installed capacity of all kinds of power generation sources (MW) in year y which comprises at least 20% of the existing installed capacity
$EF_{Thermal,y}$	=	the emission factor of thermal power plants in year *y*

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2008. The potential emission factors are sourced from "*2006 IPCC Guidelines for National Greenhouse Gas Inventories*" Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.

According to the latest and available data at the time of this PDD submission, $EF_{grid, BM,y}$ is calculated to be **0.6433** tCO_2e/MWh. Please refer to Annex 3 for the details of calculation.

<u>Step 6: Calculate the combined margin (CM) emissions factor</u>

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than

10 registered projects at the starting date of validation; and

- The data requirements for the application of step 5 above cannot be met.

The PDD will choose option A.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = \omega_{OM} \times EF_{grid,OM,y} + \omega_{BM} \times EF_{grid,BM,y} \quad \textbf{(10)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
ω_{BM}	=	Weighting of build margin emissions factor(%)
ω_{OM}	=	Weighting of operating margin emissions factor (%)

As specified in " Tool to calculate the emission factor for an electricity system " (Version 02.2.1), the proposed hydropower project shall use ω_{OM}=0. 5 and ω_{BM} =0.5 for the first crediting period, and ω_{OM}0.25 and ω_{BM} =0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool. Thus,

$EF_{grid,CM,y}$ = 1.0246× 0.5 + 0. 6433× 0.5 = **0.83395** tCO_2e/MW

Leakage (LE_y)

According to the ACM0002(Version 12.2.0), no leakage emissions are considered, LE_y.=0 tCO_2e

Emission Reductions (ER_y)

According to the ACM0002(Version 12.2.0), emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(11)}$$

Where:

ER_y	=	Emission reductions in year y (tCO_2e/yr)

BE_y	=	Baseline emissions in year y (tCO_2e/yr)
PE_y	=	Project emissions in year y (tCO_2e/yr)

Based on the previous calculations, PE_y and LE_y are calculated to be zero, and therefore:

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

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

Data / Parameter:	$FC_{i,y}$,
Data unit:	10^4t or $10^8 m^3$
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*; or The amount of fossil fuel type *i* consumed in the project electricity system of province *j* in year *y*.
Source of data used:	*China Energy Statistical Yearbook 2006-2008*
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics data
Any comment:	Used for the calculation of OM and BM.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	*China Energy Statistical Yearbook 2008*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	Used for the calculation of OM and BM

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	t C/TJ
Description:	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods	IPCC default value

and procedures actually applied :	
Any comment:	Used for the calculation of OM and BM

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by all power sources in the project electricity system, not including low-cost/must-run power plants/units, in year *y*
Source of data used:	*China Electric Power Yearbook 2006-2008*
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics data
Any comment:	Used for the calculation of OM.

Data / Parameter:	$EF_{Coal,Adv,y}$
Data unit:	$kgCO_2/TJ$
Description:	Emission factors reflecting the efficiency level of the best coal-based power generation technology commercially available in China.
Source of data used:	Notification of 2009 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value applied:	87,300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of *BM*

Data / Parameter:	$EF_{Oil,Adv,y}$
Data unit:	$kgCO_2/TJ$
Description:	Emission factors reflecting the efficiency level of the best oil-based power generation technology commercially available in China.
Source of data used:	Notification of 2009 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value applied:	75,500
Justification of the choice of data or description of measurement methods	Official released data

and procedures actually applied :	
Any comment:	Used for the calculation of *BM*

Data / Parameter:	$EF_{Gas, Adv, y}$
Data unit:	$kgCO_2/TJ$
Description:	Emission factors reflecting the efficiency level of the best gas-based power generation technology commercially available in China.
Source of data used:	Notification of 2009 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value applied:	54,300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of $EF_{BM,y}$

Data / Parameter:	$CAP_{i, j, y}$
Data unit:	MW
Description:	The installed capacity of power source *i* of province *j* of the NWCPG in the year *y*
Source of data used:	*China Electric Power Yearbook 2006-2008*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of *BM*

B.6.3 Ex-ante calculation of emission reductions:

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According to Section B.6.1, the baseline emission factor of NWCPG ($EF_{grid, CM, y}$) is calculated as 0.83395 tCO_2e/MWh. The annual electricity supplied to the grid is estimated to be 5,808 MWh. Therefore, the baseline emission can be calculated as follows:

$\boldsymbol{BE_y = EG_{facility, y} \times EF_{grid, CM, y}}$ = 5,808 MWh×0.83395 tCO_2e/MWh=4,843 tCO_2e

The annual estimated emission reductions of the project activity equal to the baseline emissions, as both LE_y and PE_y are zero:

$ER_y = BE_y$ = 4,843-0= 4,843 tCO_2e

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

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The ex-ante estimated amount of annual and total emission reductions of the first crediting period are listed below.

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2010	0	4,843	0	4,843
2011	0	4,843	0	4,843
2012	0	4,843	0	4,843
2013	0	4,843	0	4,843
2014	0	4,843	0	4,843
2015	0	4,843	0	4,843
2016	0	4,843	0	4,843
Total (tCO_2e)	0	33,901	0	33,901

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

B.7.1 Data and parameters monitored:

- **Relevant parameters necessary for monitoring the baseline emission by sources of GHGs within the project boundary:**

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data to be used:	The net electricity supplied to a grid is the difference between the measured quantities of the grid electricity export and the import in year y.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5,808
Description of measurement methods and procedures to be applied:	The electricity exported and imported will be measured continuously and recorded at least monthly by electricity meters.
QA/QC procedures to be applied:	Meters will be calibrated periodically based on the relevant national and industrial standards. Cross-check by the receipts of electricity sales and purchase.
Any comment:	
Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity

Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1200
Description of measurement methods and procedures to be applied:	The nameplates of the generators will be checked on site, once a year.
QA/QC procedures to be applied:	
Any comment:	

- **Data to be collected in order to monitor project performance on the most sensitive sustainable development indicators:**

Sustainable Development Indicator	Data type	Data unit	Measured (m), calculated (c) or estimated (e)	Mitigation Measures	Recording frequency	Methods and equipments used	Who will be in charge of the monitoring and quality control?	Comments
Other pollutants (Noise pollution)	Local/regional /global environment	Degree of noise	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Until construction completed	Monitored and assessed during EIA report preparation	Qielong Hydropower Station	As noise mainly comes from the construction site, the monitoring plan focused on the construction period, not operation period.
Employment	Social sustainability and development	Number	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Monthly	The payroll is served as additional check for the number of employees	Qielong Hydropower Station	The payroll contains the information about employees' name, gender and salary. The number of employees can be monitored.
Liveihood of the poor	Social sustainability and development	Number	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Monthly	The payroll is served as additional check for the income of the employees	Qielong Hydropower Station	The payroll contains the information about employees' name, gender and salary. The improvement of quality of the life can be monitored.

Access to energy services	Social sustainability and development	Number	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Yearly	The monthly power sales receipt received from the local grid company can be checked monthly.	Qielong Hydropower Station	Such receipt shows the amount of electricity the power plant supplies to the grid and releases the local power shortage to a certain extent.
Human and institutional capacity	Social sustainability and development	Number	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Monthly	Gender information on the monthly payroll can be checked monthly.	Qielong Hydropower Station	The payroll containing the information about employees' name, gender and salary. The number of female employees can be monitored.
Employment	Economic and technological development	Number	M	Please see Annex 5, Sustainable Development Assessment Matrix for details	Periodically	Training reports regarding operation and maintenance.	Qielong Hydropower Station	Training opportunities are provided to relevant employees. Training records can be monitored.

B.7.2 Description of the monitoring plan:

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An overall monitoring plan will be applied in order to guarantee the actual long-term measurement of GHG emission reductions of the proposed project and to have complete and reliable emission reduction calculation. The details of the monitoring plan are summarized as follows:

1. Operation and management structure of monitoring

The monitoring of the emissions reductions will be carried out according to the operation and management structure shown in Figure B-3.

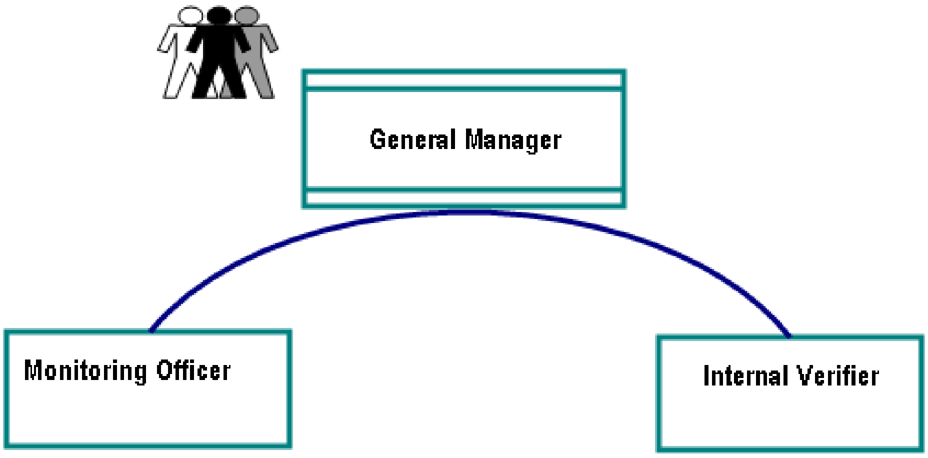


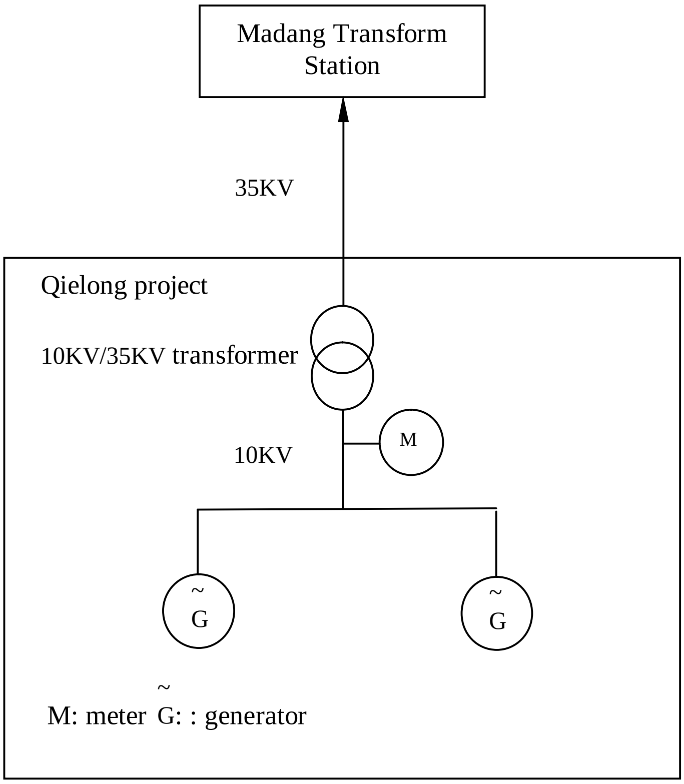
Figure B-3 Operations and Management Structure

The overall responsibility for the monitoring process will be conducted by the General Manager assigned by the project owner (i.e. Xiahe Xingxin Hydropower Development Co., Ltd.). The measurement of the electricity exports and imports will be carried out by a monitoring officer. In addition, the project developer will designate an internal verifier who will be responsible for internal verification of the measurement, collection of electricity receipts and invoices and the calculation of the emission reductions. A monitoring and management manual of Qielong hydropower station identifying detailed duties and responsibilities of the relevant parties has been developed by Climate Bridge Ltd., and will be served as a basis of the project monitoring.

2. Monitoring equipment and installation

The data requires monitoring for the project is the amount of electricity exported to the grid and the amount of electricity imported from the grid (refer to Section B.7.1).

The electricity generated by two generators will be combined and transferred to Madang Transform Station via a 10KV transmission line. A bilateral revenue meter installed at the outlet of Qielong hydropower Station measures the amount of electricity exported to the grid and the amount of electricity imported from the grid. The meter has been calibrated according to relevant national standards, and the accuracy is 0.5S.



FigureB-4 Diagram of grid connection

3. Data collection and management

The amount of exported electricity can be accurately measured per hour by the revenue meter installed at the power station and continuously recorded. All data will be archived for 2 years after the end of the last crediting period. The sum of monthly exported electricity records can be cross checked by the monthly electricity sale receipts.

4. Quality assurance and quality control

The revenue meter will be calibrated periodically based on the national standard 'electricity meter installation technical management code' (DL/T448-2000). Data and records will be checked prior to being recorded and archived, and possible errors would be identified in this step. In the case of abnormal operation, the project owner and the power company will negotiate to reach an agreement for the mis-recorded data and the replacement of the meter. If the negotiation is failed, the data monitored within this certain period shall not be claimed.

Training on monitoring will be provided to the relevant staff to guarantee the implementation of the monitoring plan.

5. Monitoring results and verification

The verification of the monitoring results of the project activity is required for each crediting period. The monitoring results will be complied in a monitoring report that will be served as a basis for project verification in each crediting year.

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

>>

The baseline study and monitoring methodology of the proposed project was completed on 07/12/2011.

Name of person/entity determining baseline study and monitoring methodology:

Xu Chen, Climate Bridge Ltd.

Email: xu.chen@climatebridge.net

Tel: ＋86 21 6246 2036； Fax: ＋86 21 2301 9950

Climate Bridge Ltd. is one of the 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:

>>

12/09/2007 (Sign of construction contract)

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

>>

20 years- 0 month

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

C.2.1. Renewable crediting period

>>

7 years × 3

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

>>

01/01/2010 or two year prior to the date of registration whichever is later

C.2.1.2. Length of the first crediting period:

>>

7 years- 0 month.

C.2.2. Fixed crediting period:

>>

Not applicable

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:

>>

The Environment Impact Assessment (EIA) was completed by Environmental Engineering Department, Coal Mining Design and Research Institute in Lanzhou on 24th August 2007, and was approved by the Environmental Protection Bureau of Ganan Tibetan Autonomous Prefecture on 10th September 2007. The recommendations of the EIA were followed up by the project owner and the summary of the main findings is given below:

1. Construction Phase

1.1Waste water

Waste water during construction period comes from the construction and living activities. The pollutants in the waste water are from construction activities such as ground excavation, sand rinsing and concrete mixing. Domestic wastewater is primarily generated by construction workers. The industrial wastewater will be treated by sedimentation, and the liquid will then be reused without discharge.

Meanwhile, the domestic sewerage is also treated and reused for plant greening or for local agriculture irrigation without discharge.

1.2 Noise pollution

Noise mainly comes from the activities of excavation, construction machines and transportation vehicles. However, the construction site is far away from the residential areas, and construction work during night is avoided. Noise control should be taken to protect the workers on site.

1.3 Waste gas

Main air contamination comes from rock exploration and transportation vehicles. Proper measures will be employed: 1. Rock exploration should be constrained to a minimal size and replant the site as soon as possible. 2. Covering the rocks and powder materials while being transported. 3 Keep doing road sparkling to prevent dust. 3 Storing the powder materials in a shelter with coverage, and protect the on-site workers with masks.

1.4 Solid wastes

Solid waste includes construction waste as well as domestic rubbish from on-site workers. Construction waste should be treated in the spoil ground. Domestic rubbish will be regularly transported to the nearby landfill site for central disposal.

1.5 Impact on water and soil loss

Water and soil loss comes with the project construction due to excavation and solid waste dumping. Following the water and soil conservation plan, all land will be remediated and trees will be planted accordingly afterwards.

1.6 Displacements of people

No displacement of people was involved in the proposed project.

2. Operation Phase

The proposed project is a renewable energy project generating electricity to support local residents' daily life. No waste water will be discharged from the power plant. No waste gas is emitted during this phase. Domestic rubbishes are kept being transported to landfill plants. The machinery noise source is far away from the residence area and can be reduced by the surrounded plants. Therefore, the environmental impact during the operation period is minor.

In conclusion, the proposed project can reduce greenhouse gas emissions and the environmental pollution caused by coal consumption. It has favourable influences on the local ecological environment; especially after the project is put into operation, the ecological restoration measures will recover the local ecological environment.

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:

>>

Not applicable.

SECTION E. STAKEHOLDERS' COMMENTS

>>

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

>>

As the proposed project seeking for retroactive registration has already been in operation, the stakeholder consultation meeting held on 24th June 2010 aimed to collect stakeholders' feedback towards the project and their opinion or suggestion upon the project operation.

There were 21 people attended the consultation, and 21questionnaire were distributed during the meeting with 19 questionnaire received. Table G-1 listed basic information of the attendees, and details of the consultation are recorded in Annex 9 (Local Stakeholder Consultation Report).

The questionnaire package including following documents:

- A questionnaire to collect stakeholders' feedback
- Project brief description
- A non-technical EIA summary of the project
- SD Matrix

Table E-1 Distribution of participants

Item		Number	Percentage（%）
Gender	Male	18	77%
	Female	3	14%
Age	18~30	11	52%
	>30	10	48%
Educational background	Primary and Junior Middle School	11	52%
	High School	1	5%
	College and above	9	43%
Nationality (Ethnic Group)	Han	12	57%
	Hui	2	10%
	Zang	7	33%
Occupation	Farmer	3	14%
	Worker	11	52%
	Government official	5	24%
	Engineer	2	10%
Distributed Questionnaires		21	
Collected Questionnaires		19	

E.2. Summary of the comments received:

>>

- **Comments from these questionnaires are summarized in Table E-2 below:**

Table E-2 Summary of stakeholders' comments

Environmental Impacts	**Yes/No/? Briefly describe**	**Is this likely to result in a significant effect? Yes/No/? -Why?**
1. Will construction, operation or decommissioning of the Project use or affect natural resources or ecosystems, such as land, water, forests, habitats, and materials or, especially any resources which are non-renewable or in short supply?	No	The project site used to be barren land.
2. Will the Project involve use, storage, transport, handling, production or release of substances or materials (including solid waste) which could be harmful to the environment?	No	No
3. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?	No	No
4. Will he Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?	Yes	There was noise during the construction period.
5. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea?	No	No
6. Are there any areas on or around the location which are protected under international or national or local legislation for their ecological value, which could be affected by the project?	No	There's no such protected area in the surrounding.
7. Are there any other areas on or around the location, which are important or sensitive for reasons of their ecology, e.g. wetlands, watercourses or other water bodies, the coastal zone, mountains, forests or woodlands, which could be affected by the project?	No	No
8. Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project?	No	No
9. Are there any inland, coastal, marine or underground waters on or around the location which could be affected by the project?	No	No
10. Is the project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?	No	No
Socioeconomic and Health Impacts	**Yes/No/? Briefly**	**Is this likely to result in a significant effect? Yes/No/?**

	describe	**-Why?**
11. Will the Project involve use, storage, transport, handling, production or release of substances or materials (including solid waste) which could be harmful to human health or raise concerns about actual or perceived risks to human health?	No	No
12. Will the Project release pollutants or any hazardous, toxic or noxious substances to air that could adversely affect human health?	No	No
13. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation that could adversely affect human health?	Yes	No.
14. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea that could adversely affect human health?	Yes	Works on-site should be protected from noise.
15. Will there be any risk of accidents during construction or operation of the Project which could affect human health?	No	No
16. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?	Yes	The project creates some jobs for local villagers and fresh graduates from technical school.
17. Are there any areas on or around the location, protected or not under international or national or local legislation, which are important for their landscape, historic, cultural or other value, which could be affected by the project?	No	No
18. Are there any transport routes or facilities on or around the location which are used by the public for access to recreation or other facilities and/or are susceptible to congestion, which could be affected by the project?	No	A new path can improve the local transportation condition.
19. Is the project in a location where it is likely to be highly visible to many people?	No	No.
20. Are there existing or planned land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?	No	No
21. Are there any areas on or around the locations which are densely populated or built-up, or occupied by sensitive uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project?	No	No
22. Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism and minerals, which could be affected by the project?	No	No
23. Is the project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present socioeconomic problems?	No	No

- **Comments received during the consultation meeting are summarized as below:**

The project develops and utilizes water resource in Xiahe County, and generates clean power. The project activity complies with relevant national and local regulations and meets with requirements for environment protection. The completion of the project promotes the local economy development.

Qielong hydropower station hires local farmers and fresh graduates as employees, and ensures the employment rate in the local area. The income for these hired farmers has been increased far more than what they used to earn, and they also received training and certificate to be qualified as a technical staff in the hydropower station.

Apart from constructing the proposed project, the project owner helped to improve the livelihood of local residents by doing extra work such as 1) paving a path to ease the transportation of local residents, and 2) building up a water channel for irrigation. All these give local residents great convenience for the local social and economic development

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

>>

To conclude, most attendees show positive opinion towards the proposed project, and would like to support the project for GS-VER registration.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Xiahe Xingxin Hydropower Development Co., Ltd.
Street/P.O.Box:	Madang Township, Xiahe County
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Salutation:	Mr
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in this project activity**.**

Annex 3

BASELINE INFORMATION

The baseline information for calculation of OM, BM and CM emission factors of North West China Power Grid is shown in the Report on 2009 Baseline Emission Factors for Regional Power Grids by China DNA at http://cdm.ccchina.gov.cn released on 2nd July, 2009. The concrete processes are shown in the following tables.

Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table1 below.

Table 1 Low calorific values, CO_2 emission factor and oxidation factor of fuels

Fuel type	Default Carbon Content	OXID	IPCC CO_2 Emission Factor (the Lower Limits of the 95% Confidence Intervals)	Low Calorific Value
	（tc/TJ）	（%）		（MJ/t,km^3）
	H	I	(kgCO_2/TJ)	
Raw Coal	25.8	100	87,300	20908
Cleaned Coal	25.8	100	87,300	26344
Other Washed Coal	25.8	100	87,300	8363
Briquette	26.6	100	87,300	20908
Coke	29.2	100	95,700	28435
Coke Oven Gas	12.1	100	37,300	16726
Other Gas	12.1	100	37,300	5227
Crude Oil	20	100	71,100	41816
Gasoline	18.9	100	67,500	43070
Diesel Oil	20.2	100	72,600	42652
Fuel Oil	21.1	100	75,500	41816
LPG	17.2	100	61,600	50179
Refinery Gas	15.7	100	48,200	46055
Natural Gas	15.3	100	54,300	38931
Other Petroleum Products	20	100	75,500	41816

Other Coke Oven Products	25.8	100	95,700	28435
Other Energies	0	0	0	0

Data Source：The emission factors and oxidation factors are form *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.3,1.4, page 1.21-1.24, chapter 1Volume 2 Energy*. The net calorific values are quoted from *China Energy Statistical Yearbook 2008.*

1. Calculation of Simple *OM* Emission Factor of NWCPG for Year 2005

Table 2 CO_2 Emission Data of NWCPG in Year 2005

Fuel type	**Unit**	**Shaanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Sub-total**	**Effective CO_2 EF**	**OXID**	**CO_2 emission factor of fossil fuel**	**Average Low Calorific Value**	**CO_2 emission（tCO_2e）**
								(tc/TJ)	**(%)**	**($kgCO_2$/TJ)**	**(MJ/t,km^3)**	**K=F*I*J/100000 (for mass unit)**
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J**	**K=F*I*J/10000 (for volume unit)**
Raw coal	10^4t	2461.28	1597	345.1	1467.7	1358.09	**7229.17**	25.8	100	87,300	20,908	131,951,756
Cleaned coal	10^4t	16.22					**16.22**	25.8	100	87,300	26,344	373,033
Other washed coal	10^4t	35.56			101.95	10.2	**147.71**	25.8	100	87,300	8,363	1,078,416
Coke	10^4t	3.23					**3.23**	29.2	100	95,700	28,435	87,896
Coke oven gas	10^8m^3						**0**	12.1	100	37,300	16,726	0
Other coal gas	10^8m^3						**0**	12.1	100	37,300	5,227	0
Crude oil	10^4t					0.18	**0.18**	20	100	71,100	41,816	5,352
Gasoline	10^4t	0.02				0.01	**0.03**	18.9	100	67,500	43,070	872
Diesel oil	10^4t	2.24	0.46	0.06		0.5	**3.26**	20.2	100	72,600	42,652	100,947
Fuel oil	10^4t	0.01	0.57			0.25	**0.83**	21.1	100	75,500	41,816	26,204
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t					7.71	**7.71**	15.7	100	48,200	46,055	171,151

Natural Gas	10^8m^3	1.46	0.52	1.33		7.81	**11.12**	15.3	100	54,300	38,931	2,350,716
Other Petroleum Products	10^4t						**0**	20	100	75,500	41,816	0
Other Coke Oven Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	8.24	1.3				**9.54**	0	0	0	0	0
											Subtotal	136,146,341

China Energy Statistical Yearbook 2006

Table 3 NWCPG Fuel-fired Electricity Generation and *OM* EF in Year 2005

Province	**Total generation (10^8 kWh)**	**Total generation (MWh)**	**Self-consumption electricity (%)**	**Total supply (MWh)**			
Shaanxi	411	41,100,000	7.16	38,157,240			
Gansu	331.06	33,106,000	4.23	31,705,616			
Qinghai	55	5,500,000	2.69	5,352,050		Total Emissions tCO_2	**136,146,341**
Ningxia	276.43	27,643,000	5.73	26,059,056		Total Power Supply MWh	**125,496,682**
Xinjiang	265.6	26,560,000	8.8	24,222,720	**Year 05**	EF	**1.08486**
Total				125,496,682			

China Electric Power Yearbook 2006

2. Calculation of Simple *OM* Emission Factor of the NWCPG for Year 2006

Table 4 CO_2 Emission Data of NWCPG in Year 2006

Fuel type	**Unit**	**Shaanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Sub-total**	**Effective CO_2 EF**	**OXID**	**CO_2 emission factor of fossil fuel**	**Average Low Calorific Value**	**CO2 emission（tCO_2e）**

								(tc/TJ)	**(%)**	**($kgCO_2$/TJ)**	**(MJ/t,km^3)**	**K=F*I*J/100000 (for mass unit)**
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J**	**K=F*I*J/10000 (for volume unit)**
Raw coal	10^4t	2834.44	1660.92	421.86	1833.72	1547.69	**8298.63**	25.8	100	87,300	20,908	151,472,271
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t				112.7	8.45	**121.15**	25.8	100	87,300	8,363	884,504
Coke	10^4t				0.01		**0.01**	29.2	100	95,700	28,435	272
Coke oven gas	10^8m^3	0.2				0.08	**0.28**	12.1	100	37,300	16,726	17,469
Other coal gas	10^8m^3	0.1					**0.1**	12.1	100	37,300	5,227	1,950
Crude oil	10^4t					0.02	**0.02**	20	100	71,100	41,816	595
Gasoline	10^4t	0.01					**0.01**	18.9	100	67,500	43,070	291
Diesel oil	10^4t	1.14	0.24	0.61		1.25	**3.24**	20.2	100	72,600	42,652	100,328
Fuel oil	10^4t		0.6			0.11	**0.71**	21.1	100	75,500	41,816	22,415
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t						**0**	15.7	100	48,200	46,055	0
Natural Gas	10^8m^3	1.59	0.56	1.06		7.49	**10.7**	15.3	100	54,300	38,931	2,261,930
Other Petroleum Products	10^4t						**0**	20	100	75,500	41,816	0
Other Coke Oven Products	10^4t	1.86					**1.86**	25.8	100	95,700	28,435	50,615
Other Energies	10^4tCe	33.57	8.81			2.2	**44.58**	0	0	0	0	0
											Subtotal	154,812,639

China Energy Statistical Yearbook 2007

Table 5 NWCPG Fuel-fired Electricity Generation and OM EF in Year 2006

Province	Total generation (10^8 kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)			
Shaanxi	544.82	54,482,000	6.97	50,684,605			
Gansu	357.38	35,738,000	4.29	34,204,840			
Qinghai	72.04	7,204,000	2.57	7,018,857		Total Emissions tCO_2	**154,812,639**
Ningxia	367.31	36,731,000		36,731,000		Total Power Supply MWh	**156,142,241**
Xinjiang	299.01	29,901,000	8.02	27,502,940	**Year 06**	EF	**0.99148**
Total				156,142,241			

China Energy Statistical Yearbook 2007

China Electric Power Yearbook 2007

3. Calculation of Simple OM Emission Factor of the NWCPG for Year 2007

Table 6 CO_2 Emission Data of NWCPG in Year 2007

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO_2 EF	OXID	CO_2 emission factor of fossil fuel	Average Low Calorific Value	CO_2 emission （tCO_2e）
								(tc/TJ)	(%)	($kgCO_2$/TJ)	(MJ/t,km^3)	K=F*I*J/100000 (for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/10000 (for volume unit)
Raw Coal	10^4t	3303.44	1969.03	470.85	2165.8	1762.11	**9671.23**	25.8	100	87,300	20,908	176,525,905
Cleaned Coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	3.73			124.31	7.73	**135.77**	25.8	100	87,300	8,363	991,243

Briquette	10^4t	3.53					**3.53**	26.6	100	87,300	20,908	64,432
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^8m^3	0.52	0.65			0.26	**1.43**	12.1	100	37,300	16,726	89,215
Other Gas	10^8m^3	14.14	0.71				**14.85**	12.1	100	37,300	5,227	289,526
Crude Oil	10^4t					0.09	**0.09**	20	100	71,100	41,816	2,676
Gasoline	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Diesel Oil	10^4t	1.12	0.26	0.42		1.77	**3.57**	20.2	100	72,600	42,652	110,546
Fuel Oil	10^4t	0.01	1.05	0.04		0.05	**1.15**	21.1	100	75,500	41,816	36,307
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t					5.99	**5.99**	15.7	100	48,200	46,055	132,969
Natural Gas	10^8m^3	1.68	0.49	1.93		8.66	**12.76**	15.3	100	54,300	38,931	2,697,404
Other Petroleum Products	10^4t						**0**	20	100	75,500	41,816	0
Other Coke Oven Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energies	10^4tCe	94.36	9.73				**104.09**	0	0	0	0	0
											Subtotal	180,940,805

China Energy Statistical Yearbook 2008

Table 7 NWCPG Fuel-fired Electricity Generation and OM EF in Year 2007

Province	**Total generation**	**Total generation**	**Self-consumption electricity (%)**	**Total supply**			
	(10^8 kWh)	**(MWh)**		**(MWh)**			
Shaanxi	591	59,100,000	6.77	55,098,930			
Gansu	424	42,400,000	5.89	39,902,640			
Qinghai	97	9,700,000	7.19	9,002,570			
Ningxia	435	43,500,000		43,500,000		Total Emissions tCO_2	**180,940,805**

Xinjiang	346	34,600,000	9.2	31,416,800		Total Power Supply MWh	**178,920,940**
Total				178,920,940	**Year 07**	EF	**1.01129**

Data source: China Electric Power Yearbook 2008

4. Calculation of Simple OM Emission Factor of the NWCPG

Table 8 Calculation of Simple OM Emission Factor of NWCPG

	Total Power Supply (MWh)	**CO2 emission (tCO_2)**	***OM* Emission Factor (tCO_2/MWh)**
2005	125,496,682	136,146,341	1.08486
2006	156,142,241	154,812,639	0.99148
2007	178,920,940	180,940,805	1.01129
The weighted average *OM* Emission Factor (tCO_2/MWh)			**1.02462**

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2005-2007, as follows: $\mathbf{EF_{OM} = 1.02462}$ tCO_2/MWh

<u>Calculation of the Build Margin emission factor ($EF_{BM,y}$)</u>

1. Calculation of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table 9 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Shaanxi	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Total**	**NCV (MJ/t or $1000m^3$)**	**Emission factor (tC/TJ)**	**Oxidation rate (%)**	**Emission (tCO_2e)**
Energy	**Unit**	**A**	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J=F*G*H*I/100000**
Raw Coal	10^4t	3303.44	1969.03	470.85	2165.8	1762.11	9671.23	20908	87300	1	176,525,905
Cleaned coal	10^4t	0	0	0	0	0	0	26344	87300	1	0
Other washed coal	10^4t	3.73	0	0	124.31	7.73	135.77	8363	87300	1	991,243

Briquette	10^4t	3.53	0	0	0	0	3.53	20908	87300	1	64,432
Coke	10^4t	0	0	0	0	0	0	28435	95700	1	0
Other Coke Oven Products	10^4t	0	0	0	0	0	0	28435	95700	1	0
Sub-Total											**177,581,580**
Crude oil	10^4t	0	0	0	0	0.09	0.09	41816	71100	1	2676
Gasoline	10^4t	0.02	0	0	0	0	0.02	43070	67500	1	581
Diesel	10^4t	1.12	0.26	0.42	0	1.77	3.57	42652	72600	1	110546
Fuel oil	10^4t	0.01	1.05	0.04	0	0.05	1.15	41816	75500	1	36307
Other petroleum products	10^4t	0	0	0	0	0	0	41816	75500	1	0
Sub-Total											**150,110**
Nature gas	10^7m^3	16.8	5	19.3	0	86.6	127.6	38,931	54,300	1	2697404
Coke oven gas	10^7m^3	5.2	7	0	0	2.6	14.3	16,726	37,300	1	89215
Other coal gas	10^7m^3	141.4	7	0	0	0	148.5	5,227	37,300	1	289526
LPG	10^4t	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10^4t	0	0	0	0	5.99	5.99	46,055	48,200	1	132969
Sub-Total											**3,209,114**
Total											**180,940,805**

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According to Table 9 and formula (3), (4), (5) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal,y}=98.14\%，\lambda_{Oil,y}=0.08\%，\lambda_{Gas,y}=1.77\%$$

2. Calculating the fuel-fired emission factor ($EF_{Thermal}$)

Table 10 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply (%)	Emission Factor of Fuel ($kgCO_2/TJ$)	Oxidation Factor	Emission Factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1,000,000*B*C
Coal-fired Power Plant	$EF_{Coal,Adv,y}$	38.10	87,300	1	0.8249
Gas-fired Power Plant	$EF_{Oil,Adv,y}$	49.99	75,500	1	0.5437
Oil-fired Power Plant	$EF_{Gas,Adv,y}$	49.99	54,300	1	0.3910

$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ = 0.8170 tCO_2e/MWh。

3: Calculating the Build Margin (*BM*) emission factor (*$EF_{BM,y}$*)

Table 11 Installed Capacity data of NWCPG in Year 2007

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	12290	7840	1900	7030	6560	35620
Hydro power	MW	1,790	4,400	5,830	430	2,140	14590
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	73	346	0	50	330	798.5
Total	MW	14,152.5	12,586.0	7,730.0	7,510.0	9,030.0	51008.5

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Table 12 Installed Capacity data of NWCPG in Year 2006

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,723	6,448	1,517	6,002	5,937	29627
Hydro power	MW	2165	4291	5423	429	1766	14074
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	0	199	0	11	189	399
Total	MW	11,888.0	10,938.0	6,940.0	6,442.0	7,892.0	44100

China Electric Power Yearbook 2007

Table 13 Installed Capacity data of NWCPG in Year 2005

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,132	5,715	887	4,577	5,052	25362.6
Hydro power	MW	1578	4036.2	4825	428.5	1352.1	12219.8
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	46	109.1	0	112.2	132.2	399.5
Total	MW	10,756.1	9,860.3	5,711.8	5,117.7	6,536.0	37981.9

China Electric Power Yearbook 2006

Table 14 Calculation of *BM* Emission Factor of NWCPG

	Installed capacity in 2005	Installed capacity in 2006	Installed capacity in 2007	Newly added capacity from 2005 to 2007	Share in total capacity additions
	(MW)	(MW)	(MW)	(MW)	
	A	B	C	D=C-A	
Thermal power	25,362.6	29,627	35,620	10,257.40	78.74%
Hydro power	12,219.8	14074	14590	2,370.20	18.20%
Nuclear power	0.0	0	0	0.00	0.00%
Wind power and Other	399.5	399	798.5	399.00	3.06%
Total	**37981.9**	**44100**	**51008.5**	**13026.6**	**100.00%**
Share in total installed capacity of 2007	74.46%	86.46%	100%		

$$EF_{BM,y} = 0.8170 \times 78.74\% = 0.6433 \ tCO_2/MWh$$

Calculating the baseline emission factor (EF_y)

According to formula (12) in section B.6.1, the baseline emission factor of the NWCPG is calculated as:

$$EF_y = 1.0246 \times 0.5 + 0.6433 \times 0.5 = \mathbf{0.83395} \ tCO_2/MWh$$

The EF_y applied in this report is fixed for a crediting period and may be revised at the renewal of the crediting period.

Annex 4

MONITORING INFORMATION

Please refer to the Monitoring plan in Section B.7.

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