The Gold Standard
Premium quality carbon credits

THE GOLD STANDARD:
Project Design Document for Gold Standard Voluntary Offset projects

(GS-VER-PDD)

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Explanatory information on how to complete the PDD and how to obtain Gold Standard registration can be found in the project developer's manual available on the Gold Standard website.

This template of the PDD is applicable for micro-, small- and large-scale projects. Note that the shaded boxes present information on the Gold Standard VER project development procedures. Project developers should delete these shaded boxes when preparing their PDD.

VOLUNTARY OFFSET PROJECTS

PROJECT DESIGN DOCUMENT FORM (GS-VER-PDD)
Version 01 - in effect as of: January 2006)

CONTENTS

List of Annexes

Note: Annex marked with "*" is confidential

SECTION A. General description of project activity

A.1 Title of the project activity

>>
Title: Qielong 1.2MW Hydro Power Project
Version: 01
Date: 24/12/2010

A.2. Description of the project activity

>>
Qielong 1.2MW Hydro Power Project (hereafter referred to as "the project") is located on 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., and 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 5,840MWh. 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. It is estimated to reduce 4,870tCO_2e per year during the first crediting period.

As a renewable 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 50 jobs at most 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 and save the trees in the local area. 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 4 for more details.

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

TOTAL	

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)	+
Subtotal	+
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	+

A.3. Project participants:

>>

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Xiahe Xingxin Hydropower Development Co., Ltd. (project owner)	No
UK	Climate Bridge Ltd. (Buyer)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>

People's Republic of China

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

>>

Gansu Province

A.4.1.3. City/Town/Community etc:

>>

Madang Township, Xiahe County, Gannan Tibetan Autonomous Prefecture

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

>>

The proposed project is 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°48'36'' and north latitude 35°19'40''. Figure A-1 below shows the location of the proposed project.

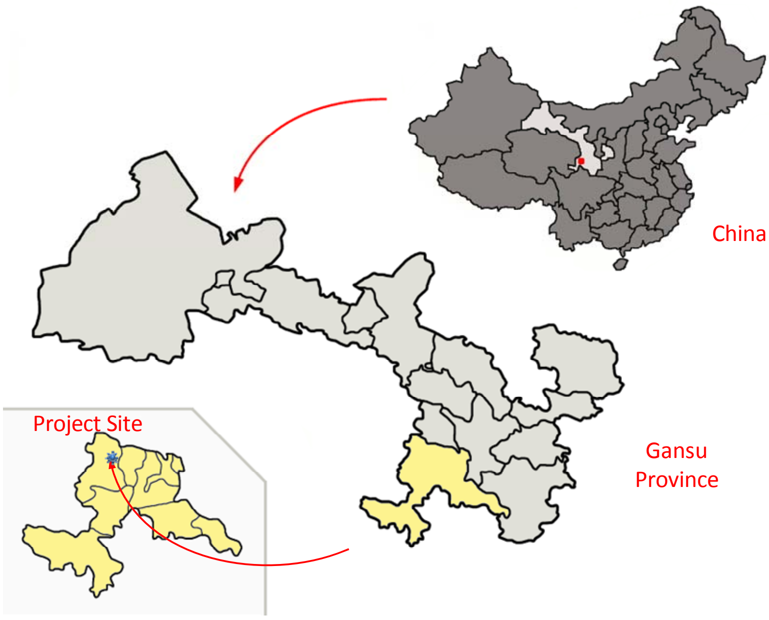

Figure A-1 Location of the Project Site

A.4.2. Size of the project:

>>

The estimated annual emission reduction is 4,870 tons CO_2e, which is lower than 5,000 tonnes CO_2e per year, and therefore the project is classified as Micro-Scale project in accordance with the Gold Standard VER Manual thresholds.

A.4.3. Category(ies) of project activity:

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

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

>>
Xiahe County is in short of such fossil fuel as coal, oil, or gas, but has great potential of hydro resources[1]. With the path of local social and economic development, the electricity demand for industries, agriculture, and people's daily life is increasing. However, the utilization of hydropower has been limited due to the lack to financial incentives, especially a small hydropower project as the proposed one. Therefore, registration of the project as a Gold Standard VER activity would result in additional income flows and improve the economic attractiveness of the project.

The project utilizes water as clean and renewable resource to generate electricity. It is projected to deliver annually 5,840 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 (refer to Section D for details). The anticipated total reductions would be 34,089tonnes of CO_2 equivalent over the crediting period of seven years (refer to Section E for detailed calculation). 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.
.

A.4.4.1. Estimated amount of emission reductions over the crediting period:

>>

The ex-ante estimated amount of annual emission reductions over the first crediting period are 4,870tCO_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 34,089CO_2e.

Table A-2 Ex-ante estimated amount of emission reductions over the first crediting period

Year	Annual emission reductions (tCO_2e)
2010	4,870
2011	4,870
2012	4,870
2013	4,870
2014	4,870

[1] *Feasibility Study Report of Qielong Hydropower Project* [August 2007]

2015	4,870
2016	4,870
Total emission reductions (tCO_2e)	34,089
The length of the crediting period(years)	7×3
Annual emission reductions in the crediting period (tCO_2e)	4,870

SECTION B. Application of a baseline methodology

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

>>

The project used the approved methodology *"AMS-I.D. Grid Connected renewable electricity generation"* (version 16), EB54.

In line with application of the methodology the project draws on the following tools:
"Tool for the demonstration and assessment of additionality" (version 05.2), EB39;
"Tool to calculate the emission factor for an electricity system" (version 02), EB50.

For more information regarding the methodology, please refer to
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html;
http://cdm.unfccc.int/Reference/tools/index.html

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

The methodology AMS-I.D. (version 16) is applicable to the proposed project:

1. The project activity is a hydro power project that supplies electricity to a regional grid (NWCPG).
2. The project activity involves a newly built project at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (greenfield plant)
3. The project has no reservoir.
4. The installed capacity of the project is 1.2MW, which is within the limit of 15 MW stipulated by the chosen (small-scale) methodology.
5. The project is not a combined heat and power (co-generation) project.

B.2. Description of how the methodology is applied in the context of the project activity:

>>

The application of methodology AMS-I.D. (version 16) consists of 5 steps:

Step 1: Checking the applicability
Please see Section B.1.1 for details.

Step 2: Definition of project boundary
According to methodology AMS-I.D (version 16), the project boundary encompasses the physical, geographical site of the renewable generation source.
Please see Section B.4 for details.

Step 3: Identification of the baseline
According to methodology AMS-I.D. (version 16), the baseline of the project is the electricity produced by the proposed project multiplied by a combined margin (CM) which consists of the combination of operating margin (OM) and build margin (BM) of NWCPG.

Step 4: Demonstration and assessment of Additionality
This step comes after the identification of the baseline. The project has been found additional by using the *"Tool for the determination and assessment of additionality"* (version 05.2).
Please see Section B.3 for details.

Step 5: Calculation of baseline, project and leakage emissions
The calculations of baseline, project and leakage emissions have been conducted according to formulas proposed by the

approved methodologies AMS I.D (version 16). and ACM0002 (version 12.1.0)
Please see Section D.4 for details.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered VER project activity:

>>

Previously announced project screen

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 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.

Table B-1 Time table of key events of the project key events

Time	Project Implementation
August 2007	Completion of Project Feasibility Study Report (FSR) by Lanzhou Xinrong Hydraulic and Hydropower Engineering Consulting Services Co., Ltd.
24 August 2007	Completion of Project Environmental Impact Assessment (EIA) by the Environmental Engineering Department, Coal Mining Design and Research Institute in Lanzhou
10 September 2007	Approval of EIA by the Environmental Protection Bureau of Ganan Tibetan Autonomous Prefecture
12 September 2007	Signature of Project Construction Contract
15 September 2007	Approval of FSR by the Water Resource Bureau of Ganan Tibetan Autonomous Prefecture
12 November 2009	Signature of Power Purchase Agreement
Time	**Carbon fund revenues Consideration**
15 August 2007	Board Resolution with Decision of Implementing Carbon Fund Activity
8 May 2008	Signature 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 Fundation & Climate Bridge for Qielong 1.2MW Hydro Power Project China
24 June 2010	Local stakeholder consultation meeting

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.

Project additionality has been demonstrated using *“Tool for the demonstration and assessment of additionality”* (Version 05.2)

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 carbon fund 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 into.

For Alternative 1, without carbon fund revenues, the FIRR of total investment of the project is 7.34%, 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, geothermal 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. Application of compulsory 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 1 simple cost analysis;

Option 2 investment comparison analysis or

Option 3 benchmark analysis

The proposed project will generate electricity sales in addition to carbon fund revenues, so Option 1 not applicable. The investment comparison analysis (Option 2) is only applied when the baseline is an invested project. In the case of the proposed

[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

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 2) is not appropriate. As benchmark FIRR (Financial Internal Return Rate) is available, **Option 3** is chosen to demonstrate the additionality.

Sub-step2b. 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.

According to *Economic Evaluation Code for Small Hydropower Project* [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

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-2 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
Rate of Internal power consumption	%	0.5	FSR
Rate of Transmission Loss	%	3.0	FSR
Grid Emission Factor	tCO_2/MWh	0.83395	2009 Grid Emission Factor of North-west China Power Grid
Electricity Tariff (including VAT)	RMB/KWh	0.227	FSR
Total Static Investment	RMB	8,500,000	FSR
Total Working Capital	RMB	24,000	FSR
Operation & Maintenance Expenses	RMB	200,200	FSR
Value Added Tax Rate	%	6	FSR
Surcharge for Education	%	3	FSR
City Maintenance and Construction Tax	%	5	FSR
Income Tax Rate	%	33	FSR
Expected Project lifetime	Year	20	*Economic Evaluation Code for Small Hydropower Project* (SL16-95)

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

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-3 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	8.12%	10%	12.25%

Since the FIRR of the proposed project is 8.12% 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 12.25%. 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

The sensitive analysis is conducted to check whether, under variation of ±10%, the project FIRR 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 Electricity Delivered to the Grid

Table B-4 summarizes the results of the sensitivity analysis and FigureB-1 provides a graphic depiction.

Table B-4 Sensitivity Analysis

	-10%	-5%	0%	5%	10%
Total Static Investment	9.38%	8.70%	8.12%	7.56%	7.05%
Electricity Tariff	6.71%	7.42%	8.12%	8.80%	9.48%
Annual O & M cost	8.34%	8.23%	8.12%	8.01%	7.89%
Annual Electricity Delivered to the Grid	6.71%	7.42%	8.12%	8.80%	9.48%

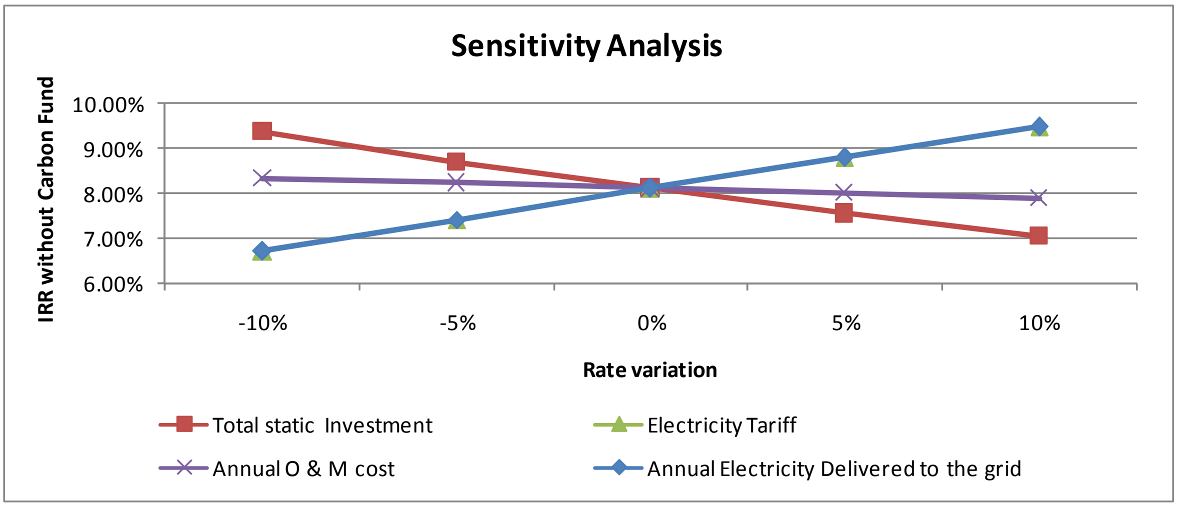

Figure B-1 Sensitivity analysis of the proposed project

Total Static Investment

With a decrease in the total static investment by 10%, the FIRR is still 9.38%, 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.

Electricity Tariff

The above sensitivity analysis shows the IRR for the project will only reach 9.48% 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 tariff in FSR was based on the regulation in 2006[9], and thus could be considered as appropriate for this project. Meanwhile, the actual tariff approved by the Gansu Price Bureau on 2 Dec 2009 for the project is 0.227RMB/Kwh[10]. This is the same as the tariff applied in the financial analysis, and can therefore be considered reasonable as applied tariff.

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 0.22%. Therefore, the FIRR is very unlikely to reach the benchmark by reducing annual O&M cost.

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 operating hour at full capacity increases by 10%, the IRR remains lower than the benchmark.

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 IRR 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 county/region and/or rely on a broadly 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.

Hydropower projects in Xiahe County, Gansu province

Projects at county level 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.

Hydropower projects with installed capacity less than 10MW

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.

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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 http://www.gswj.gov.cn/detail.asp?LMID=2&ID=5860&Class=2261&FN=jgzc

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

China is richly endowed with small hydropower resource. According to a public statistics report, 46,989 small-scale hydropower stations had been constructed by the end of 2006, with a total generation of 44,934WM, which occupies 34.9% of total hydropower generation in China[11]. Though small hydropower projects possess evident advantages in local electricity supply and ecological protection, the external factors is still unfavourable to its development such as abolition of specified loan, limitation of financing channel, lack of price incentive, and low efficiency of administration system, etc[12]

Because of its geographic site that the Yellow River and its tribunes run through, Gansu Province places 10th in China in terms of hydropower potential. The water resources are mainly distributed in Gannan Tibetan Autonomous Prefecture and Longnan District with respective potentials of 2,230MW and 2,250MW. Unfortunately, the local area still faces those difficulties mentioned above in developing small hydropower projects[13].

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*"[14]. In other words, project developers can obtain sufficient return guaranteed by provincial government. However the policy changed after 2002. The electricity tariff was determined on the basis of average costs of power generation using the same advanced technology and built within the same period under the provincial power grids[15]. Therefore, only projects operated after 2002 are considered in the common practice analysis.
The table B-5 listed 3 similar hydropower projects in Xiahe County, Gannan Tibetan Autonomous Prefecture, Gansu Province, and they all started operation after 2002.

Table B-5 Similar Implemented Hydropower Projects in Gansu Province

Project Name	Installed Capacity (MW)	Project Status
Xiaohe	9.6MW	CDM registered[16]
Qianguangtan	9.6MW	CDM registered[17]
Fuhuang II	2.4MW	VGS applying

As other similar projects in Xiahe Coutny are either registered as CDM projects or applying VCS 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.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

>>
According to methodology AMS-I.D. (version 16), the project boundary encompasses the physical, geographical site of the

11 http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=185420

12 http://www.sei.gov.cn/ShowArticle.asp?ArticleID=118712&ArticlePage=1

13 http://www.66wen.com/06gx/shuili/shuiwen/20071222/53476.html

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

15 http://china.findlaw.cn/fagui/jj/27/155788.html

16 http://cdm.unfccc.int/Projects/DB/DNV-CUK1158580010.94/view

17 http://cdm.unfccc.int/Projects/DB/RWTUV1259834352.76/view

renewable generation source. As to the proposed project, the boundary therefore is the project power plant including the water diversion structure, and the power house. The project replaces equivalent power generated from NWCPG, a large regional grid including Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, and Xinjiang Uygur Autonomous Region according to the guideline by China DNA.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

>>

The baseline study and monitoring methodology of the proposed project was completed on 24/12/2010.

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

Feng Zhang, Climate Bridge Ltd.

Email: zhang.feng@climatebridge.com

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 (Signature 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:

>>
7 years × 3

C.2.1. Renewable crediting period

>>

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. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

>>

The approved small-scale methodology *"AMS-I.D. Grid Connected renewable electricity generation"* (version 16) is used for proposed project. For more information regarding the methodology, please refer to

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

Furthermore the *"Tool to calculate the emission factor for an electricity system"* (version 02) is also adopted.
For more information regarding the methodology, please refer to
http://cdm.unfccc.int/Reference/tools/index.html

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

>>
Please see B.1.1 for details.

D.2. 1. OPTION 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

Not applicable, as described in Section E no relevant project emissions are expected, i.e. PE_y=0 tCO_2e.

D.2.1.2. 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
Income and number of employees	Social sustainability and development Economic and technological development	Number	M	Please see Annex 4, Sustainable Development Assessment Matrix for details	Monthly	The payroll is served as additional check for the number of employees and their income monitored	Qielong Hydropower Station	The payroll contains the information about employees' name, gender and salary. Two aspects are to be under check: ⁎ number of employees ⁎ improvement of quality of the life (livelihood of the poor)
Access to energy services	Social sustainability and development	Number	M	Please see Annex 4, 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.
Position for local women	Social sustainability and development	Number	M	Please see Annex 4, 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 will be provided by Qielong Hydropower Station every month.
Training opportunities and certification	Economic and technological development	Number	M	Please see Annex 4, Sustainable Development Assessment Matrix for details	Periodically	Training reports regarding operation and maintenance.	Qielong Hydropower Station	Training opportunities are provided to relevant employees.

D.2.1.3. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>
As described in Section E no relevant project emissions are expected.

D.2.1.4. Relevant data necessary for determining the baseline of anthropogenic emission by sources of GHGs within the project boundary and how such data will be collected and archived:

>>

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
(ID3-1)-(ID3-2)	Net Electricity supplied to the grid by the project (EG_y)	Meter reading	MWh	M	Recorded monthly	100%	Paper	Electricity monitored by meter reading will be cross-checked with the electricity sales receipt. Data will be kept for 2 years following the end of the last crediting period.

D.2.1.5. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>> The baseline emissions are calculated as the electricity supplied by the project activity to the grid ($EG_{BL,y}$ in MWh) times the combined margin emission factor ($EF_{grid,CM,y}$ in tCO2/MWh) as follows:

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

The combined margin (CM) emission factor consists of the combination of operating margin (OM) and build margin (BM) emission factors. According to the *"Tool to calculate the emission factor for an electricity system"* (version 02), the following six steps are applied to determine OM, BM, and CM used for calculating project baseline emissions:

D. 2.2. OPTION 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

Not applicable

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

Not applicable

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

>>Not applicable

D.2.3. Treatment of leakage in the monitoring plan

Not applicable, as described in Section D2.4 no leakage effect is considered

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

Not applicable, as described in Section D2.4 no leakage effect is considered

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recordin g Frequenc y	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>
Not applicable, as described in Section D.2.4 no emission leakage is considered

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>.

Baseline emissions

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_y = EG_{BL,y} \times EF_{CO2}$$

Where:

BEy	=	Baseline Emissions in year *y*; t CO2
EG $_{BL,y}$	=	Energy baseline in year *y*; kWh
EF $_{CO2}$	=	CO2 Emission Factor in year y; t CO2e/kWh

According to methodology AMS-I.D. (version 16), there are two options available for calculating the emission factor:

Option 1 A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" Or Option 2 The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Power consumption in the NWCPG is growing rapidly, which requires the construction of additional generating capacity. The project activity is expected to replace electricity that would have otherwise been generated by plants at the operating margin. Therefore, the baseline emission factor has been calculated as the "combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (version 02). Option 1 is used for the proposed project.

According to the "Tool to calculate the emission factor for an electricity system" (version 02), the following seven steps are applied to determine OM, BM, and CM used for calculating project baseline emissions:

<u>Step 1: Identify the relevant electric power system</u>

In accordance with delineations of connected electricity systems by China NRDC [12](China's DNA), Northwest China Power Grid (NWCPG) is the connected electricity system for the project as it is the spatial extent of the power plants that are physically connected through transmission and distribution lines to the proposed project and can be dispatched without significant transmission constraints. The NWCPG covers Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, and Xinjiang Uygur Autonomous Region according to the delineations published by the DNA of China.

<u>Step 2: Choose whether to include off-grid power plants in the project electricity system</u>

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

According to the "Tool to calculate the emission factor for an electricity system" (version 02), there are two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation
Option I is adopted by the project participants to calculate the operating margin and build margin emission factor.

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:

Option 1 Simple OM, or
Option 2 Simple adjusted OM, or
Option 3 Dispatch data analysis OM, or
Option 4 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 2 and Option 3 cannot be possibly used for the proposed project. For the available data of most recent 5 years (2003-2007), the low-cost/must run resources constituted less than 50% of total power generation of NWCPG and the relevant ratios are respectively were 22.82%, 18.77%, 19.92%, 25.36%, and 24.71%for 2003, 2004, 2005, 2006 and 2007(*China Electric Power Yearbook 2004-2008*). 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 1, but not Option 4. Based on these reasons, Option 1 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: A 3-year generation-weighted average, based on the most recent data available at the time of VER-PDD to the DOE validation, without requirement to monitor and recalculate the emission factor during the crediting period, or
- Ex post option: The year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

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

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

In accordance with the tool (version 02), the simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The PDD adopts Option B for the calculation of the simple OM, because:

1) The necessary data required for Option A is not available; and
2) 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 source is known; and
3) Off-grid power plants are not included in the calculation.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (1)$$

Where:

$EF_{grid,OM\ simple,y}$	= Simple operating margin CO_2 emission factor in year *y* (tCO_2e/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_2e/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 chosen 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.

<u>Step 5: Identify the group of power units to be included in the build margin</u>

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been build most recently, or

(b) The set of power capacity additions in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.

In terms of vintage of data, project participants can choose between one of the following two steps:

Option 1. For the first crediting period, calculate the build margin emission factor *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 crediting period to the DOE. 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 the 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 choose *Option 1*, which requires the project participant to calculate the Build Margin Emission Factor ex-ante based on the most recent information available already built for sample group *m* at the time of PDD submission.

<u>Step 6: Calculate the build margin emission factor</u>

For the proposed project, *ex-ante* data are used for calculating the BM emission factor ($EF_{grid,BM,y}$). In accordance with the tool (version 02), the build margin emission factor ($EF_{grid,BM,y}$) is calculated as:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (2)$$

Where:

$EF_{grid,BM,y}$	= Build margin CO_2 emission factor in year y (CO_2e/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m inyear 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

However, the data that can be used to determine the sample group of power units *m* either from five existing power plants that are built most recently, or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently is not available in China. Taking notice of this situation, EB accepts the following deviation[10] in the methodology application.

1) Use of capacity additions during last 1-3 years for estimating the build margin emission factor for grid electricity.

2) Use of weights estimated using installed capacity in place of annual electricity generation.

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

According to The "*Bulletin on the Baseline Emission Factors of the China Grids",* which has been renewed by the Chinese DNA (Director Office of National Climate Change Coordination of NDRC) on December 30th 2008 the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, is suggested to be used as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM). Therefore, for the project, **firstly**, calculate the newly added installed capacity and the contribution component of different power generation technologies, **secondly**, calculate the weight of newly added installed capacity of each power generation technology and **finally**, calculate the emission factor using the efficiency level of the best technology commercially available in China.

Since the installed capacities of coal-fired, oil-fired and gas-fired technologies can not be separated from the existing statistical data, the *BM* calculation adopts the following method specified in the following steps:

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

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad (3)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co_2,i,j,y}} \quad (4)$$

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

Where:

Sub-Step 2: Calculate the emission factor of thermal power ($EF_{Thermal}$) for each grid based on the result of sub-step 1 and the efficiency level of the best technology commercially available in China

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (6)$$

Where:

$EF_{Coal,\ Adv,\ y}$ $EF_{Oil,\ Adv,\ y}$ and $EF_{Gas,\ Adv,\ y}$ respectively represent the emission factors of the coal-fired, oil-fired and gas-fired power generation technology with the best efficiency level commercially available in China.

Sub-step 3: Calculate BM of the grid based on the result of Sub-step 2 and the share of the thermal power in the recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \qquad (7)$$

Where:

$CAP_{Total,\ y}$ = The total capacity addition of all types of power generation sources (MW) in year *y* which is close to but less than 20% of the existing installed capacity

$CAP_{Thermal,,\ y}$ = The capacity addition of thermal power generation source (MW) in year *y*

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 and also China DNA's "Report on 2009 Baseline Emission Factor of Regional Power Grids in China"[11]

<u>Step 7: Calculate the combined margin emission factor</u>

According to the tool (version 02), the combined margin emission factor *($EF_{grid,CM,y}$)* is calculated as the weighted average of the operating margin emission factor ($EF_{fgrid,OM,\ y}$) and the build margin emission factor ($EF_{grid,BM,\ y}$), as:

$$EF_{grid,CM,y} = \omega_{OM} \times EF_{grid,OM,y} + \omega_{BM} \times EF_{grid,BM,y} \qquad (8)$$

According to the tool (version 02), the weight $w_{OM,}$ and the weight w_{BM} are both taken as 50% as the default value. Thus,

$EF_{grid,CM,y}$ = 1.0246× 50% + 0. 6433× 50% = 0.83395tCO_2e/MW

Baseline Emissions (BE_y)

The baseline emissions can be calculated as follows:

$$BE_y = EG_y \times EF_{grid,CM,y} \qquad (9)$$

Project Emissions (PE_y)

[11] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2333.pdf

Since the project activity involves a mini hydro power station, which is a renewable energy source, the project CO_2 emissions are assumed to be zero, i.e. PE_y=0 tCO_2e.

Leakage (LE_y)

According to AMS-I.D (version 16), leakage is considered if the energy generating is transferred from another activity. As the proposed project activity is a newly constructed project and the energy generating equipment is not transferred from another activity, no leakage is to be considered, i.e. LE_y=0 tCO_2e.

Emission Reductions (ER_y)

The emission reductions (ER_y) by the project activity during a given year y are the difference among baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y). The final GHG emission reduction is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad (10)$$

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

The data requires monitoring for the project is the amount of electricity exported to the grid by the project and the amount of electricity imported from the grid by the project (refer to Section D.2.1.4).

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.

Data (Indicate table and ID number e.g. 3.-1.; 3.2.)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
3-1	Low	<u>$EG_{export,y}$:</u> 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. The revenue meter will be calibrated periodically based on the national standard 'electricity meter installation technical management code' (DL/T448-2000). 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.

3-2	Low	*EG $_{import, y}$*: The amount of imported 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 imported electricity records can be cross checked by the monthly electricity sale receipts. The revenue meter will be calibrated periodically based on the national standard 'electricity meter installation technical management code' (DL/T448-2000). 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.

D.4. Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

>>

The monitoring of the emissions reductions will be carried out according to the operation and management structure shown in Figure D-2.

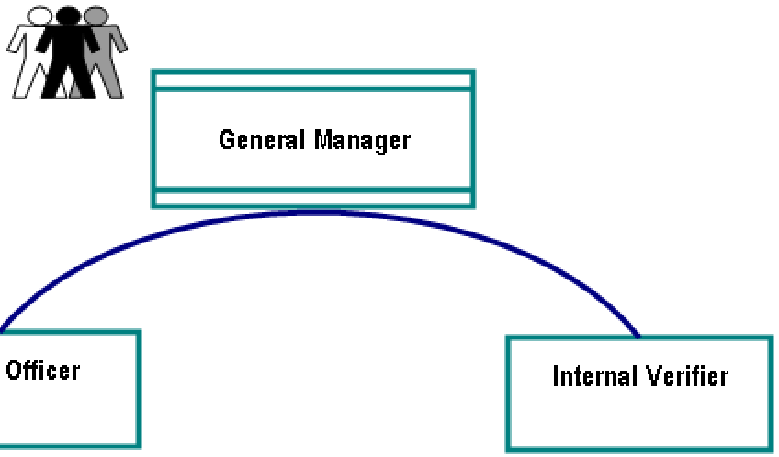

Figure D-2 Operations and Management Structure

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.

D.5 Name of person/entity determining the monitoring methodology:

>>

The monitoring methodology of the proposed project was completed on 24/12/2010.

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

Feng Zhang, Climate Bridge Ltd.

Email: zhang.feng@climatebridge.com

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

Climate Bridge Ltd. is one of the project participants.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

Project Emissions:

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, i.e. PE_y=0 tCO_2e.

E.2. Estimated leakage:

>>

Leakage emissions:

According to AMS-I.D (version 16), leakage is considered if the energy generating is transferred from another activity. As the proposed project activity is a newly constructed project and the energy generating equipment is not transferred from another activity, no leakage is to be considered, i.e. LE_y=0 tCO_2e.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

>>

The sum of project emissions and leakage is zero, i.e. $PE_y + LE_y = 0$.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

>>

According to Section D.4, the CM emission factor of the project is EF_y= 0.83395tCO_2/MWh. The annual amount of electricity to be delivered to the grid from the project is EG_y=5,840MWh. The baseline emissions (BE_y) are the product of the baseline emissions factor (EF_y) and the electricity supplied by the project activity to the grid:

$BE_y = EG_y \times EF_y$ =4,870tCO_2e

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

>>

$ER_y = BE_y - PE_y - LE_y$

ER_y = 4,870tCO_2e – 0 – 0 = 4,870tCO_2e

E.6. Table providing values obtained when applying formulae above:

>>

The renewable crediting period of 7 years × 3 has been chosen. The ex-ante estimated amount of annual emission reductions over the first crediting period are 4,870 tCO_2e. In the first crediting period from 2010 to 2016, the total emission reductions are estimated to be 34,089 tCO_2e.

Table E-1 Ex-ante estimated amount of emission reductions over the first crediting period

Year	Estimation of project activity emission reductions (tonnes CO_2 e)	Estimation of baseline emission reduction (tonnes CO2 e)	Estimation of leakage (tonnes CO_2 e)	Estimation of emission reductions (tonnes CO_2 e)
2010	0	4,870	0	4,870
2011	0	4,870	0	4,870
2012	0	4,870	0	4,870
2013	0	4,870	0	4,870

2014	0	4,870	0	4,870
2015	0	4,870	0	4,870
2016	0	4,464	0	4,464
Total	0	34,089	0	34,089

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

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 10 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.

F.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 G. Stakeholders' comments

G.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 22 people attended the consultation, and 22 questionnaire were distributed during the meeting. Table G-1 listed basic information of the attendees, and details of the consultation are recorded in Annex 8 (Local Stakeholder Consultation Report).

Table G-1 Stakerholders Basic Information

Item		Number	Percentage（%）
Gender	Male	17	77%
	Female	3	14%
Age	18~30	12	55%
	>30	10	45%
Educational background	Primary and Junior Middle School	11	50%
	High School	1	5%
	College and above	10	45%
Nationality (Ethnic Group)	Han	13	59%
	Hui	2	9%
	Zang	7	32%
Occupation	Farmer	4	18%
	Worker	11	50%
	Government official	5	23%
	Engineer	2	9%
Distributed Questionnaires		22	
Collected Questionnaires		22	

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

G.2. Summary of the comments received:

>>
- Comments from these questionnaires are summarized in Table G-2 below.

Table G-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 describe**	**Is this likely to result in a significant effect? Yes/No/? -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 hydro resource in Xiahe County, and generates clean electricity. 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.

The project has brought some benefits to the local social and economic development. With the construction of the power station, the building of the path has facilitated local transportation.

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.

G.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 propose the project for GS-VER registration.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

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 （tc/TJ） H	OXID （%） I	IPCC CO2 Emission Factor (the Lower Limits of the 95% Confidence Intervals) ($kgCO_2/TJ$)	Low Calorific Value （MJ/t,km3）
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 NWPG for Year 2005

Table 2 CO_2 Emission Data of NWPG in Year 2005

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO_2 EF (tc/TJ)	OXID (%)	CO_2 emission factor of fossil fuel ($kgCO_2/TJ$)	Average Low Calorific Value (MJ/t,km3)	CO2 emission (tCO2e)
												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	10^8m3						0	12.1	100	37,300	16,726	0
Other coal gas	10^8m3						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 NWPG 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
Ningxia	276.43	27,643,000	5.73	26,059,056
Xinjiang	265.6	26,560,000	8.8	24,222,720
Total				125,496,682

	Total Emissions tCO2	136,146,341
	Total Power Supply MWh	125,496,682
Year 05	EF	1.08486

China Electric Power Yearbook 2006

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

Table 4 CO_2 Emission Data of NWPG in Year 2006

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO_2 EF (tc/TJ)	OXID (%)	CO_2 emission factor of fossil fuel ($kgCO_2$/TJ)	Average Low Calorific Value (MJ/t,km3)	CO2 emission (tCO2e) K=F*I*J/100000 (for mass unit) K=F*I*J/10000 (for volume unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	
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	10^8m3	0.2				0.08	0.28	12.1	100	37,300	16,726	17,469
Other coal gas	10^8m3	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 NWPG 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
Ningxia	367.31	36,731,000		36,731,000
Xinjiang	299.01	29,901,000	8.02	27,502,940
Total				156,142,241

	Total Emissions tCO2	154,812,639
	Total Power Supply MWh	156,142,241
Year 06	EF	0.99148

China Energy Statistical Yearbook 2007
China Electric Power Yearbook 2007

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

Table 6 CO_2 Emission Data of NWPG in Year 2007

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO_2 EF （tc/TJ）	OXID （%）	CO_2 emission factor of fossil fuel ($kgCO_2$/TJ)	Average Low Calorific Value （MJ/t,km3）	CO2 emission （tCO2e）
												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	10^8m3	0.52	0.65			0.26	1.43	12.1	100	37,300	16,726	89,215
Other Gas	10^8m3	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 NWPG Fuel-fired Electricity Generation and *OM* EF in Year 2007

Province	Total generation (10^8 kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (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 tCO2	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 NWPG

Table 8 Calculation of Simple *OM* Emission Factor of NWPG

	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: 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

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total F=A+B+C+D+E	NCV (MJ/t or 1000m³) G	Emission factor (tC/TJ) H	Oxidation rate (%) I	Emission (tCO2e) 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 NWPG 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

China Electric Power Yearbook 2008

Table 12 Installed Capacity data of NWPG 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

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Table 13 Installed Capacity data of NWPG 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 NWPG

	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 (8) in section B.6.1, the baseline emission factor of the NWCPG is calculated as:

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

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 3

MONITORING PLAN

Please see Section D for relevant details.

Annex 4

SUSTAINABLE DEFELOPMENT ASSESSMENT MATRIX

Component • Indicators	Score (- to +)	Reasons
Local/regional/global environment		
• Water quality and quantity	0	During the construction period, industrial wastewater is treated with 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. During the operational period, the machinery oil and the cleaning wastewater go through oil-water-separation, and then the liquid will be reused for greening or road watering without discharge. Similar with that during the operation period, the domestic sewerage at this stage is also treated and reused for plant greening without discharge. Therefore, this indicator scores as zero. (Annex 6)
• Air quality (emissions other than GHGs)	0	The air pollution mainly comes from project construction. Proper measures are 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. By doing so, the pollution can be minimized to the least significant level. During the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, directly reducing emissions other than GHG such as SO_x and NO_x. However, such contribution is difficult to qualify or measure, Therefore, this indicator scores "0". (Annex 6)
• Other pollutants (including, where relevant, toxicity, radioactivity, POPs, stratospheric ozone layer depleting gases)	0	Noise Pollution Noise mainly comes from the construction machines, concrete casting and transportation vehicles, yet, their operations at night are avoided, and the machines are installed at a furthest location away from human where possible. Regular machine diagnosis is arranged to prevent dysfunctional operation. The workers on-site are also be protected by proper measurements. Meanwhile, the location of the power plant is actually far away from the village. Hence, the noise does no significant affect to local people. So, this indicator scores as zero. (Annex 6)

• Soil condition (quality and quantity)	0	A comprehensive soil and water conservation plan is arranged in line with the project construction plan. Besides, considering the small size of the project, land excavation is limited, and the soil condition can be recovered with restoration. Therefore, this indicator scores as zero. (Annex 6)
• Biodiversity (species and habitat conservation)	0	The project does not affect the forest ecosystem or wildlife in the surrounding. With the construction of dam, the transparency of the waterbody will be increased and the amount of Plankton volume will be increased accordingly. Thus, the impact to the biodiversity is not significant, and the indicator scores as zero. (Annex 6)
Sub total	0	
Social sustainability and development		
• Employment * (including job quality, fulfillment of labor standards)	+	During the construction and operation phases, some temporary and permanent job opportunities are provided, and, relevant trainings are provided to help the employees upgrade their skills and knowledge. Therefore, this indicator scores as positive. (Annex 13)
• Livelihood of the poor * (including poverty alleviation, distributional equity, and access to essential services)	+	Poverty Alleviation Some 50 jobs are available during the construction period and 8 permanent employment opportunities have been created during operation period, most of which are from local community. The average income for permanent employee is about 10000 RMB/year above the average level of 2436 RMB/year in rural area of Gansu Province[18]. The temporary construction worker will earn about 1000 RMB/month. Therefore, this indicator scores as positive. A path leading to the power station has been paved, and a water channel for irrigation has been built up. These give convenience to local villagers. (Annex 14) Therefore, this indicator scores as positive.

[18] http://www1.china.com.cn/economic/txt/2009-05/05/content_17724321.htm

• Access to energy services*	+	Although the project is micro-scale, it helps to release the power supply shortage in Madang township, and reduces the dependences of provincial grid to a certain extent. Therefore, this indicator scores as positive.
• Human and institutional capacity (including empowerment, education, involvement, gender)*	+	The local stakeholder consultation for the GS-VER retroactive registration invited both local residents and officers. This helps to improve the local democracy. Therefore, this indicator scores as positive. Meanwhile, one female farmer has been hired to work in the hydropower station (Annex 13) Therefore, this indicator scores as positive.
Subtotal	+	
Economic and technological development		
• Employment (numbers) *	+	Over 50 jobs at most were available during the construction period. 8 permanent jobs are created during the operation period. Training has also been provided to relevant employees. (Annex 13)
• Balance of payments (sustainability)	0	No foreign currency or domestic investment involved in the project activity.
• Technological self reliance (including project replicability, hard currency liability, skills development, institutional capacity, technology transfer)	0	The technology adopted by the proposed project is domestic technology, so technology transfer was not involved in the proposed project.
Sub total	+	
TOTAL	+	

*The asterisk indicators will be monitored in sustainable development monitoring plan

Annex 5

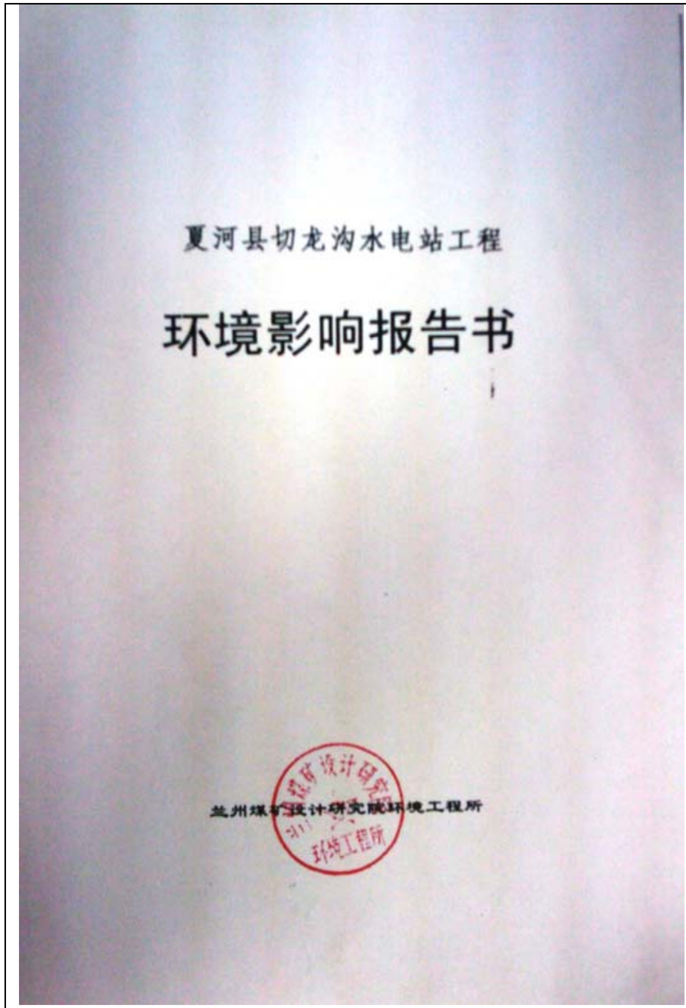
EIA REQUIREMENTS FOR RUN OF RIVER PROJECTS (Appendix C of Gold Standard VER Project Developer's Manual)

Management domain	Basic requirements	Source (From EIA)
Minimum Flow	Goal is dynamic flow regime, which qualitatively simulates the natural hydrological regime	P43
	Minimum flow which guarantees habitat quality and prevents critical oxygen and chemical concentrations	P43
	No disconnection of lateral rivers	P41
	Minimum water depth for fish migration during critical periods	P41
	Lateral and vertical connectivity (flood plain and groundwater) shall not be substantially disturbed	P41
	Provides sufficient transport capacity for sediments	P40
	Landscape compartment shall not be destroyed	P41
	Flood plain ecosystems shall not be endangered	P57
	Conservation of locally adapted species and ecosystems	P41
Hydropeaking	Rate of change of water level should not impair fish and benthic populations	P43
	Reduction in water level should not lead to drying of the water course	P41
	Protective measures if flood plain ecosystems are impaired	P40
	No isolation of fish and benthic organisms when water level decreases	P43
	No impairment if spawning habitat for fish	P43
Reservoir management	Are there feasible alternatives to reservoir flushing?	No reservoir
	Changes in reservoir levels should not impair lateral ecosystems (flood plain, river shores, …)	No reservoir
	Connectivity with lateral rivers should not be impaired	No reservoir
	Sediment accumulation areas should be used as valuable habitats, where feasible.	No reservoir
	Special protection of flood plain ecosystems if they are impaired	No reservoir
Sediment management	Sediments have to pass through the power plant	P40
	No erosion and no accumulation in the river bed below storage dams and water in takes because of a deficit in sediments	P40
	Sediment transport should sustain morphological structures, which are typical for the river	P40
	No accumulation of sediments below dams	P40
	Riverine habitats have to be established	P43

Power plant design	Free fish migration upwards and downwards (as far as technologically feasible)	P42
	Protection of animals against injury and death stemming from power plant operations (turbines, canals, water intakes, …)	P42
Social impacts	Cultural landscapes	P41
	Human heritage (including protection of special ethnic groups)	P87
	Preservation of lifestyles	P87
	Empowerment of local stakeholders in the decision-making process (about mitigation and compensation of social impacts)	P87
	Resettlement of local population under similar or better living conditions (than prior to the project)	P87
	Build additional social infrastructure, sufficient to cope with population increase (due to migration induced by the project)	No migration
	Water quality and fishing losses affecting downstream riverside population	P41

<u>Annex 6</u>

Excerpts from EIAS with translation

 夏河县切龙沟水电站工程 环境影响报告书 兰州煤矿设计研究院环境工程所	Xiahe Qielong Hydro Power Project Project Environmental Impact Assessment Environmental Engineering Department, Coal Mining Design and Research Institute in Lanzhou 24 August 2007

根据工程施工和工程运行特点，对以下因素进行分析见表 3-1。

表 3-1 工程对环境的作用因素及影响源分析表

	影响源	影响方式	影响对象、范围	影响程度
施工期	施工场地	占压破坏、排污	植被、河水	短期、可逆
	料场	开挖、水土流失	植被、河道	短期、可逆
	渣场	占压破坏、水土流失	植被、荒坡地、沙地	短期、可逆
	交通运输	噪声、扬尘	施工人员和村民	短期、可逆
	机械设备运行	废水、废气、粉尘和噪声	施工人员、村民、河流	短期、可逆
	施工人员活动	生活污水、生活垃圾	施工人员和村民	短期、可逆
运行期	永久占地	土地利用改变	村民	长期、不可逆
	水资源分布	局部河道减水	河流生态、村民	长期、不可逆
	水文、泥沙	冲淤条件改变	河流水文情势	长期、不可逆
	建筑物阻隔	下游用水和水生生物发生变化	村民、河流生态	长期、不可逆

3.1.4 移民安置影响分析

电站建设不淹没耕地，永久工程不占用农田，只有厂房及生活管理区占用部分河漫滩地、荒坡草地，没有人口迁移问题。

3.2 工程污染源分析

本工程在建设过程和运行期，不采用任何措施情况下，均有污染物排放，分析见表 3-2、表 3-3。

表 3-2 施工期污染源及污染物分析表

序号	环境因子	污 染 源	污 染 物	排放方式	排放去向
1	水	大坝基坑排水	泥沙、悬浮物	间断排放	洒水洗沙
		沙料冲洗	泥沙等	间断排放	重复利用
		机械维修	含油类废水	隔油池处理	综合利用
		施工人群	生活污水	撒泼、绿化	综合利用
2	大气	运输车辆	CO、CO_2、扬尘	间断排放	大气
		建材开采	扬尘	间断排放	大气
		饮食油烟	烟尘、SO_2、CO_2	连续排放	大气
3	噪声	施工机械	噪声	连续排放	
		爆破开挖	噪声	间断排放	

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The project does not submerge arable land, and the permanent construction does not occupy farmland… the project involves no resettlement.

Table 3-2 Pollution source and pollutant during the construction period

No	Environmental factor	Pollution source	Pollutant	Discharging status	Treatment /wayout
1	Water	Draining water	Sediment, SS	intermittent	For sparkling, or sand washing
		Aggregate cleansing	Sediment	Intermittent	Reuse
		Mechanical fixing	Oily wastewater	Oil separation tank	Multipurpose utilization
		Workers	Domestic wastewater	Sparkling, watering plants	Multipurpose utilization
2	Air	Transportation vehicles	CO, CO_2, dust	Intermittent	Emit to air
		Excavation	Dust	Intermittent	Emit to air
		Cooking	Smoke, SO_2 CO_2	Continuously	Emit to air
3	Noise	Machines	Noise	Continuously	
		Excavation	Noise	Intermittent	

4	生态环境	基础开挖	弃渣	间断排放	荒地、河漫
		建筑材料	弃渣	间断排放	荒地、河漫
		施工人群	生活垃圾	间断排放	填埋场

表 3-3　运行期污染源及污染物分析表

序号	环境因子	污染源	污染物	排放方式	排放去向
1	水	职工及家属	生活污水	间断排放	综合利用
		设备检修	含油废水	间断排放	隔油池处理
3	噪声	运输车辆	噪　声	瞬时排放	
		发电机组	噪　声	连续排放	降噪处理
4	生态环境	职工及家属	生活垃圾	间断排放	填埋场

3.3 污染物排放分析

3.3.1 废水

施工期间，水污染源以基坑废水、砂石骨料冲洗废水、混凝土拌和设备冲洗废水，含油污水和生活污水为主。水中污染物主要为 SS，另有油污、BOD_5 等，见表 3-4。

表 3-4　各类废（污）水排放情况一览

污染源类型	废水排放时段	排放特性	废水排放强度	主要污染物排放浓度
砂石料加工废水	施工期	连续排放	$120m^3/h$	SS: 5000mg/L
混凝土拌和废水	施工期	间歇式排放	冲洗废水：$0.5m^3$/次；罐养护废水：$0.35m^3$/次·罐	SS: 5000mg/L PH值：12
基坑废水	施工期的枯水期	间歇式排放	$22m^3/h$	SS: 2000mg/L
生活污水	施工期	连续排放	$3.84m^3/d$	BOD_5: 260mg/L SS: 340mg/L
含油废水	施工期	连续排放	$0.8m^3/h$	石油类：30～150mg/L

电站建成后由于厂区工作人员较少，在厂区建设旱厕一处，生活污水综合利用，无外排。

3.3.2 废气

施工期废气污染源主要来自机械设备、爆破、运输车量、土石方开挖和食堂炉灶，主要污染物为扬尘、粉尘、烟尘、SO_2、CO、CO_2 等。工程建成后运行期间，由于取暖和生活均采用电能，而且生产过程中不存

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4	Ecological environment	Excavation	Waste slag	Intermittent	Barren land
		Construction materials	Waste slag	Intermittent	Barren land
		Worker	Domestic solid waste	Intermittent	Landfill site

Table 3-3 Pollution source and pollutant during the operation period

No	Environmental factor	Pollution source	Pollutant	Discharging status	Treatment /wayout
1	Water	Workers and their family	Domestic waste water	Intermittent	Multipurpose utilization
		Mechanical fixing	Oily wastewater	Intermittent	Oil separation tank
2	Noise	Transportation vehicles	Noise	Temporarily	
		Machines	Noise	Continuously	Noise insulation
3	Ecological environment	Workers and their family	Domestic solid waste	Intermittent	Landfill site

5 环境影响预测和评价 5.1 拦水坝淤积的影响分析 切龙沟的建设工程为径流低坝引水式电站，水坝淤积来源为切龙沟河流推移质，而切龙沟河水比较浑浊，河床推移质较多，水坝淤积问题较重，水坝的淤积可能造成水位的抬高，造成溃坝、溢流等问题，应定期做好清淤工作，避免造成溃坝、溢流。 5.2 河道冲淤的影响分析 工程兴建运行期内，由于为径流低坝引水式电站，再加上切龙沟河水质浑浊，含沙量较大，将会有一部分悬移质泥沙淤积在坝前，下泄的水流挟带的泥沙与工程建成前的泥沙量稍有变化；通过发电厂房的尾水，虽然流速较河水流速有所增大，但其形成的动能尚不足以使下游河道的冲刷作用增强，在尾水中大部分能量已经消除，因此不会引起河道形态发生较大变化。 5.3 水文情势的影响分析 本电站为径流低坝引水式电站，设计坝高 2.0m，进水闸设计水位为 2501.32m，设计水头 39.6m、引水流量 3.93 m^3/s，多年平均流量 2.58m^3/s，最枯流量为 1.76m^3/s，根据国家环境保护总局办公厅环办函〔2006〕11号《关于印发水电水利建设项目水环境与水生生态保护技术政策研讨会会议纪要的函》，河道生态用水量的计算需开展多方法、多方案的比选。维持水生生态系统稳定所需最小水量一般不应小于河道控制断面多年平均流量的 10%（当多年平均流量大于 80m^3/s 时按 5%取用）。本项目河道生态需水流量为 0.258m^3/s。该电站最小引水流量 0.72m^3/s、最大引水量 3.93m^3/s，按坝址多年平均流量 2.58m^3/s 计，机组最小出力仍能保证 兰州煤矿设计研究院环境工程所　　40	…the amount of sediments in the waterflow will be slighted different than that before the construction of the project…this will not cause significant change in the river configuration

<table>
<tr>
<td>0.258m³/s 的下泄流量，按枯水年最小日均流量 1.76m³/s 计，在保证最小生态用水量 0.258m³/s 的情况下，机组不能稳定运行。

由于减水河段河道两岸无灌溉耕地，也无其它大的植物带，只要保证电站在枯水期下泄流量不小于 0.258m³/s。就可满足河道生态环境需水量，防止河道断流。该项目减水河段内无工业、农业取水口，电站引水后不会对减水河段内的农牧民取水、用水造成影响。工程周围无工业污染源、当地生活污水量较小，考虑电站运行期，所需生产管理人员较少，修建一处旱厕，因此该阶段不会对水体水质造成污染。但引水后会使减水河段内河流水位下降，河宽变窄，流速减缓，流量减少。

5.4 对局地气候的影响

由于本电站属微型工程、枢纽前将形成长约60m的峡谷型水面，回水面积小，对近陆面的气候要素的影响很小，不存在引发和加重灾害性气象的条件。

5.5 对地质环境的影响

本项目为径流低坝式水电站，蓄水后最大抬高水位仅为 1.5m，库水压力小。因此，根据坝区地质构造条件，地震活动特征和水文地质条件综合分析，坝区蓄水后不存在诱发地震的地震地质背景，产生水坝诱发地震的可能性很小，但应该对坝上的回水影响范围内的两岸设置深防护堤。

5.6 对生态环境的影响

5.6.1 工程对两岸陆生生态环境影响分析

因该电站属于新建设微型工程，且暗渠 (75.21m) 和隧道（962.14m）长度均小，施工过程中对枢纽和厂房工程区基本没有改变原地段的动物生境，自然植物群落结构级组成。故对两岸区域内生态系统的结构和稳定行

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<td>…as long as the minimum flow of 0.258 m³/s is assured, no water breaking will occur in the river…the reduced amount of water flow will not affect the water use of local residents and herdsman…
…considering the small amount of workers in the hydropower plant during the operation period, one latrine will be built up, and no pollution will be caused to the waterbody.

…the construction of diversion system and power house does not affect the living hood of animals and plant communities.</td>
</tr>
</table>

同浮游生物一样，水库大坝建成蓄水，形成大水面，泥沙沉降，流速减缓，为底栖动物提供了较为适宜的生存环境，有利于底栖生物的生长和繁殖。 **(4) 本水电站工程对水生生物影响的评价结论** 通过对水生生物现状的调查监测，影响预测评价，切龙沟水电站的修建，对浮游生物、底栖生物不会造成明显的负面影响，但对主要土著经济鱼类黄河裸裂尻鱼的遗传进化有一定的负面影响，通过采取一系列科学合理的补救措施，基本可以排除这一负面影响。所以，本评价认为该水电工程对水生生物无明显的不利影响。电站拦水坝建成后，流水变成静水或缓流水泥沙沉降，水体透明度加大。浮游生物量会有所增加。 **5.7 对减水河段的影响分析** **5.7.1 减水河段地表水资源分析** 本电站枢纽区年平均流量为 2.58m³/s，枯水期最枯流量为 1.76m³/s，电站运行时必须保证 0.258m³/s 的生态流量。 **5.7.2 河道生态环境需水分析** 河道内生态环境用水量分为河道内生态环境用水量和河道外生态环境用水量。分析采用《水电水利建设项目河道生态用水、低温水和过鱼设施环境影响评价技术指南（试行）》（国家环保局 2006 年）《水电水利建设项目水环境与水生生态保护技术政策研讨会会议纪要》（国家环境保护总局 2005 年 12 月）中推荐的生态环境影响预测评价方法中生态环境需水量估算方法和有关规定： 河道内生态环境需水量主要有以下四类： ①维持河道基本功能的需水量，包括防止河道断流保持水体一定的自 兰州煤矿设计研究院环境工程所 43	(Conclusion of the project's impact towards aquatic organisms)…Therefore, it is considered that the project causes no obvious adverse effect to aquatic organisms. The average flow of the project water diversion system is 2.58m²/s, and the water flow during the dry season is 1.76m²/s; a minimum ecological flow of 0.258m²/s should be assured during the project operation period.

<table>
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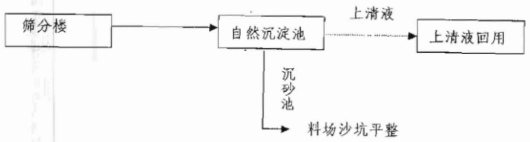
6 环境保护措施
6.1 施工期环境保护措施
6.1.1 施工期水环境保护措施
① 施工期生产废水处理措施
施工期生产废水主要产生于混凝土拌和、沙石骨料清洗加工废水等。这些废水中主要含有一定量的 BOD、COD、SS。对于这些废水，采用自然沉淀和自然蒸发处理，处理流程见图 6-1。含高悬浮物的废水从筛分楼流出，进入沉淀池，不使用凝聚剂，在沉淀池中进行自然沉淀，上清液回用。该方案特点是处理流程简单，技术要求不高，运行操作简单，运行费用少，但为达到较好的处理效果，沉淀池的体积较大，废水经处理后全部回用于施工生产，其措施是可行的。


图 6-1 废水处理流程图
在每个混凝土加工系统修建一处废水沉淀池，通过自然沉淀，去除悬浮物等，清水用于施工生产，根据实际情况对沉淀池及时进行清理，沉淀池规模为 2m × 2m × 1.5m。
在砂砾石料场各修建 1 个废水沉淀池，通过自然沉淀，去除悬浮物等，其规模为 2m × 2m × 2m。清水重复利用。
兰州煤矿设计研究院环境工程所 54
</td>
<td>It is feasible to reuse the construction waste water after treatment</td>
</tr>
</table>

含油废水处理方案： 在机械修配处、汽车修理点修建一处隔油池，每周收集一次废油。隔油池规模为 1.5m×1.5m×1m，清水重复利用。 施工期(10 个月)平均施工人员为 120 人，污水产生量按 40L/人·d 计，则施工期污水排放总量为 $1152m^3$，直接用于周围灌丛绿化和厂地及道路的降尘用水，不需做生化处理。在施工生活区，修建旱厕，在年末或施工结束时，由当地百姓将排泄物用于农肥，不对外环境造成影响。 **6.1.2 施工期大气环境保护措施** 该工程施工期废气和扬尘主要产生于施工道路修建和各种类型的土、石方爆破、开挖以及粉状施工材料的运输、堆放、装卸、拌和等过程及弃土石方的堆放场等。采取的扬尘控制措施是: ① 严禁随地随处乱开挖、乱堆放。 开挖面要尽可能小，不能随意扩大开挖过程，开挖后要及时平整填压开挖面；对不再利用的开挖面平整后及时植树或种植草籽，尽早恢复植被；对暂时不用的开挖面及时平整后夯实，避免扬尘产生；对暂时不用的土石，应整理后夯实表面或保证其表面的潮湿，减小扬尘的产生。 ②对运输土石方及粉状施工材料的车辆上面要加遮盖物，禁止土、砂等撒落，并在临时施工道路上经常洒水，以免产生扬尘。 ③经常在作业区域洒水，以防止扬尘产生。 ④对于施工用的粉状材料如石灰、水泥等的堆放场应设在四面有墙、带盖的棚内，或用遮盖物遮盖，以避免产生扬尘。操作凿岩机的人员要配戴防尘口罩，防止和减轻扬尘、粉尘对其的危害。 经采取以上措施后，施工期间所产生的扬尘就会降至最低程度，从而减轻对周围环境空气质量的影响。 兰州煤矿设计研究院环境工程所 55	…domestic wastewater during the construction period can be used for plant watering and road sparkling. Latrines will be built up in the construction area, and the excreta will be used for irrigation. To control the air pollution, following measurement will be taken out: 1) Disordered excavation and piling are not allowed. 2) Materials should be transported with coverage 3) Frequent road sparkling to prevent dust 4) Equip workers with masks

6.1.3 施工期固体废弃物处置措施 在闸(坝址)、厂址施工营地、施工场地各设 2 个垃圾箱,共设 6 个。生活垃圾收集后定期清运,拉至夏河县垃圾填埋场进行填埋。每周清理一次。为了保护水质,防止切龙沟河流域大肠菌群和细菌总数指标恶化,在施工较集中的主营地、施工场地各设旱厕 1 处,枢纽区施工人员的粪便均排入防渗旱厕,定期清理用作农家肥。施工结束后,拆除临时用房和设施时,将产生建筑垃圾,其中一部分回收利用,其余送入渣场处置。 本工程弃渣分别运至就近渣场,堆高 0.8m 时夯实一次,工程结束时,可将开挖的土方回填表面。另将施工过程中产生的建筑废渣与弃渣一起处置。	Litter bins should be available at the dam site, construction camp site, and the construction site. Domestic solid wastes will be collected and send to Landfill site in Xiahe county regularly.
6.1.4 施工期声环境保护措施 ①对于空压机、电焊机、柴油发电机、钢筋切断机、搅拌机等,在施工允许的范围内,尽可能安设在离人群活动较远的地方; ②在其安设处周围用临时围墙或安装在临时隔离活动机房内; ③给施工操作人员配戴防噪耳塞以降低噪声影响; ④在选购施工机械时尽可能选择噪声小的机械; ⑤对施工机械应定期维修,避免带病作业; ⑥采取轮班的方法让操作人员工作不超过 8 小时; ⑦禁止夜间爆破和噪声产生量大的机械作业。 经采取以上切实可行的措施后,施工中产生的噪声对环境敏感点、施工人员、机械操作人员的影响会降至最低程度。 6.2 运行期废污水处理措施 ①根据地表水功能区划方案,水体执行 GB3838-2002 的Ⅲ类标准。为了避免蓄水后出现的水体污染问题,坝区周边严禁新建污染型企业及污 兰州煤矿设计研究院环境工程所 56	…by taking the above measurements, the effect of noise during the construction period towards to workers will be minimised.

10 结论与建议 10.1 结论 10.1.1 工程概况 切龙水电站的建设工程位于甘肃省甘南藏族自治州夏河县麻当乡境内的大夏河支流切龙沟中下段，为一低坝径流引水式电站，设计引水流量 3.93 m^3/s，隧洞长 962.14m，暗渠长 75.21m，坝高 2m，总装机容量 1200KW，设计水头 39.6m，装 2 台水轮发电机组，保证出力 289kw（P=85%），年利用小时数 5042h，年平均发电量 605×10^4kwh，总投资 615.63 万元。 10.1.2 工程分析 工程施工期: 主要污染源为生产废水、生活污水、生活垃圾、机械废气、施工噪声、工程弃渣、作业面上的水土流失。主要的生态破坏表现在三通一平、主体工程开挖、料场开采等方面。 工程运行期: 主要污染源为电站工作人员产生的生活污水、生活垃圾、蓄水坝前漂浮物；本项目为径流低坝式电站，项目运行期无淹没问题存在，在保证 0.258m^3/s 生态流量的情况下，对生态环境影响不大。 工程施工期: 施工期施工人员生活污水总排放量为 1152m^3，生活垃圾总排放量为 43.2t，工程共产生弃渣量 0.56 万 m^3。 工程运行期: 电站工作人员年污水产生量为 70.1t，生活垃圾产生量为 2.6t。 10.1.3 项目环境质量现状 兰州煤矿设计研究院环境工程所 83	Conclusion and Suggestion: The project causes no submergence; Provided a mean flow of 0.258 m^3/s is assured, the project would not cause significant impact to the ecological environment.

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(1)水环境质量现状
经对切龙沟水电站上、下游水质监测结果，本项目区内水质较优，水体中除硫化物稍有超标外，其余各项因子均达到II类水域标准值。
(2)声环境质量现状
据现场查勘，工程区域内无工矿企业，根据现状监测结果，项目区噪声均符合《城市区域环境噪声标准》(GB3096-93)中的1类标准。
(3)大气环境质量现状
根据现场调查，项目区周边无工业企业和相对集中的居民区，无污染物排放，加之周边为山地和农田，背景值较低，空气环境质量符空气质量功能区二类标准要求，地面扬尘导致的TSP为主要污染物。
(4)陆生生物、水生生物现状
①陆生生物
项目建设区植被主要有云杉、冷杉、落叶松、油松、桦树等。草场植被主要有苜蓿、早熟禾、鹅冠草、野豌豆、野生药材、经济树、莎草等牧草。
项目建设区1.5km范围内，无保护类动物，只有牛、羊、猪、鸡等家畜家禽。
②水生生物
切龙沟河段无国家一、二级重点保护水生野生动物，也无列入《濒危野生动植物种国际贸易公约》附录I、附录II、附录III的物种和省级重点保护的水生野生动物及列入《中国濒危动物红皮书·鱼类》的物种，故不存在对濒危保护鱼类的影响。
(5)水土流失现状
兰州煤矿设计研究院环境工程所 84
</td>
<td>There is no key protected or endangered aquatic wild life in Qielong river.</td>
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展提供了电力保障。

(3) 工程开挖和弃渣，将对植被产生一定的破坏，并加剧区域的水土流失。但通过对弃渣场修建拦渣墙、渣面的土地整治，及种草植树等的综合治理，恢复和提高了植被的覆盖率，减少了由工程建设可能产生的水土流失量。

(4) 施工期间通过修建沉淀池、垃圾台、施工区洒水等措施，可减少施工期产生的生活污水和生产废水及扬尘对环境的影响。生活区和电站厂房区，通过绿化美化措施，不但增加了植被，而且美化了环境。

(5) 枢纽建成后，由于水域面积较小，对局的气候等不会产生影响，库区无大的环境地质问题。

(6) 为减少电站建设对河道生态环境的影响，电站枢纽处应下泄生态环境流量为 0.258m³/s 。建议在泄冲闸底部设置泄水孔，保证下泄流量，在泄水孔的后设置矩形量水堰，对下泄水量进行监控。

工程建成后在不会对项目下游的农牧民的人畜饮水和农业灌溉产生影响。

(7) 本工程占地主要包括工程建设占地、工程管理占地、施工占地三部分，工程总占地 0.67hm²，主要为荒地、荒坡地和河漫滩。通过对受影响村民按照国家政策进行土地补偿，不会降低受影响村民的生产生活水平不会对当地环境产生不利影响。

(8) 风险评价结果表明，该工程存在一定的风险因素，但该风险通过采取加强管理等综合措施，可减免风险的危害。

(9) 该项目不但财务指标较好，具有一定的抗风险能力，而且环境经济损失较小，而效益十分明显有利，环保投资较少而效益较好，是一项综合环境经济效益较好的水电项目。
兰州煤矿设计研究院环境工程所 86
</td>
<td>
Conclusion and Suggestion

3) The excavation and project slag will destroy the plants to a certain extent, and intensify the soil erosion. However, by taking such measurement as building up walls to embrace waste slag, remediating the land, and replanting trees, the rate of green coverage can be recovered or even raised, and save the soil that may possibly be eroded.
4) Though such measurements as building up sedimentation tanks and waste collection site, and sparkling roads in the construction area will released the environmental impact from the domestic wastewater and dust. Through greening the living area and the power house, the rate of green coverage will be increased and the natural environment will be more beautiful.
5) As for the water diversion system, the water area is small and does not affect the local climate.
6) … The constructed project will not affect the water use of farmers or herdsman or the livestock, and will not affect the agriculture irrigation in the downstream.
7) … The project takes up 0.67hm² land, consisting of barren land, barren slope and flood plain mainly.
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(10)公众参与调查结果，绝大多数被调查者，均表示支持该工程的建设。 (11)工程的建设和运行对当地经济发展和人民生活水平的提高具有重要意义，它将有利于改变当地经济落后的面貌，改善投资环境。 (12)本项目环保总投资经费估算为 45.79 万元，占总投资的 7.4%，其中水土保持投资为 10.14 万元。 综上所述，切龙沟水电站建设，将对工程区环境产生一定的不利影响（植被破坏、水土流失加剧、空气污染、噪声干扰等），只要严格落实本报告书提出的环境保护措施，保证环保资金到位，采取有效的环境管理措施后，将使环境的不利影响降低到最低程度，从而发挥一定的社会、经济和环境效益。通过对项目的环境影响评价，本环评认为从环境保护角度考虑，该工程是可行的。 **10.2 建议** 在工程可行性研究阶段，设计单位应结合工程区环境现状，对弃渣进行可能利用，减少弃渣量。工期要严格控制噪音污染，合理安排作业时间，布置施工场地；开挖土石方时，尽量做到土石方平衡，施工道路定期撒水，降低粉尘污染；施工结束后恢复植被，种树种草。 兰州煤矿设计研究院环境工程所 87	10) The result of public consultation shows that most interviewees supports the construction of the project. 11) The construction and the operation of the project is meaningful for the development of local economy and the improvement of living hood of local residents… To sum up, the project construction will cause some negative environmental impact (such as vegetation damage, soil erosion, air pollution, noise, etc); however, if strictly follows the environment protection measurements this report proposed, ensures the availability of environment protection fund, and effectively manages the environment project measurements, the negative environmental impact can be minimized.