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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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Project title: Qinghai Maqin Gequ Level 2 hydropower Station

PDD Version: 3.0

Completion date: 12/06/2012

Revision histories:

Version	Date	Note
1.0	12/12/2011	PDD for GSP
2.0	13/03/2012	Revised according to CLs and CARs
3.0	12/06/2012	Revised according to the further comments from DOE

A.2. Description of the project activity:

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The objective of Qinghai Maqin Gequ Level 2 hydropower station (hereinafter referred to as the “Project”) is to generate zero-green gas emission electricity through the application of a renewable source (in this case, it is hydropower) and displace the same amount of electricity from the Northwest China Power Grid (NWPG) that is mainly dominated by electricity derived from coal-fired power plants. The Project, which is located in the Maqin County, Guoluo Zang Autonomous Prefecture, Qinghai Province, P.R. China, is supposed to meet the increasing demand of electricity in Qinghai Province in a sustainable way and contribute to the sustainability of the NWPG. The Project is constructed and operated by Qinghai Maqin Gequ River Cascade Hydropower Development Co., LTD.

The existing scenario prior to the start of the implementation of the Project is: electricity delivered to the grid by the existing coal-fired power plants connected to the Northwest China Power Grid (NWPG). The baseline scenario as identified in section B.4 is the same as this scenario.

The Project will install 2 turbine-generator sets each with a unit capacity of 24MW for a total installed capacity of the hydropower station of 48MW. The Project is estimated to generate annually 250,870MWh of electricity and operate 5,226 hours annually with plant load factor of 59.7%[1], of which 223,525MWh is delivered to Qinghai provincial gird which is connected to NWPG. Therefore, the Project will lead to an

[1] The annual operation hours of the Project is 5,226 hours which is determined by the design institute (Qinghai Province Water Conservancy and Hydropower Survey Design Institute) based on 48 years historical hydraulic data. And the hours number in a whole year is 365*24=8,760. Therefore PLF of the Project is calculated as 5,226/8,760*100%=59.7%

estimated annual greenhouse gases (GHG) emission reductions of 177,166tCO_2e and a total of 1,240,161tCO_2e of GHG emission reductions during its first 7-year crediting period.

The Project contribute to the sustainable development of the local area and the Host Country by enhancing the electricity supply capacity and improving the electricity quality and reducing transmission line loss for the area as well as by bringing positive social and environmental benefits to local communities. The specific sustainable development benefits of the Project are listed as follows:

- Reducing the reliance of the NWPG on exhaustible fossil fuels for power generation;
- Reducing air pollution by fossil fuel based electricity by clean, renewable power ;
- Improving the power mix of the NWPG by supplying clean energy;
- Improving the local energy generation infrastructure, bridging the gap between power supply and demand by increasing the electricity generation capacity to the local grid;
- Reducing the threat posed by air pollution to human health;
- Creating job opportunities for the local communities. The Project will bring 27 job opportunities throughout the operating period, and these employment opportunities are helpful for the local people to improve their living standards.

In views mentioned above, the Project strongly contributes to the sustainable development in local area.

A.3. Project participants:

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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)**
People's Republic of China (host)	Qinghai Maqin Gequ River Cascade Hydropower Development Co., LTD	No
United Kingdom	Carbon & Energy Capital Co. LTD	No

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Qinghai Province

A.4.1.3. City/Town/Community etc.:

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Maqin County, Guoluo Zang Autonomous Prefecture

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

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The Project is located in Maqin County, Guoluo Zang Autonomous Prefecture of Qinghai Province, P.R.China. The straight-line distance from the location of the factory to Dawu town and Xining city, the provincial capital of Qinghai are respectively 53km and 493km. The geographical coordinate of the dam is 100°15′06″E, 34°46′50″N. And the geographical coordinate of the plant is 100°13′32"E, 34°50′35"N .The location of the Project is indicated in the maps below:

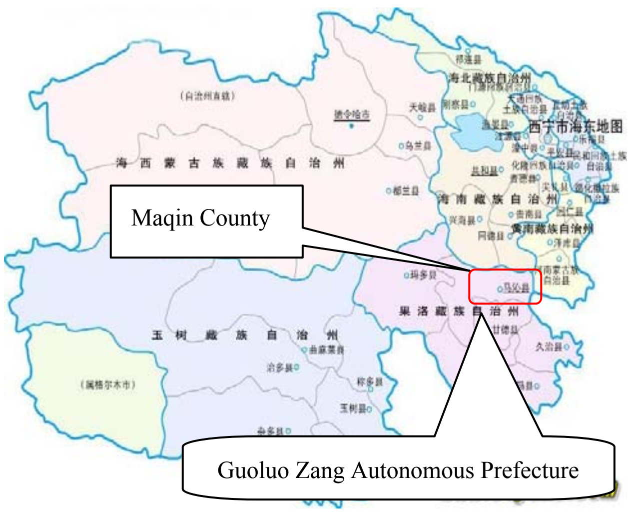

Figure A.4-1: Location of the Project

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

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Sectoral scope 1: energy industries (renewable / non-renewable sources)

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

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The Project aims to generate electricity from hydropower resources and to displace the same amount of electricity from the Northwest China Power Grid (NWPG) whose generation mix is dominated by coal-fired, electricity generating power plants.

The existing scenario prior to the start of the implementation of the Project is: electricity delivered to the grid by the operation of grid connected thermal plants belonging to the Northwest China Power Grid (NWPG). The NWPG consists of 5 sub-grids: Shanxi, Gansu, Qinghai, Ningxia and Xinjiang provincial grids, which mainly rely on coal-fired power plants[2].The baseline scenario as identified in section B.4 of this PDD is the same as the existing scenario prior to the start of the implementation of the Project.

The Project is a run of river hydropower station with a total installed capacity of 48MW. After operating, the gross electricity generated by the Project will reach 250,870 MWh annually, of which 223,525MWh will be delivered to the power grid.

The main manufacturing technology is to convert mechanical energy available in the water flow into electrical energy with the help of hydro turbines and generators. Main components of the Project include the dam on the river, diversion canal, factory buildings, booster station, transmission project and residential area. The Project is a daily regulation hydropower project. The normal water level of the Project

[2] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

is designed to be 3,412m. Under the normal water level, the reservoir capacity is designed to be 3,967,000m^3. The surface area of the reservoir is designed to be 245,900m^2. The power density of the Project is 195.2W/m^2 and the power load factor of the project is 59.7%.

The model of the hydro turbine used in the Project is CJA237-L-155/6*14 and the model of generator is SF24-12/3300.The key technical specifications of these two equipments are listed as Tables below:

Table A.4-1 Key technical specifications of Hydro turbines

Parameters Name	Unit	Data
Model	/	CJA237-L-155/6*14
Quantity	/	2
Rated Output	MW	24
Rated Rotation Speed	r/min	500
Rated head	m	376.7
Rated flow	m^3/s	7.96
Equipment life time	year	20

Table A.4-2 Key technical specifications of Generators

Parameters Name	Unit	Data
Model	/	SF24-12/3300
Quantity	/	2
Installed capacity	MW	24
Rated Voltage	kV	10.5
Rated current	A	1649.6
Rated frequency	Hz	50
Rated Rotation Speed	r/min	500
Rated Power Factor	%	80
Equipment life time	year	20

China possesses the technological capacity to manufacture all the necessary components, so no technology transfer is involved in the Project.

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

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The Project chooses renewable crediting period 3* 7 years. During its first 7 years crediting period (estimated as 01/01/2014 to 31/12/2020 the Project is expected to generate a total amount of emission reductions of 1,240,161tCO_2e, with an annual emission reduction of 177,166tCO_2e. The estimated amount of emission reductions during the first crediting period is provided below.

Table A.4-3 Estimation of Emission Reductions in the 1st Crediting Period

Year	Annual estimation of emission reductions (tCO_2e)
01/01/2014-31/12/2014	177,166
01/01/2015-31/12/2015	177,166

01/01/2016-31/12/2016	177,166
01/01/2017-31/12/2017	177,166
01/01/2018-31/12/2018	177,166
01/01/2019-31/12/2019	177,166
01/01/2020-31/12/2020	177,166
Total estimated reductions(tCO_2e)	**1,240,161**
Total number of crediting years	7
Annual average of estimated reductions over the crediting period	177,166

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for this Project.

SECTION B. Application of a baseline and monitoring methodology

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

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The Project applies to the approved methodology: ACM0002 "Consolidated Baseline Methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0).

In line with the approved methodology, the Project applies to the following tools:

"Tool for demonstration and assessment of additionality" (Version 06.0.0)

"Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

"Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0)

Information regarding to the tools could be found respectively at:
http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

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

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The methodology ACM0002 (Version 12.3.0) is applicable to the Project, because the Project meets all the applicability criteria stated in the methodology with relevance to Hydropower power plant:

- ✓ The proposed project is the installation of a new power plant, in the form of a hydro power plant with a run-of-river reservoir;
- ✓ The proposed project results in new single reservoir and the power density of power plant , as per definitions given in the project emissions section, is 195.2W/m^2 which is greater than 4W/m^2;
- ✓ The proposed project is a grid-connected hydropower project which is connected to a regional power grid, NWPG. The geographic and system boundaries for NWPG can be clearly identified and information on the characteristics of this grid is available;
- ✓ The proposed project does not involve switching from fossil fuels to renewable energy sources at the site of the proposed project activity;
- ✓ No biomass fired power generation will take place at the proposed project.

Therefore, the Project activity is in accordance with the applicability of ACM0002 (Version 12.3.0).

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

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As referred to the approved methodology ACM0002, the project boundary includes the Project plant itself and all the power plants connected to Northwest China Power Grid (NWPG). According to the Baseline Emission Factors for Regional Power Grids in China published by China NDRC[3], NWPG covers Shanxi, Gansu, Qinghai, Ningxia, Xinjiang power grids.

The emissions sources included and excluded from the Project boundary for determination of both baseline and project emissions are listed below:

Table B.3-1 Basic parameters used for calculating baseline emissions

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	The power density of the Project is 195W/m^2. According to ACM0002, if the power density is greater than 10 W/m^2, there is no need to calculate emission from water reservoirs.
		N_2O	No	Minor emission source.

[3] China NDRC (20/10/2011), 2011 Baseline Emission Factors for Regional Power Grids in China. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

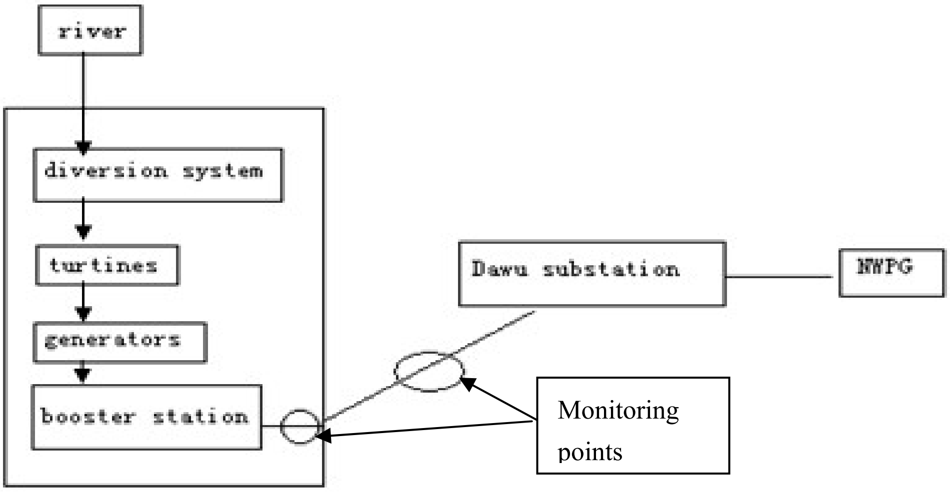

Figure B.3-1 Diagram of the project boundary

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

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According to Methodology of ACM0002 (Version12.3.0), if the project is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

The Project is a new grid-connected hydropower plant. The electricity generated by the Project will be delivered to the Northwest China Power Grid (NWPG), so the project’s baseline scenario is the same amount of electricity is generated by NWPG-connected power plants and the addition of new generation sources connected to NWPG as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” (version 02.2.1). As the baseline scenario boundary of the Project is the NWPG, so the Project boundary for calculating EF_{OM} and EF_{BM} will be limited to the NWPG.

Table B.4-1 Data source of baseline emission calculation

Parameters	Value	Source
$EF_{grid,OM,y}$ of NWPG	1.0001 tCO_2e/MWh	Calculated according to data provided by the Chinese DNA

$EF_{grid,BM,y}$ of NWPG	0.5851 tCO_2/MWh	Calculated according to data provided by the Chinese DNA
$EF_{grid,CM,y}$ of NWPG	0.7926 tCO_2/MWh	Calculated according to data provided by the Chinese DNA
Electricity supplied to grid ($EG_{facility,y}$)	223,525MWh	Feasibility Study Report

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

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Prior CDM consideration

After the feasible study report (FSR) was finished by Qinghai Province Water Conservancy and Hydropower Survey Design Institute on 02/2010 and was approved by Department and Reform Commission of Qinghai Province on 27/10/2010, the project owner learned Internal Return Rate (IRR) of the Project was 6.58%, which was far below the benchmark 10%. To improve the financial attractiveness of the project, the board meeting was held on 02/12/2010 to discuss this issue and finally members of board decided to take the Project as a CDM project. Then the project owner started to contact with some CDM consulting companies and finally signed consulting agreement with Hangzhou Carbon Trade Environment Engineering Co., Ltd (HCTEE) on 07/02/2011. On 04/07/2011, the construction contract of dam was signed which was the earliest starting date of the Project and marked the starting date of the Project as the CDM project.

With the help of the consulting company, the project owner then proceeded to secure the CDM application for the project. In accordance with the "Guidelines on the demonstration and assessment of prior consideration of the CDM", the project owner submitted the notification of CDM consideration to Chinese DNA and CDM EB in November 2011 respectively.

Here followed a general implementation schedule of the Project to illustrate main events. An overview of key event is given in Table B.5-1.

Table B.5-1 Overview of key events in the development of the project

Date	Key events
02/2010	Feasible study report(FSR) was completed
08/2010	Environmental Impact Assessment report was completed
15/09/2010	Environmental Impact Assessment report was approved by Department of Environmental Protection of Qinghai Province
27/10/2010	Feasible study report was approved by Department and Reform Commission of Qinghai Province
02/12/2010	Board Decision for the Project to apply for CDM
07/02/2011	Consulting Agreement was signed between project owner and HCTEE
16/04/2011	Stakeholder meeting was held
04/07/2011	Project started （the construction contract of dam was signed which was

	the earliest starting date of the Project）
08/10/2011	Construction contract of power house signed
01/11/2011	EB notification for the Project.
02/11/2011	DNA notification for the project
25/11/2011	ERPA was signed between the project owner and the buyer
28/03/2012	LOA was issued from China DNA

Additionality

The following steps demonstrate additionality for the Project according to *Tool for the demonstration and assessment of additionality (V 06.0.0)* as required by the methodology:

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

Sub-Step 1 a. Define alternatives to the project activity

Since the project is the installation of a new grid-connected hydropower plant, according to the *ACM0002* (version 12.3.0), the baseline scenario is the following:

Electricity delivered to Northwest China Power Grid (NWPG) by the Project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in NWPG, as reflected in the combined margin (CM) calculations described in the "Tool to calculated the emission factor for an electricity system"(version 02.2.1). Coal-fired power generation is currently the dominant power supply option within the Northwest China Power Grid (NWPG). Therefore it is the most credible and realistic alternative choose.

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

The alternative, which is the baseline scenario described above, means the continuation of current situation that complies with current law and regulations of China

Step 2: Investment Analysis

The purpose of investment analysis is to determine whether the Project is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, following sub-steps are adopted:

Sub-step 2a: Determine appropriate analysis method

The *Tools for the Demonstration and Assessment of Additionality (V06.0.0)* recommends three investment analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The Project generates financial and economic benefits through the sales of electricity therefore the simple cost analysis (Option I) cannot be taken. The investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of the Project is the electricity imported from Northwest China Power Grid (NWPG) rather than a new investment project. Therefore the benchmark analysis (Option III) has been chosen.

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

According to *Economic Evaluation Code for Small Hydropower Project SL16-95*[4], the financial benchmark internal rate of return (IRR) for hydropower projects in rural area with an installed capacity below 50MW is 10% (total investment after tax). Only those projects whose IRR equals or exceeds the benchmark will be identified to be financially acceptable. The Project is located in Dawu town which is in rural area and the installed capacity is 48 MW, thus the benchmark is applicable to the Project. According to the documents issued by Ministry of Water Resources of People's Republic of China, SL 16-95 was replaced by the new version of "Economic Evaluation Code for Small Hydropower Project" (SL 16-2010), which was issued in October 2010 and implemented from Jan 22nd 2011. However, when the FSR of the Project completed on Feb 2010, SL-95 was still valid. Besides, the benchmark IRR for all hydropower projects with installed capacity below 50MW in SL-2010 is still 10% (total investment after tax). Since then, no new documents establishing benchmarks for small scale hydropower stations have been released by the Chinese government. As a result, 10% (total investment after tax) is suitable and currently used for financial appraisal of this project with total installed capacity of 48MW.

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

Followed parameters and financial analysis are all taken from Feasibility Study Report[5] (FSR) which was completed on February 2010. Basic data and parameters for the calculation of financial indicator of the Project are summarized in TableB.5-2:

TableB.5-2 Main parameters for the financial analysis

Parameters	Value	Source
Total Investment	386,722,000CNY	FSR
Static Investment	355,156,000CNY	FSR
Annual O&M cost	6,585,000CNY	FSR
Installed Capacity	48MW	FSR

4 *Economic Evaluation Code for Small Hydropower Project SL-16-95* was published by *Ministry of Water Resource* in1995. Please refer to followed website: www.cws.net.cn/guifan/bz%5CSL16-95/

5 FSR was completed by Qinghai water conservancy and hydropower survey design research institute in February 2010

Annual Electricity Generation	250,870MWh	FSR
Effective Power Coefficient	0.9[6]	FSR
The electricity consumed on transmission line	1%	FSR
Electricity delivered to grid	223,525MWh	FSR
Electricity tariff (with VAT)	0.23 CNY/KWh	FSR
Electricity tariff (without VAT)	0.20 CNY/KWh	FSR
Value Added Tax Rate	17%	FSR
City maintenance & construction tax rate	7%	FSR
Educational surcharges rate	3%	FSR
Income Tax	25%	FSR
Loan rate	5.94%	FSR
Rate of depreciation	4.7%	FSR
Residue Rate	5%	Government regulation
Operational lifetime	20y	FSR
Expected CERs price	8.5Euro /tCO_2	ERPA

TableB.5-3 shows the Project IRR with and without the revenue of CERs. Without the revenue of CERs, the Project IRR is 6.58% [7]which is clearly lower than benchmark IRR, and indicates that the Project is not financially attractive in normal investment fields. However, taking into account the CDM revenues, the Project IRR is 10.66%, which is higher than the benchmark IRR. Therefore, to make a conclusion, the CDM revenues could improve the economic feasibility of the Project.

TableB.5-3 IRR with and without the CERs revenues

	Without CERs	With CERs
IRR	6.58 %	10.66%

Sub-step 2d: Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding financial attractiveness is robust to reasonable variations in the critical assumptions.

The following key parameters have been selected as sensitive indicators to test the financial attractiveness of the Project.

(1) Static Investment
(2) Annual O&M cost

[6] In the FSR, 0.9 of effective coefficient has been chosen for that it is a project with daily regulation ability, which in accord with requirements from SL16-95.

[7] It is taken from *Project IRR spreadsheet with & without CDM revenue* which developed based on FSR

(3) Electricity tariff

(4) Annual electricity generation

The financial sensitivity analysis is performed by altering the four parameters above by ranges of ±10%. The result of the sensitivity analysis is shown below.

TableB.5-4 IRR Sensitivity to Different Financial Indicators of the Project

Indicators	Range				
	-10%	-5%	0	5%	10%
Static investment	7.75%	7.14%	6.58%	6.05%	5.56%
Annual O&M cost	6.75%	6.66%	6.58%	6.49%	6.40%
Electricity tariff	5.42%	6.01%	6.58%	7.13%	7.68%
Annual electricity generation	5.43%	6.01%	6.58%	7.13%	7.66%

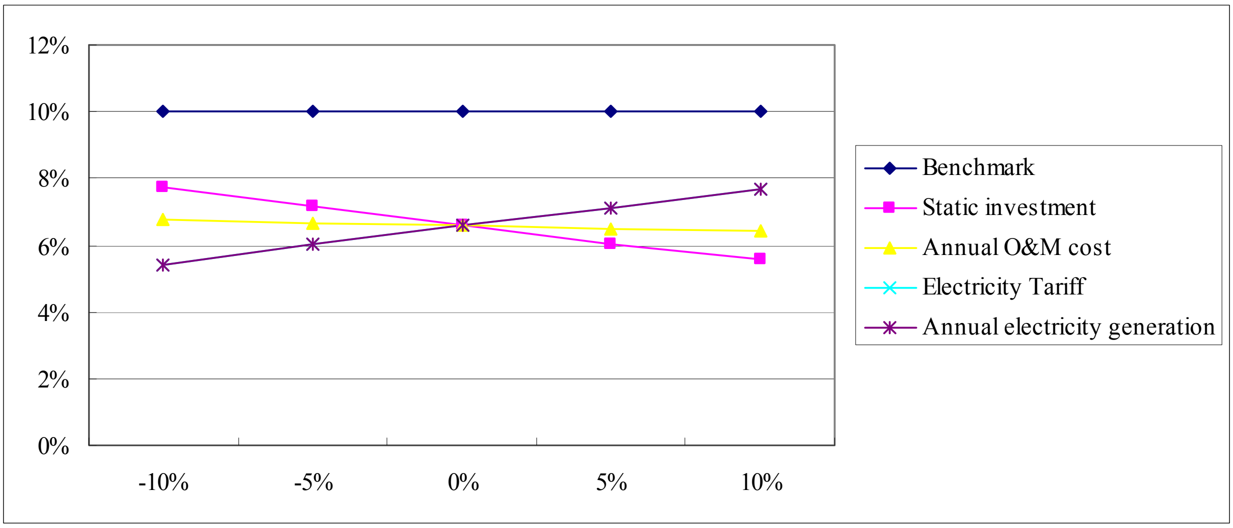

Fig B5-1 Sensitivity Analysis of the Project

The sensitivity analysis results show that if the indicators range from -10% to 10%, the Project IRR is always lower than the financial benchmark of 10%. Thus the Project lacks financial attractiveness without CER revenues.

To further analyze the probability of IRR if the Project reaching to the benchmark, critical threshold analysis is taken as below:

Table B.5-5 The threshold of IRR's variation to reach up to benchnmark

Indicators	**Threshold (without CERs)**	**Benchmark**
Static investment	-25.45%	10%
Annual O&M costs	-215.30%	

Electricity tariff	32.70%	
Annual electricity generation	33.10%	

The result of above table shows that in order to make the Project IRR reach the benchmark 10%, construction investment would need to decrease by 25.45%, or annual O&M cost reduce by 215.30%, or electricity tariff increases by 32.70%, or annual electricity generation increases by 33.10%, respectively. However, none of these scenarios are likely.

- **Static Investment:** It needs to reduce static investment 25.45% to reach benchmark IRR 10% which is rarely possible. According to the Statistics Bulletin of the National Economic and Social Development of Qinghai Province, the price of raw material, fuel & power increased 10.4%[8], -0.2%[9], 8.6%[10] and 8.9%[11] in year 2008, 2009, 2010 and 2011 respectively, so the price of equipments and construction of civil work can not be procured with lower cost during construction period. As a result, the static investment can not be decreased.

- **Annual O&M cost:** The sensitivity analysis has showed that the impact of O&M cost is insignificant. Assumed the Annual O&M cost decreased 215.30%, the project IRR could reach 10%, which means that even if there is no O&M cost, the IRR would stay below the benchmark. Therefore, the project can't become commercially attractive through decrease of Annual O&M cost.

- **Electricity tariff:** When the project IRR reaches the benchmark 10%, the electricity tariff should increases 32.70%, which should be 0.31CNY/kwh. This is unlikely to happen. According to the latest tariff document issued by Qinghai Province Development and Reform Commission (Qingfagaijiage No.[2009]1181) on 24/11/2009[12], the electricity tariff for small hydropower plant in Qinghai province was 0.229 CNY/kwh (Inc. VAT)[13]. Thus, 0.31CNY/kwh can not be happen in Qinghai province for small hydropower stations.

Furthermore, according to "Information note on the highest tariffs applied by the executive board in its decisions on registration of projects in the People's Republic of China", the highest tariff of small hydropower stations in Qinghai province is 0.21CNY/kwh which is lower than the tariff in the PDD, so the IRR could not cross the benchmark.

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8 http://www.qhfgw.gov.cn/qhei/ghyfz/tjgb/t20090311_296990.shtml

9 http://www.qhfgw.gov.cn/jjwx/tjgb/t20100302_330356.shtml

10 http://www.qhfgw.gov.cn/jjwx/tjgb/t20110421_376874.shtml

11 http://www.qhfgw.gov.cn/jjwx/tjgb/t20120228_393923.shtml

12 http://www.qhei.gov.cn/jqgg/t20091126_323013.shtml

13 The electricity tariff used in PDD is 0.23 CNY/kwh which is soured from the FSR. The tariff is nearly 0.4% higher than the document (Qingfagaijiage No.[2009]1181) thus can be deemed more conservative.

Therefore, the tariff of the project is reasonable and it is unlikely that the electricity tariff increase by 32.70%.

- **Annual Electricity generation:** The Annual Electricity Generation should increase 33.10% to reach benchmark IRR 10%. However, this is improbable; as the power generation as well as the annual utilization hours and installed capacity were estimated based on 48 years of hydrological data which comes from adjacent hydrological measuring stations mentioned in the FSR and will change little. Furthermore, the power generation was calculated by the designing institute based on the on-site situation, including social environment, hydrological condition and power requirement which are relatively stable. Therefore, it is unlikely for the annual power generation of the project to increase 33.10%.

To conclude, the sensitivity analysis shows that without CER revenue, IRR of the project is difficult to reach the benchmark 10%, which supports the conclusion, that the proposed project is unlikely to be financially attractive and little changed.

Outcome of Step2: According to the sensitivity analysis, within the reasonable range of each indicator, the Project IRR is always lower than the investment benchmark IRR, thus it can be confirmed that the Project is unlikely to be financially attractive.

Step 3: Barriers Analysis

This step is not used for Project.

Step 4: Common practice analysis

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

According to the paragraph 6 of "Tool for Demonstration and Assessment of Additionality" (version 06.0.0):

Measure *(for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework:*

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);
(c) Methane destruction;
(d) Methane formation avoidance.

The hydro power project belongs to the second type of *measure*:

(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);

According to the paragraph 47 of "Tool for the Demonstration and Assessment of Additionality" (version 06.0.0), "*for measures that are listed in paragraph 6*", this part should analysis in the following:

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

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The applicable output range as+/-50% of the design capacity 48MW of the proposed project activity is from 24MW to 72MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all} Registered CDM project activities shall not be included in this step;

According to the paragraph 47 of "Tool for the Demonstration and Assessment of Additionality" (version 06.0.0), projects are considered "similar" in case they are located in the "same county/region", are of "similar scale", and "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc". Therefore, the applicable geographical area can be identified as below:

In China, there are significant differences in policies, regulation and economic conditions between different provinces. Provincial governments are authorized to develop local laws, regulations and policies by national people's congress[14]. Therefore, the selection of similar projects is based on consideration of same province. Qinghai Province with an area of 722,300 km^2 is comparatively and considerably larger than many countries. According to the requirements of common practice, the projects with similar conditions, such as investment conditions and natural conditions (including geographical conditions, climate conditions, development conditions and so on), are necessary to be analyzed. Projects located in different provinces of Northwest China Grid have not the similar investment conditions and natural conditions. Therefore, the PDD selects geographical area, i.e. Qinghai Province, as a common practice region.

Two categories of projects that deliver the same output (electricity generation) are identified in Qinghai province as below:

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[14] http://www.gov.cn/flfg/2005-06/21/content_8297.htm

-Category 1: Hydropower projects between 24 MW to 72 MW in Qinghai province, $N_{hydropower}$
-Category 2: Power generation projects other than hydropower with the applicable output range in Qinghai province, N_{other}

Therefore $N_{all}=N_{hydropower}+N_{other}$

According to China Electric Power Yearbook and China Water Resource Yearbook, there are 9 similar hydropower projects with installed capacity between 24MW to 72MW identified in Qinghai Province. The details are listed below:

TableB.5-5 Projects that are similar to the Project in the common practice analysis region

No	Project Name	Applying CDM or not	Installed Capacity (MW)	Operation Year	Note
1	Geermu Xiaogangou	no	32	1991	http://www.qhsdjt.com.cn/news/viewa.asp?id=1052&cataid=454
2	Delingha Bayin River	no	30	2008	http://www.nj.qhei.gov.cn/njxm/xmjj/t20061103_226203.shtml
3	Moduo	yes	60	2007	http://cdm.unfccc.int/Projects/Validation/DB/L51Y5KYTDZG61NJARP1R1L6LCJPACG/view.html
4	Jinshaxia	yes	70	2007	http://cdm.unfccc.int/Projects/DB/DNV-CUK1197268584.97/view
5	Qinggangxia	yes	43.8	2007	http://cdm.unfccc.int/Projects/DB/DNV-CUK1197698449.39/view
6	Zequ River Gakong	yes	30	2009	http://cdm.unfccc.int/Projects/DB/DNV-CUK1249396389.29/view
7	Jiangyuan	yes	42	2009	http://cdm.unfccc.int/Projects/DB/JACO1247821314.28/view
8	Zharikou	no	50	Under construction	http://www.qhsdjt.com.cn/news/viewa.asp?id=1794&cataid=456
9	Angsai	no	55	Under construction	http://www.qhsdjt.com.cn/news/viewa.asp?id=1797&cataid=457

The **Project 3**, **Project 4**, **Project 5**, **Project 6** and **Project 7** are all applying CDM thus excluded for further analysis as per the tool.

As indicated in section B.5, the start date of the proposed project was 04/07/2011, thus, as per the requirements in step 2, the **Project 8** and **Project 9** are still under construction and not start commercial operation now therefore excluded from further analysis.

It can be concluded from above analysis that there are 2 similar hydropower projects in Qinghai province that operated without CDM support and started commercial operation before the start date of the proposed project, thus, the $N_{hydropower}$ is 2.

Thus, $N_{all}=N_{hydropower}+N_{other}=2+N_{other}$

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff},

As per the Paragraph 9 of the Tool for the demonstration and assessment of additionality (Version 06.0.0), different technologies in the context of common practise are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

- *(a) Energy source/fuel;*
- *(b) Feed stock;*
- *(c) Size of installation (power capacity):*
  - *(i) Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);*
  - *(ii) Small (as defined in paragraph 28 of Decision 1/CMP.2);*
  - *(iii) Large;*
- *(d) Investment climate in the date of the investment decision, inter alia:*
  - *(i) Access to technology;*
  - *(ii) Subsidies or other financial flows;*
  - *(iii) Promotional policies;*
  - *(iv) Legal regulations;*
- *(e) Other features, inter alia:*
  - *(i) Unit cost of output (unit costs are considered different if they differ by at least 20 %);*

For Category 1-Hydropower projects

The **Project 1-** Geermu Xiaogangou project was operated in 1991. In China, projects commissioned prior to the year 2002 were developed by the state under a market environment that was substantially different from the current market environment, which is, the first Power System Reform Blue Print has been published by State Council in February 2002[15], and the reform content mainly include: Power plants separating from the power grid, reforming enterprises for power plants and power grids; bidding to power grid, building a competitive and open power market initially; changing the current situation of all power purchased by the state owned grid enterprises. Therefore, the **Project 1** is quite different with the proposed project thus it is excluded.

[15] Notice on issuing “Reform scheme on power regulatory framework” from the State Council. No. guofa[2002]5.

The **Project 2-**Delingha Bayin River Project is a Cumulative Gorge Reservoir Engineering project. The main function of this project is irrigation, flood control and water supply, the auxiliary function is electricity generation. Thus, except the revenues from electricity purchase, there are also revenues from water supply fee, which makes this project more financial attractive, and the IRR of this project is 11.02%[16] which is much higher than the proposed project thus has no financial barriers. Furthermore, this project is developed by state owned company[17] while the proposed project is developed by private company, in China, the state owned companies have greater access to financial support from banks[18], while the private companies often have financial difficulties as the bank is reluctant to grant a loan to them[19]. Thus, this project has obvious financial advantage than the proposed project.

For Category 2-Non-hydropower projects

The energy sources of projects in category 2 are different from the proposed project which uses water sources for power generation. So the projects in Category 2 apply technologies different from that the technology applied in the proposed project activity.

In sum, based on the paragraph 9 of "Tool for the Demonstration and Assessment of Additionality" (version 06.0.0), different technologies between similar projects and the proposed project are summarised as follows:

Item	Category 1		Category 2
	Project 1	Project 2	
(a)Energy source/fuel			◆
(d)Investment climate of in the date of the investment decision			
(i)Access to technology			
(ii)Subsidies or other financial flows	◆	◆	
(iii)Promotional policies		◆	
(iv)Legal regulations	◆		

As analysed above, similar projects have different investment climate and obvious financial advantage than the proposed project, so the $N_{diff} = 2 + N_{other}$.

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16 http://www.chinaqw.com/node2/node116/node1046/node1050/userobject6ai242814.html

17 "Report of the national construction projects" 2005

18 http://www.chinaqw.com/news/201001/12/178275.shtml

19 http://www.022net.com/2009/6-20/462047302713463.html

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

$F=1-N_{diff}/N_{all}=1-(2+N_{other})/(2+N_{other})=0$

According to the “Tool for the Demonstration and Assessment of Additionality (version 06.0.0)”, the proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and N_{all} - N_{diff} is greater than 3. As analysis above, the factor F is 0 which is less than 0.2, and N_{all} - N_{diff} is 0 which is less than 3, as a result, the proposed project is not a common practice.

Summary:

From the investment analysis it is clear that the specific project faces significant financial barriers. The common practice analyses confirm this argument.

Moreover, taking into account the financial difficulty faced by the project owner in the construction of the Project and the project's poor rate of return, the project owner decided to proceed with the implementation of the Project only if it could be registered as a CDM project. Thus, the proceeds of CERs are a key element for the Project.

Therefore, the Project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The project is the installation of a new grid-connected renewable power plant/unit; therefore the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the *Tool to calculate the emission factor for an electricity system(Version 02.2.1)*.

According to ACM0002 (Version 12.3.0), project emissions, baseline emissions, leakage emissions and emission reductions are calculated as follows:

Project emissions

According to ACM0002 (Version 12.3.0), the project emission is calculated as follows:

$$PE_y=PE_{FF,y}+PE_{GP,y}+PE_{HP,y} \quad (1)$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The project is a hydro project, so $PE_{FF,y}$ and $PE_{GP,y}$ are considered zero according to methodology ACM0002(Version12.3.0). Moreover, as described in the methodology, hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir.

In order to define calculation method, the power density is calculated bellow:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{48000000w - 0w}{245900m^2 - 0m^2} = 195.2w/m^2 \qquad (2)$$

Where:

PD	=	Power density of the project activity (W/m^2)
C_{apPJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
C_{apBL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

According to the ACM0002 (Version 12.3.0), if the power density of the project activity is greater than 10 W/m^2, the Project emissions ($PE_{HP,y}$) is zero. Through above calculation, the power density of the Project is 195.2W/m^2, therefore:

$$PE_y = 0 \qquad (3)$$

Baseline emissions

The baseline scenario of the Project is: Equal amount of electricity delivered to Central China Power Grid. The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \qquad (4)$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ for greenfield plants is described below:

(a) Greenfield renewable energy power plants

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

$$EG_{PJ,y} = EG_{facility,y} \quad (5)$$

Where:

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

Determination of the emission factor for electricity generation ($EF_{EL,j,y}$)

In the following section, combined margin emission factor is calculated based on the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). According to the tool, the following six steps are applied.

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emissions factor

Step 1. Identify the relevant electricity systems

The DNA of China has published a delineation of the project electricity system and connected electricity systems, so the project adopt the delineation of project electricity system and connected electricity system published by NDRC. The power generated by the project will be transmitted to the China Northwest Power Grid through the Qinghai Grid. The China Northwest Power Grid consists of 5 sub-grids: Shanxi, Gansu, Qinghai, Ningxia, Xinjiang.

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

The following 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 selected to calculate the operating margin and build margin emission factor.

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

The "Tool to calculate the emission factor for an electricity system" (version 02.2.1) offers four options for the calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$):

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

For the proposed project activity, the simple OM calculation should be used, because from 2007 to 2009 the proportion of low-cost/must-run resources in the total grid electricity of the NWPG is far lower than 50%. Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{OM,y}$) for the project.
For simple OM, the emission factor can be calculated using either of the two following data vintages:

Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (*y*-2) may be used. The same data vintage (*y*, *y*-1 or *y*-2) should be used throughout all crediting periods.

The "ex-ante option" will be used for OM calculation of the project, without requirement to monitor and recalculate the emissions factor during the fixed crediting period.

Step 4. Calculate the operating margin emission factor according to the selected method (Simple OM)

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

Option A: Based on the electricity generation and a CO_2 emission factor of each power unit; [20] or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

In China, the related data of each power plant / unit is not available from the official data; therefore the Option A is unavailable. Furthermore, off grid power plants are not included in the calculation. Only nuclear and renewable power generation is considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known. So the Option B is available for calculating OM emission factor ($EF_{OM,y}$). 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} \right)}{EG_y} \qquad (6)$$

Where

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume

[20] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group of low-cost/must-run units.

unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year *y*

y =The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant *m*.

According to the above steps and the emission factor of NWPG published by Chinese DNA on 20/10/2011, a 3-year average Simple OM Emission Factor of NWPG is:

$EF_{grid,OM,y}$=1.0001 tCO_2e/MWh

The detailed calculation is shown in Annex 3.

STEP 5. Calculate the build margin (BM) emission factor;

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

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-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.

In this PDD, project participants choose “Option 1” to calculate BM ex ante and there is no need to update during the crediting period.

The sample group of power units are used to calculate the build margin should be determined as per the following procedure:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units)and determine their annual electricity generation (AEGSET-5-units,in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGTotal,in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEGTotal (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calcualtion) (SET≥20%) and determine their annual electricity generation (AEG≥20%,in MWh);

(c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET sample);

Identify the data when the power units in SET sample started to supply electricity to the grid. If none of the power units in SET sample started to supply electricity to the grid more than 10 years ago, then use SET sample to calculate the build margin.

In China it is difficult to obtain the data of the five existing power plants built most recently and the power plants capacity additions in the electricity system that comprise 20% of the system generation and that were built most recently. Taking notice of this situation, EB accepts the following deviation in calculation of build margin emission factor:

- Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

- Use proportional weights of installed capacity in place of electricity generation and plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial / regional or national grid of China, as a conservative proxy

According to the above, the proposed project activity calculate BM emission factor based on sample group m which comprise 20% of the system generation based on proportional weights of installed capacity in place of electricity generation. Based on the latest official statistics data, system capacity in 2006 (the year in which capacity addition exceeds 20% of the present system capacity for the first time) is chosen to compare with that in 2008 to determine the newly added amount as the sample group m (Annex 3 for detail).

According to the tool "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), $EF_{grid,BM,y}$ can be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (7)$$

Where

$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$EF_{EL,m,y}$ =CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m =Power units included in the build margin

y =Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available.

As stated in above, EB accept deviation in calculation of build margin emission factor for China. The build margin calculations featured below is derived from the "2011 Baseline Emission Factor for Regional Grids in China", which is in according with the EB's deviation and has been renewed by the China DNA (Director Office of National Climate Change Coordination of NDRC) on October 20, 2011.

- First, according to the statistical data of the most recent one year, determine the ratio of CO_2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency; and
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

BM emission factor for the proposed project activity is calculated these steps, detailed procedures are:

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO2 emissions from coal, oil and gas).

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}} \quad (8)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}} \quad (9)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{co2,i,j,y}} \quad (10)$$

Where:

$F_{i,j,y}$ =the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*, while *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$NCV_{i,y}$ =the fuel i net caloric value in the year y (for solid and liquid fuel for the GJ / t, for fuel gas for GJ/m3)

$EF_{CO2,i,j,y}$ =the fuel emission factors (tCO_2/GJ)

Sub-step 2. Calculate the emission factor of the thermal power

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (11)$$

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

Third, we calculate BM of the power grid

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (12)$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions to thermal power.

The calculation of the $EF_{grid,BM,y}$ is done as indicated in the Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011. The result is followed:

$EF_{grid,BM,y}$ = 0.5851 tCO_2/MWh

Step 6. Calculate the combined margin emissions factor

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

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.
The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (13)$$

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

We calculate the result as follows: the Operating Margin Emission Factor ($EF_{grid,\ OM,\ y}$) of the China Northwest Power Grid is 1.0001 tCO_2e/MWh and the Build Margin Emission Factor ($EF_{grid,\ BM,\ y}$) is 0.5851 tCO_2e/MWh. According to the "Tool to calculate the emission factor for an electricity system" the default values of this project are:

$w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period.

$$EF_{grid,CM,y}=EF_{grid,OM,y}\times w_{OM}+EF_{grid,BM,y}\times w_{BM} \quad (14)$$

$$=1.0001\ tCO_2/MWh\times0.5+0.5851tCO_2/MWh\times0.5$$
$$=0.7926\ tCO_2/MWh$$

Using above mentioned values the Combined Baseline Emission Factor of the China Northwest Power Grid corresponds to 0.7926tCO_2e/MWh.

Leakage emissions

According to ACM0002 (Version 12.3.0), no leakage emissions are considered.

$L_y = 0\ CO_2e/yr$ (15)

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (16)$$

Where:

ER_y	=	Emission reductions in year y (tCO_2e/yr)
BE_y	=	Baseline emissions in year y (tCO_2/yr)
PE_y	=	Project emissions in year y (tCO_2e/yr)

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

Data / Parameter:	$FC_{i,y}$
Data unit:	Mtons, Mm^3
Description:	Amount of fossil fuel type *i* comsumed in the project electricity system in year *y*
Source of data used:	*Chinese Energy Statistical Yearbook*, 2007-2009 editions Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011. (http://cdm.ccchina.gov.cn)
Value applied:	Varies for each fuel and year, see Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is official released statistic. The data source is reliable.
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	TJ/ton or TJ/m^3
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	*Chinese Energy Statistical Yearbook* 2007-2009 Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011. (http://cdm.ccchina.gov.cn)
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods	This is official released statistic. The data source is reliable.

and procedures actually applied :	
Any comment:	-

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2
Description:	CO_2 emission factor of fossil fuel type *i* used in year *y*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011. (http://cdm.ccchina.gov.cn)
Value applied:	See Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is IPCC default value.
Any comment:	-

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity generated in the project electricity system in year *y*
Source of data used:	"Chinese Electricity Yearbook" 2007~2009editions Notification on Determining Baseline Emission Factor of China's Grid published on the official web site of the Chinese DNA on 20/10/2011. (http://cdm.ccchina.gov.cn)
Value applied:	Varies with province and year, see Annex 3 for detail.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is official released statistic. The data source is reliable.
Any comment:	-

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually	Due to it is a new hydro power plant, according to ACM0002 (Version12.3.0), this value is zero.

applied :	
Any comment:	-

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data used:	Project site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Due to it is a new reservoir, according to ACM0002 (Version12.3.0), this value is zero.
Any comment:	-

B.6.3. Ex-ante calculation of emission reductions:

>>

As explained in B.6.1, the project emissions and leakage emissions of the Project are all considered as zero. The baseline emissions in year *y* (BE_y) are calculated as

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

The net electricity of the project is 223,525MWh as estimated in FSR.

The emission factor of NWPG is 0.7926tCO_2e/MWh.

Thus the baseline emission is

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 223,525MWh \times 0.7926CO_2e / MWh = 177,166tCO_2e$$

The emission reductions for a given year are calculated as baseline emissions minus the project emissions:

$ER_y = BE_y - PE_y - LE_y$=177,166t$CO_2$e-0 t$CO_2$e-0 t$CO_2$e =177,166t$CO_2$e

Therefore, the Project will have an emission reduction estimated at 177,166tCO_2e.

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)

01/01/2014-31/12/2014	0	177,166	0	177,166
01/01/2015-31/12/2015	0	177,166	0	177,166
01/01/2016-31/12/2016	0	177,166	0	177,166
01/01/2017-31/12/2017	0	177,166	0	177,166
01/01/2018-31/12/2018	0	177,166	0	177,166
01/01/2019-31/12/2019	0	177,166	0	177,166
01/01/2020-31/12/2020	0	177,166	0	177,166
Total(tCO_2e)	0	**1,240,161**	0	**1,240,161**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied to grid in year y by the project plant
Source of data to be used:	meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	223,525
Description of measurement methods and procedures to be applied:	Measured directly by electricity meters. The exact data will be the electricity delivered to the power grid minus the electricity supplied by the power grid. The data will be measured continuously and monthly aggregated.
QA/QC procedures to be applied:	According to Technical administrative code of electric energy metering (DL/T448 – 2000), meters will be calibrated annually by an independent inspection authority. Data measured by meters will be cross checked by the electricity sales documents.
Any comment:	100% of data will be kept for two years after the end of the last crediting period or the last issuance of CERs for this Project, whichever occurs later.

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	48,000,000
Description of measurement methods and procedures to be applied:	Check the Generators' nameplates annually
QA/QC procedures to be applied:	/
Any comment:	Refer to B.7.2 Description of the monitoring plan

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full.
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	245,900
Description of measurement methods and procedures to be applied:	Annual measured from topographical surveys, maps, satellite pictures, etc.
QA/QC procedures to be applied:	/
Any comment:	/

B.7.2. Description of the monitoring plan:

>>

The monitoring plan is made according to *ACM0002 Consolidated Baseline Methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0)*. Monitoring procedure should be implemented firmly and responsibly by owner; the project owner should ensure that the emission reduction of the project activity during crediting period are calculated correctly.

1. Monitoring Data

Since the emission factor is calculated as *ex-ante* and according to the Monitoring Methodology ACM0002 (Version 12.3.0), the following data should be monitored:

a) Quantity of net electricity generation supplied by the project plant to the grid in year y ($EG_{facility,y}$)

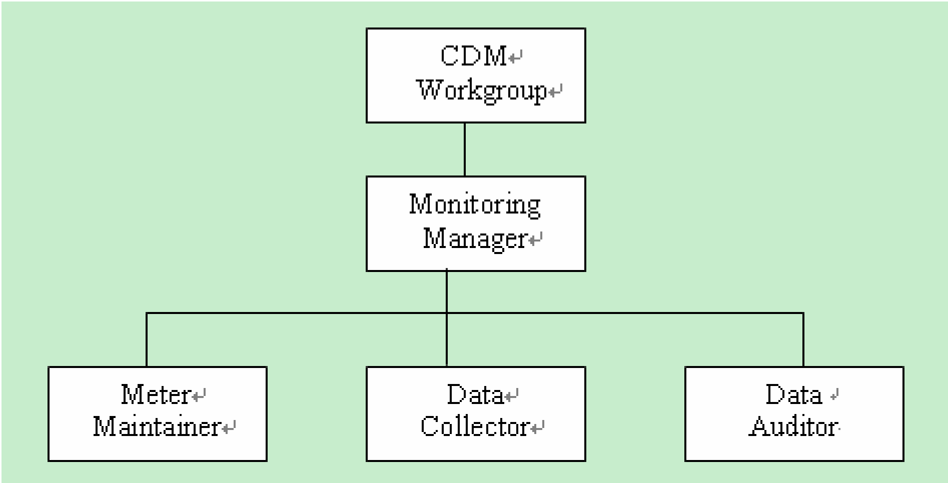
b) Installed capacity of the hydro power plant after the implementation of the project activity (Cap_{pj})

c) Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full (A_{pj}).

2. Monitoring Organization

A CDM group will be established to carry out the monitoring plan. The project owner will designate a CDM manager to responsible for daily monitoring and reporting. Under the CDM manager, there will be three positions involved, respectively referred as meter maintainer, data collector and data auditor.

Followed figure shows the CDM group structure:



The CDM Manager is fully responsible for implementing monitoring plan and reviewing monitoring results.

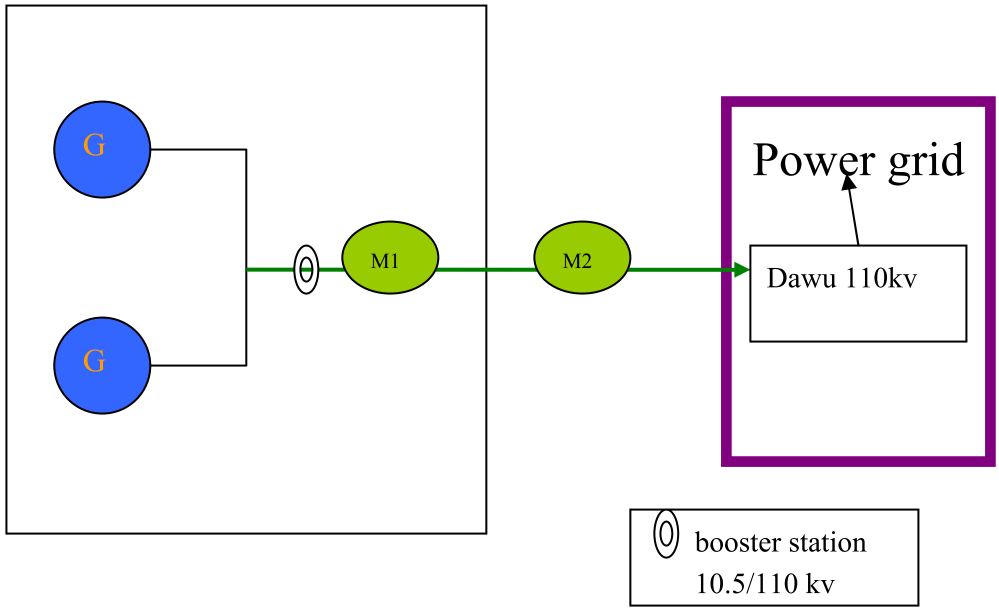
The maintainer is in charge of the organization of calibration tasks and regular maintenance of the meters equipped in the Project. The meters will be calibrated by specific technical staff and third party verification in accordance to relevant regulation and standard.

The Data collector is responsible for regular collecting of the financial data, including meters reading records and the electricity sales invoices or receipts. Those data will be audited and verified by the CDM group.

The Data Auditor will check the validity of the data by comparing with previous recorded data and data from third party such as the Power Corporation. If an obvious discrepancy does exist, it should be reported to Monitoring Manager. The validated data will be archived electronically in CDM data management system by the Data auditor.

3. Installation of meters

The metering equipment will be properly configured and checked annually according to the requirement from Technical administrative code of electric energy metering (DL/T448－2000, issued by State Economic and Trade Commission on Nov. 03, 2000 and implemented on Jan.1, 2001).The metering equipment will be checked by the Project owner and Grid Company before operation. The diagram of the meters' position is shown as following:



The main meter M2 (accuracy level >=0.5S) is a bidirectional power meter that will be installed at the Grid Company, which will monitor the quantity of net electricity generation supplied by the Project to the grid ($EG_{facility,y}$) ie. The electricity exported to the grid by the project subtracts the electricity imported to the project from the grid. M_2 will be owned and maintained by Qinghai Power Grid which belongs to NWPG. The backup meter M1 will be installed at the project site and will monitor the electricity coming out from the plant to grid and the electricity received by the plant from the grid, M_1 will be owned and maintained by the project owner. The difference between M2 and M1 is the line loss.

4. Data Collection

The project owner is responsible for monitoring the meter M1 and the Grid Company is responsible for monitoring the main meter M2, and they should guarantee the measuring equipment are in good operation.

The main meter data collection process is presented as follow:

a) The project owner read M_1 on site hourly and record the data everyday
b) The power gird read M_2 monthly and recorded
c) At a fixed day of each month, Grid Company sends the project owner notification of net electricity generation. Then, the project owner offers the electricity sales invoices to Grid Company.

The project owner will verify the installed capacity of the project on site annually and take a record. The area of reservoir measured in the surface of water when reservoir is full will be calculated annually using the schematics and area maps, etc, and the data will be recorded.

The QA&QC procedures for recording, maintaining and archiving data shall be optimized to ensure the Project provides credible, accurate, transparent and conservative monitoring data of the emission reductions.

5. Calibration

The calibration of electric energy meter should be annually carried out according to relevant National electric industry standards or regulations. After calibration, meters should be jointly inspected on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

All the meters installed shall be tested by the qualified metrical organization.

In Case of Emergency:

If the error of the main meter is out of the permissible limits, the data of the backup meter will be used to determine the electricity amount; the calculation of line loss can be determined by maximum historical records between M1 and M2. If both the main meter and the backup meter fail, the project owner and Grid Company shall jointly prepare a reasonable and conservative estimate of the correct reading. If the grid company and project owner can not determine a reasonable and accurate way to confirm the electricity generation during the meter failure period, then the electricity generated during this period will be neglected for conservative approach.

6. Data management system

All the data monitored under the monitoring plan will be kept for 2 years after the end of the last crediting period or the last issuance of CERs for this Project, whichever occurs later. The monitored data will be presented to DOE to for verification.

7. Monitoring Report

At the end of each crediting year, a monitoring report will be compiled including the metering results and evidence (i.e. sales receipts).

8. Personnel training

The monitoring plan needs to be executed by qualified professionals, thus the project owner will train the relevant personnel.

The training will make sure the relevant personnel to master the necessary mechanical, electric and installing knowledge, know well the working principle and the fundamental structure of generator, understand the reasons of common malfunction and the corresponding solving methods, expertly use the monitoring system. If personnel alternation happens, the worker taking over should be ensured to receive the same training.

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

>>

The study of the baseline and monitoring methodology was concluded on 12/06/2012 by the following organization and person.

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The entity above is not the Project participants in the Annex 1.

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:

>>

04/07/2011(the construction contract of dam was signed)

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

>>

20 years

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

C.2.1. Renewable crediting period:

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

>>

01/01/2014 or the registration date whichever the later one

C.2.1.2. Length of the first crediting period:

>>

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Environmental impacts

>>

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

>>

According to China Environmental Protection Law, the Project owner entrusted Qinghai environmental science research institute to compile Environmental Impact Assessment (EIA) report for the Project. The Project EIA report was completed in 08/2010 and approved by the Department of Environmental Protection of Qinghai Province on 15/09/2010. The main assessment conclusions are provided below:

Construction Phase

Water Environment

In construction period, there are mainly four impacts, respectively rock excavation and foundation trench drainage, processing wastewater of sandstone, oily sewage and sanitary waste. Excavation and foundation trench drainage will change water quality in the downstream obviously, mainly manifesting as suspended substance increased in the water contents and thus the water become muddy.

Air environment

The main pollutant source is from fuel oil of construction machinery and vehicles and open blasting. In addition the construction of sand area pollutes air environment. However, the amount and diffusion range of pollutants in ambient air is limited, thus the impact of these pollutants is slight.

Acoustical Environment

Noise source of the Project is mainly from earthwork during the construction phase and motor vehicles.

Ecological environment

Impact on species such as terrestrial ecology, terrestrial animal and soil environment is presented bellow.

a) Impact on terrestrial ecology

The impact is resulted from vegetation deterioration and soil erosion. After construction, the area temporarily occupied will be recovered through maintained and planting.

b) Impact on terrestrial animal

The impact resulted from changes of animal living environment. However, these changes are not significant, such as water, air, noise. The animal disturbed can find new suitable habitat nearby.

c) Impact on soil environment

The soil environment impact is posed by two parts. One is the permanent loss due to buildings. Other is damage of surface soil layer. The ways of organic exchange is blocked and soil is lost. During construction, the impact will be minimized and after construction, the recovery work will be carried out.

Solid waste

The solid waste consists of construction waste and household waste of workers. They are out of the list of poisonous and harmful waste.

Operation Phase

Hydropower is clean energy. During operation period, there is no pollutant from station. The environmental factors influenced are water, geology and ecology.

Impact on climate

The influence of climate is resulted from difference of the heat transfer and distribution during reservoir operation. It occurs in the large project. In this project, the influence can be neglected.

Impact on water environment

The sediment imposes the main impact on water of river and reservoir. The conservation measures of soil are taken to reduce the soil loss in the upstream. Meanwhile, the amount of sediment in reservoir is little through its designing and layout such as sand wash treatment measures. The amount of sediment is little, so its impact on quality of water and aquatic animals is little.

In the reservoir region, the surface area of water is increased because of storing water. And the flow rate of river is decreased. As a result, the quality of downstream water is improved with the increasing process time of natural purifying effect.

Impact on inundated area

The most of inundated area is cliff without minerals or street furniture or farm or protection zone. The families in this area are few. So there is no Submerged problem existing

Mitigation measures

1) waste water

The oil separator is set up for the oily sewage whose floating oil can be recovered. Then waste water of construction is treated with flocculation and mechanical dewatering. The sanitary wastewater is collected to sedimentation basin. The waste water treated can be reuse for dust fall and irrigation to minimize the waste water discharged into environment.

2） air environment and noise

Corresponding measures will be adopted to reduce the impacts. In addition, focus will be put on the construction personnel. Protective measures, such as wearing dust masks, ear plugs, etc., will be equipped to prevent health hazards from dust and earplugs, earmuffs, or helmets etc. will be provided for the sake of personnel. These impacts will disappear after the completion of the Project.

3） Solid waste

They are collected in time and treated as the landfill process. And the conservation measures of water and soil in residue place is taken. Thus it will not affect much on the surrounding environment

4） Ecology

According to the national policies and regulations, the ecology is recovered by planting in area temporarily occupied. In addition, the design and technology of EIA is strictly complied with to minimize the area disturbed. And the public education is carried out to workers.

In conclusion, environmental impacts arising from the project are considered insignificant. The insignificant impacts on environment could be solved by protection measures.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

According to EIA results and reply from Department of Environmental Protection of Qinghai Province, the impact on the environment is not significant.

SECTION E. Stakeholders' comments

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

>>

To investigate the impacts on local socio-economy and environment, the Project owner conducted a public meeting on 16/04/2011[21]. Before that, on 06/04/2011, the project owner has published a notice on its Bulletin board to invite potential stakeholders to attend the meeting and give comments. The survey was

[21] The meeting minute of the Project stakeholder comment results (16/04/2011).

arranged through delivering questionnaires among local residents (especially Dawu town) at the project site.

E.2. Summary of the comments received:

>>

50 questionnaires copies were delivered and all of them available. The survey had a 100% response rate. Details of the stakeholders taken part in the survey are showed in the Table E-1.

Table E.2-1 Details of the stakeholders for the Project

Item		total	percentage
Age（year）	30	7	14
	39-40	10	20
	40-49	21	42
	50-59	7	14
	above 60	5	10
Profession	Farmer	33	66
	other	17	34
Education level	Preliminary school	12	24
	Junior high school	29	58
	Senior high school	7	14
	other	2	4

Table E.2-2 Results of the survey

Content		Statistical Results	
		total	%
1. What's your attitude towards the Project?	support	46	92
	indifference	4	8
	objection	0	0
2. Do you think the Project has an effect on the local socio-economy and environment?	positive	36	72
	passive	2	4
	no effect	12	24
3. Do you think the construction of the Project will bring employment opportunities to local people?	yes	50	100
	no	0	0
4. What's your opinion about the influence the Project caused?	positive effect	27	54
	Some influence but acceptable	19	38
	no effect	4	8
5. Do you think the project should be built as soon as possible?	yes	41	82
	no	0	0

	indifference	9	18
6. Will the Project have impact on your work and life?	large influence	2	4
	little influence	14	28
	no influence	34	68
7. What role do you think CDM plays in the Project?	positive	16	32
	no effect	0	0
	Improve local clean energy usage	34	68

Conclusion

The public investigation shows that most respondents support the construction of the Project, and all of them insist that this Project is beneficial to the local development. There are some concerns on the impacts in the construction phase, but according to the description in EIA all problems can be solved by applying the advanced technology and adopting environmental protection measures.

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

>>

The environmental concerns from the respondents are seriously considered by the Project owner and will be solved by applying the related measures. All the comments received which strongly show a positive attitude in supporting the construction of the Project have been integrated into the Project construction phase plan and earnestly implemented.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the Project.

Annex 3

BASELINE INFORMATION

Based on the approved methodology ACM0002, the "tool to calculate the emission factor for an electricity system", and the document "2011 Baseline Emission Factors for Regional Power Grids in China", the emission factor of Northwest China Power Grid (NWPG) calculation was shown below:

Tables A3-1 Fossil Fuel-fired Power Generation of NWPG in 2007

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Shanxi	59,100,000	6.77	55,098,930
Gansu	42,400,000	5.89	39,902,640
Qinghai	9,700,000	7.19	9,002,570
Ningxia	43,500,000		43,500,000
Xinjiang	34,600,000	9.2	31,416,800
total			178,920,940

Total Emission of CO_2(tCO_{2e})	180,940,805
Total Electricity Supply (MWh)	178,920,940
Emission factor	1.01129

Data source： China Electric Power Yearbook 2008

Tables A3-2 Calculate the Operating Margin Emission Factor of NWPG in 2007

Fuel	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO_2(tCO_{2e})
								（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	L=G*J*K/100000 （quantity）
		A	B	C	D	E	G=A+B+C+ D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	3303.44	1969.03	470.85	2165.8	1762.11	**9671.23**	25.8	100	87,300	20,908	176,525,905
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	3.73			124.31	7.73	**135.77**	25.8	100	87,300	8,363	991,243
Briquette	10^4t	3.53					**3.53**	26.6	100	87,300	20,908	64,432
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.52	0.65			0.26	**1.43**	12.1	100	37,300	16,726	89,215
Other gas	10^8m^3	14.14	0.71				**14.85**	12.1	100	37,300	5,227	289,526
Crude oil	10^4t					0.09	**0.09**	20	100	71,100	41,816	2,676
Petrol	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 dry gas	10^4t					5.99	**5.99**	15.7	100	48,200	46,055	132,969
Nature 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	72,200	41,816	0
Other coking products	10^4t						**0**	25.8	100	95,700	28,435	0
Other energy	10^4t ce	94.36	9.73				**104.09**	0	0	0	0	0
											Total	180,940,805

Data source: China Energy Statistical Yearbook 2008

Tables A3-3Fossil Fuel-fired Power Generation of NWPG in 2008

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Shanxi	71,500,000	6.95	66,530,750
Gansu	46,800,000	6.4	43,804,800
Qinghai	10,700,000	7.14	9,936,020
Ningxia	44,000,000	7.57	40,669,200
Xinjiang	39,700,000		39,700,000
total			200,640,770

Total Emission of CO_2(tCO_{2e})	197,137,915
Total Electricity Supply (MWh)	200,640,770
Emission factor	0.98254

Data source： China Electric Power Yearbook 2009

Tables A3-4 Calculate the Operating Margin Emission Factor of NWPG in 2008

Fuel	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO_2(tCO_{2e})
								（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	L=G*J*K/100000 （quantity）
		A	B	C	D	E	G=A+B+C+ D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	3620	2216.9	507.44	2330.72	1924.9	**10599.96**	25.8	100	87,300	20,908	193,477,720
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	9.22			53.85	8.2	**71.27**	25.8	100	87,300	8,363	520,335
Briquette	10^4t						**0**	26.6	100	87,300	20,908	0
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.35	0.74			0.13	**1.22**	12.1	100	37,300	16,726	76,113
Other gas	10^8m^3	18.38	0.2				**18.58**	12.1	100	37,300	5,227	362,249
Crude oil	10^4t						**0**	20	100	71,100	41,816	0
Petrol	10^4t	0.05				0.01	**0.06**	18.9	100	67,500	43,070	1,744
Diesel oil	10^4t	1.03	0.44	0.26	0.05	1.64	**3.42**	20.2	100	72,600	42,652	105,902
Fuel oil	10^4t		0.86	0.04		0.02	**0.92**	21.1	100	75,500	41,816	29,045
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery dry gas	10^4t					7.25	**7.25**	15.7	100	48,200	46,055	160,939
Nature gas	10^8m^3	0.94	0.24	2.99		7.2	**11.37**	15.3	100	54,300	38,931	2,403,565
Other petroleum products	10^4t					0.01	**0.01**	20	100	72,200	41,816	302
Other coking products	10^4t						**0**	25.8	100	95,700	28,435	0
Other energy	10^4t ce	93.67	10.58		21.24		**125.49**	0	0	0	0	0
											Total	197,137,915

Data source: China Energy Statistical Yearbook 2009

Tables A3-5Fossil Fuel-fired Power Generation of NWPG in 2009

Province	Electricity Generation (MWh)	Rate of Electricity (%)	Electricity Supply (MWh)
Shanxi	77,400,000	7.24	71,796,240
Gansu	44,100,000	6.88	41,065,920
Qinghai	10,700,000	7.01	9,949,930
Ningxia	44,700,000	7.76	41,231,280
Xinjiang	45,200,000	5.16	42,867,680
total	222,100,000		206,911,050

Total Emission of CO_2(tCO_{2e})	208,481,441
Total Electricity Supply (MWh)	206,911,050
Emission factor	1.00759

Data source： China Electric Power Yearbook 2010

Tables A3-6Calculate the Operating Margin Emission Factor of NWPG in 2009

Data source: China Energy Statistical Yearbook 2010

Fuel	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Carbon content	$OXID_i$	$EFCO_{2,i}$	NCV_i	Emission of CO2(tCO_{2e})
								（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	L=G*J*K/100000 （quantity）
		A	B	C	D	E	G=A+B+C+ D+E+F	H	I	J	K	L=G*J*K/10000 (volume)
Raw coal	10^4t	3949.22	2060	467.05	2350.13	2380	**11206.4**	25.8	100	87,300	20,908	204,546,878
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t	8.34			56.01	6.66	**71.01**	25.8	100	87,300	8,363	518,437
Briquette	10^4t						**0**	26.6	100	87,300	20,908	0
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke oven gas	10^8m^3	0.49	0.8			0.12	**1.41**	12.1	100	37,300	16,726	87,967
Other gas	10^8m^3	18.37	0.44				**18.81**	12.1	100	37,300	5,227	366,733
Crude oil	10^4t						**0**	20	100	71,100	41,816	0
Petrol	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Diesel oil	10^4t	0.6	0.52	0.2	0.07	0.7	**2.09**	20.2	100	72,600	42,652	64,718
Fuel oil	10^4t		0.25	0.08		0.06	**0.39**	21.1	100	75,500	41,816	12,313
LPG	10^4t	0.02					**0.02**	17.2	100	61,600	50,179	618
Refinery dry gas	10^4t					8.56	**8.56**	15.7	100	48,200	46,055	190,019
Nature gas	10^8m^3	0.91	0.07	3.93		7.83	**12.74**	15.3	100	54,300	38,931	2,693,177
Other petroleum products	10^4t						**0**	20	100	72,200	41,816	0
Other coking products	10^4t						**0**	25.8	100	95,700	28,435	0
Other energy	10^4t ce	73.76	18.52		18.08		**110.36**	0	0	0	0	0
											Total	208,481,441

Table B-7 Breakdown per fuel of annual emissions

Data source: China Energy Statistical Yearbook 2010

		Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Calorific value	EF	Oxidation rate	Emission
Fuels	Unit	A	B	C	D	E	G=A+…+F	H	I	J	K=G×H×I×J/100,000
Raw coal	10^4t	3,949.22	2,060	467.05	2,350.13	2,380	11,206.4	20,908	87,300	1	204,546,513
Cleaned coal	10^4t	0	0	0	0	0	0	26,344	87,300	1	0
Other washed coal	10^4t	8.34	0	0	56.01	6.66	71.01	8,363	87,300	1	518,437
Briquette	10^4t	0	0	0	0	0	0	20,908	87,300	1	0
Coke	10^4t	0	0	0	0	0	0	28,435	95,700	1	0
Other coking products	10^4t	0	0	0	0	0	0	28,435	95,700	1	0
Total											205,064,950
Crude oil	10^4t	0	0	0	0	0	0	41,816	71,100	1	0
Gasoline	10^4t	0.02	0	0	0	0	0.02	43,070	67,500	1	581
Diesel oil	10^4t	0.6	0.52	0.2	0.07	0.7	2.09	42,652	72,600	1	64,718
Fuel oil	10^4t	0	0.25	0.08	0	0.06	0.39	41,816	75,500	1	12,313
Other petroleum products	10^4t	0	0	0	0	0	0	41,816	72,200	1	0
Total											77,612
Nature gas	10^7m^3	9.1	0.7	39.3	0	78.3	127.4	38,931	54,300	1	2,693,177
Coke oven gas	10^7m^3	4.9	8	0	0	1.2	14.1	16,726	37,300	1	87,967
Other gas	10^7m^3	183.7	4.4	0	0	0	188.1	5,227	37,300	1	366,733
LPG	10^4t	0.02	0	0	0	0	0.02	50,179	61,600	1	618
Refinery dry gas	10^4t	0	0	0	0	8.56	8.56	46,055	48,200	1	190,019
Total											3,338,514
Total											208,481,076

Here:

$\lambda_{Coal,y}$ =98.36%，$\lambda_{Oil,y}$ =0.04%，$\lambda_{Gas,y}$ =1.60%

Therefore,

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

=0.7899 tCO_2/MWh

Table B-8 Installed Capacity of NWPG in 2009

Installed Capacity	**Unit**	**Shanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Total**
Thermal	MW	19,900	10,990	1,930	8,820	9,520	51,160
Hydro	MW	1,920	5,940	8,740	430	2,430	19,460
Nuclear	MW	0	0	0	0	0	0
Wind and other energies	MW	0	750	0	270.3	860	1,880
Total	MW	21,820	17,680	10,670	9,520	12,810	72,500

Data source： China Energy Statistical Yearbook 2010

Table B-9 Installed Capacity of NWPG in 2008

Installed Capacity	**Unit**	**Shanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Total**
Thermal	MW	17,850	8,980	2,000	7,540	8,200	44,570
Hydro	MW	1,810	5,440	5,910	430	2,190	15,780
Nuclear	MW	0	0	0	0	0	0
Wind and other energies	MW	0	600	0	170	510	1,280
Total	MW	19,660	15,020	7,910	8,140	10,900	61,630

Data source： China Energy Statistical Yearbook 2009

Table B-10 Installed Capacity of NWPG in 2007

Installed Capacity	**Unit**	**Shanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Total**
Thermal	MW	12,290	7,840	1,900	7,030	6,560	35,620
Hydro	MW	1,790	4,400	5,830	430	2,140	14,590
Nuclear	MW	0	0	0	0	0	0
Wind and other energies	MW	72.5	346	0	50	330	798.5
Total	MW	14,152.5	12,586	7,730	7,510	9,030	51,008.5

Data source： China Energy Statistical Yearbook 2008

Table B-11 BM EF of NWPG

	Installed Capacity of 2007	Installed Capacity of 2008	Installed Capacity of 2009	New Installed Capacity2007-2009(MW)	New Installed Capacity2008-2009(MW)	Cumulative increase (%)
	A	B	C	D	E	F
Thermal(MW)	35,620	44,570	51,160	16,998	7,389	74.07%
Hydro(MW)	14,590	15,780	19,460	4,870	3,680	21.22%
Nuclear(MW)	0	0	0	0	0	0.00%
Wind(MW)	798.5	1,280	1,880.3	1,081.8	600	4.71%
Total	**51,008.5**	**61,630**	**72,500.3**	**22,949.8**	**11,669**	**100.00%**
% versus 2009				31.65%	16.10%	

$EF_{BM,y}$=0.7899×74.07%=0.5851 tCO_2/MWh

Table B-12 CM EF of CSPG

OM (tCO_2/MWh)	BM (tCO_2/MWh)	CM=(OM+BM)/2 (tCO_2/MWh)
1.0001	0.5851	0.7926

Annex 4

MONITORING INFORMATION

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