CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Annexes

Revision history of this document

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

SECTION A. General description of the small-scale project activity

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

Lianghekou 15MW Small Hydropower Project, Gansu Province
Version: 2.5
Date: 08/05/2007

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

The Lianghekou Hydropower Project (hereafter refers to 'LHP' or 'the project'), a run-of-river hydro project, is located on the tributary of Bailong River in Gansu Province, P.R.China. Total capacity of the proposed CDM project will be 15MW, consisting of three (3) 5 MW turbines, with an average annual output of 92,000MWh. Main activity of the project is generation of electricity using hydro potential available and exporting the generated power to Gansu Provincial Grid which connected to Northwest Power Grid (NWPG), and it will alleviate power shortage in the NWPG.

The generated electricity by LHP will displace part electricity of the NWPG which is dominated by coal-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are expected to be 75, 827 tCO_2e.

As a renewable energy project, the LHP will produce positive environmental and economic benefits, and contribute to the local sustainable development mainly through following ways:

- Consistence with China's national energy policy and the Western Development Strategy;
- Improvement in generation and reliability of electricity to the local areas. The proposed project activity will act as a direct supplement to local electricity capacity, and thus would supply reliable power for the local community;
- Reduction of greenhouse gas emissions (GHG), especially CO_2. The LHP will displace part electricity from coal-fired power plants, and also will protect natural vegetation and water resources through facilitating the local residents to switch from wood to electricity in their daily cooking and heating;
- Creation of direct permanent and temporary employment for the local area. During the construction and operation time, 550 thousand workdays and 120 permanent jobs will be created;
- Increased income of local governments and residents, and thus will alleviate poverty in the local area, which is one of the poorest areas in Gansu Province.

A.3. Project participants:

Name of Party involved	Private and/or public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Gansu Zhouqu County Linghekou Hydropower development Co., Ltd	No
The Netherlands	Energy Systems International B.V.	No

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

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

A.4.1.1. Host Party(ies):

People's Republic of China

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

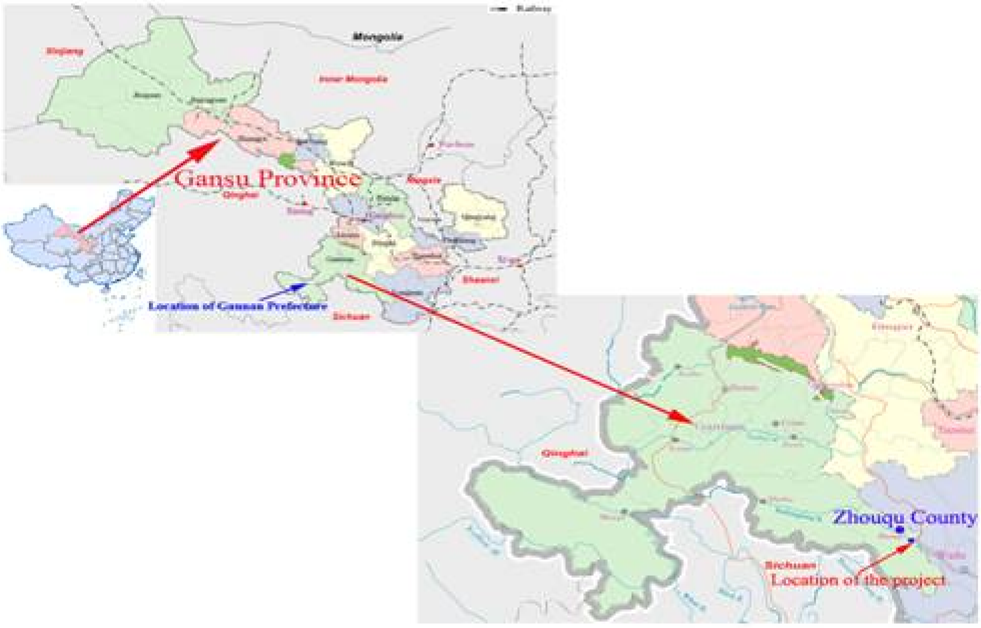
Gansu Province

A.4.1.3. City/Town/Community etc:

Zhouqu County, Gannan Tibetan Autonomous Prefecture

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

The proposed CDM project activity is located within the territory of Dachuan Township, Zhouqu County of Gannan Tibetan Autonomous Prefecture in Gansu Province. It will be located on the middle reaches of Bailong River, which is a tributary of Jialing River, approximately 14 Km southeast of Zhouqu County. Detailed physical location of the proposed project activity following as (Fig1):



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

According to Appendix B[1] of the simplified procedures for small-scale activities, the type and category of the LHP as follows:

TYPE I - *Renewable Energy Project*
CATEGORY I.D. - *Grid Connected Renewable Electricity Generation*

The proposed project uses run-of-river hydropower technology which is converting the potential energy

[1] UNFCCC web site, http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf

available in the water flow into electrical energy using hydro turbines and alternators.. It is consisted of a diversion weir, a channel, a penstock, a forebay, high-pressure pipelines, a powerhouse and a step-up substation. Generated voltage at the generator terminals will be 6.3 kV, which will be stepped-up to 35 kV to match the nearest Zhouqu 110 kV substation voltage level. All technologies utilized in the project activity are advanced domestic technologies (the key technical parameters for the equipments within the project detailed in the following table).

Summary of key equipment in the project[2]

Parameter	Unit	Amount
Turbine		
Units		3
Model		ZD500-LH-210
Rated Header	m	23.5
Rated Flow	m^3/s	26.6
Runner Diameter	m	2.1
Rated Rotation Speed	r/min	300
Rated Power	kW	5000
Rated Output	kW	5263
Rated Model Design Efficiency	%	89.5
Generator		
Model		SF5000-20/3250
Rated Power	kW	5000
Rated Voltage	kV	6.3

According to the waterpower studies carried out for the project, the net head available has been estimated as 23.5 m; the flow rate of water in the stream available as 79.80 m^3/s. So based on the head available and discharge of water, the optimum capacity of LHP has been envisaged at 15MW. In addition, the proposed project will not expand beyond 15 MW, proof is that the approval of the Chinese authorities is for the current design of 15 MW; in other words, expansion beyond the current capacity would not be possible without further government approvals. Therefore, the project has not the probability for increase in the operating stage. In view of above, the project activity will remain under the limits of SSC throughout the crediting period.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

The proposed project activity generates electricity using hydro potential and exports the generated power to Gansu Provincial Grid, which is connected to NWPG. Therefore, it has not any emissions of anthropogenic greenhouse gas (GHGs) by sources.

Under the business as usual scenario, NWPG will mainly depend on developing thermal power to meet more and more electricity demand according to the current structure of energy and the practicality of technology. At the end of 2004, NWPG is nearly dominated by thermal power plants, which accounted for about 78.0% of the total generation[3]. Such situation will not be changed in a long term. In addition, from analysis detailed in **B.3,** the FIRR of the project is only 7.06%, which is lower than the benchmark rate (10%) of small hydropower projects in China. Therefore, the proposed project activity is not

[2] Source: Lianghekou Feasibility Study Report

[3] China Electric Power Yearbook 2005, China Electric Power Press, 2005, p[474]

financially viable, and also not the baseline scenario.

Without the CER_S revenue, the unmet electricity demand possibly will be satisfied by newly built coal-fired power plants and intensified operation of existing plants. Therefore, the generated power by the proposed project activity will displace part of electricity generated by coal-fired power plants, and thus the emission reductions to be achieved are additional.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

Annual emission reductions of the proposed project are estimated to be 75,827 tCO_2e. During the first crediting period (2007-2013), the total emission reductions are estimated to be 530,789 tCO_2e.

Years	Annual estimation of emission reductions in tonnes of CO_2e
2007	75,827
2008	75,827
2009	75,827
2010	75,827
2011	75,827
2012	75,827
2013	75,827
Total estimated reductions (tonnes of CO_2e)	530,789
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	75,827

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

This project has not received any public funding from parties included in Annex Ⅰ to the Convention.

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

According to Appendix C[4] of the simplified modalities and procedures for the small-scale CDM project activities, the proposed project is not a debundled component of any larger scale project. The project participants further confirm that they have not registered any small scale CDM activity or applied to register another small CDM project activity within the same project boundary, in the same project category and technology/measure.

SECTION B. Application of a baseline methodology:

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

According to UNFCCC's most recent list in Appendix B of the simplified M&P for small scale CDM project activities, the approved baseline methodology applied to the proposed project as follows:

Title of the methodology: *Grid connected renewable electricity generation*

4 http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

Reference of the methodology: AMS-I.D.（*Version 10: EB 28*）[5]

In addition, according to the definition of power density to renewable hydropower project in the meeting from EB23, the project has the eligibility of power density for CDM project activities with 628W/m^2 greater than 10W/m^2. Therefore, it can use the current approved methodology (AMS-I.D).

B.2 Project category applicable to the small-scale project activity:

The project falls into project Category I.D. since it is a hydropower project that will supply renewable electricity to NWPG and also the unit added is only 15MW, which is satisfied with the eligibility limit of 15MW for a small-scale CDM project activity. Hence, the applicable baseline methodology for the project is AMS-I.D, which is provided in Appendix B.

Under clause 9 of Category I.D. in Appendix B, two methods of calculating the emission coefficient are given. First method i.e. (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered; The second method i.e. (b) The weighted average emissions (in kgCO_2equ/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

In China Electric Power Yearbook and other data resources, the data of the year in which project generation occurs are available only two years later, and also the second method need to call for reviewing the baseline emission factor every year ex-post. Therefore, the first method (a: A combined margin) is chosen as the calculation method for the proposed project activity's baseline emission coefficient.

This selected approach just needs to calculate ex-ante the baseline emission coefficient, and does not call for reviewing it every year ex-post.

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

Justification for additionality of the project

UNFCCC simplified modalities seek to establish additionality of the project activity as per Attachment A to Appendix B, which listed various barriers, out of which, at least one barrier shall be identified due to which the project would not have occurred any way. The main barrier identified by project participants for the proposed project activity is investment barrier.

Without additional revenue funding, possibly from CDM project activities, the project Financial Internal Rate of Return (FIRR) shall not be considered economically viable. Based on the Feasibility Study of the proposed project, a revised investment analysis was done through applying benchmark analysis method, which mainly based on the FIRR as the financial indicator. The investment analysis was conducted in the following steps:

a. Apply benchmark analysis

The benchmark FIRR on total investment for the proposed project is chosen as 10% as per the *"Economic Evaluation Code for Small Hydropower Projects"*, which was issued by Ministry of Water Resources in 1995 (Document No.SL16-95) and is the most important reference for small-scale hydro Power (SHP) assessment in China. And thus a project will be financially acceptable when FIRR is better than the benchmark rate.

b. Calculation and comparison of financial indicators

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[5] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_88PZMJZZR5KRJ6L9V7AXGGWHG7W2HH

Main items for the calculation of financial indicators following as:

Item	Unit	Value	Data sources
Annual Export to NWPG	MWh	92,000	Feasibility Study
Electricity Tariff (including VAT)	RMB Yuan /kWh	0.18	National Policy
Project Lifetime	Years	23	Feasibility Study
Static Total Investment	RMB million Yuan	129.29	Feasibility Study
Value Added Tax (VAT)	%	6	Feasibility Study
Income Tax	%	33	Feasibility Study
Additional tax on city building and education	%	8	Feasibility Study
Annual total costs on electricity generating	RMB million Yuan	6.03	Feasibility Study
Operation and Maintenance Expenses	RMB million Yuan	2.39	Feasibility Study
Expected CERs Price	EUR / tCO_2e	8	
CERs Crediting Period	Years	7*3	

The FIRRs with and without CER_S revenue are listed below. Without the CER_S revenue, the LHP would not make the investment viable with FIRR 7.06% lower than benchmark rate, and it is not financially attractive. With the CER_S revenue, the FIRR is increased to above the benchmark rate and is thus financially acceptable.

Item	Without CER_S revenue	Benchmark rate	With CER_S revenue
FIRR of total investment	7.06%	10.00%	11.39%

c. Sensitivity analysis

For the proposed project, the feasibility is mainly dependent on the following three parameters. A detailed sensitivity analysis was done to test the project feasibility with varying project parameters.

1) Total investment
2) Annual output
3) Operation and Maintenance Expenses (OM)

The impact of change for on-grid tariff is not considered because the tariff is approved by related price department.

When the three parameters above fluctuate in the possible range of -10% to +10%, the FIRR of the total investment varies to different extent, as shown in the following table and Figure 2.

Change rate	Benchmark rate	Total investment	Annual output	OM
		Basal value	Basal value	Basal value
-10%	10%	8.22%	5.97%	7.25%
-5%	10%	7.62%	6.52%	7.16%
+5%	10%	6.54%	7.60%	6.96%
+10%	10%	6.06%	8.13%	6.86%

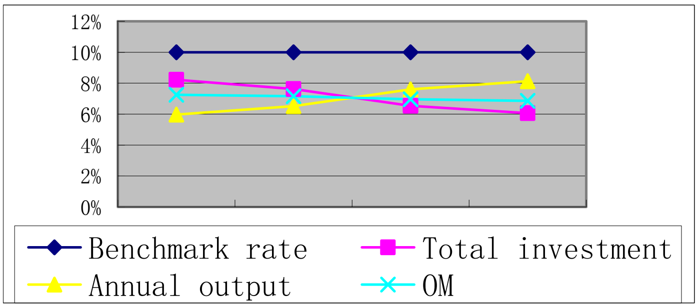


Fig 2: Sensibility analysis of the proposed project

From the sensitivity analyses above, the FIRR of the proposed project is unlikely to reach the benchmark rate. Therefore, without the CER_S revenue, the project is not financially viable, even when the possible variations of the main parameters are considered.

In addition, the proposed project has great barriers in investment, mainly as follows:

●*Geological risks* -During the construction time, the proposed project activity involved construction of a penstock in a hilly terrain with weathering rocks which posed complex geological situation, and also involved construction of a diversion weir with debris flow which resulted in increasing works. Because of these reasons, the earlier development entity, Gansu Yilong Investment Co., Ltd (GYIC), had to increase a great deal of additional investment (about 14 million RMB Yuan) which was not planned in Feasibility Study[6]. Just these risks, which serious influenced the investment confidence of GYIC, the project had been ceased work for sixteen months[7]. Therefore, geological risks were major barriers for the proposed project activity.

In conclusion, without the CER_S revenue, the project can not be considered as financially viable because of the lower FIRR and various barriers described above. Therefore, the proposed project activity is additional and not the same as the baseline scenario.

Impacts of CER_S revenue

Considering the CER_S revenue, the FIRR will be increased to about 11.39% which is higher than the benchmark rate, and will significantly improve the financial indicators of the proposed project. Therefore, the proposed project with CER_S revenue can be considered as financially viable.

Considering the development of the proposed CDM project, Gansu Branch of China Construction Bank (GBCCB), had agreed with GYIC on the loan of LHP in January 2005[8], and regarded the CER_S revenue as the mortgage for repayment of the loan. And then the GYIC started the construction again.

Considering the development of the proposed CDM project, Lanzhou Changcheng Industry and Tradition Co., Ltd (LCITC) had agreed with GYIC on the cooperation of LHP in year 2004[9], i.e. LCITC would become LHP's second largest shareholder through supplying all the equipments of the proposed project. In September 2006, the project entity, Zhouqu County Linghekou Hydropower development Co., Ltd was registered, which was held by GYIC and LCITC.

[6] Report on supervision, Gansu Tieke Engineering Construction Supervision Company, File NO.005, 10/09/2003: described the bad geological situations and the increasing works by diversion weir, which resulted in a great deal of additional investment.
[7] Document on the stopping construction of Lianghekou Hydropower Station, Zhouqu County Hydropower Administration: supplied the proof for the time (20/09/2003-05/01/2005) and reasons of the stopping construction
[8] Loan Contract for Lianghekou Hydropower Station, Gansu Branch of China Construction Bank (GBCCB) and GYIC, 20/01/2005: considered the provision regarding the future CER_S revenue as mortgage
[9] Cooperation agreement of GYIC and LCITC,21/12/2004: described the provision of considering CER_S revenue

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

Project boundary specified in the Appendix B of simplified modalities and procedures is that encompasses the physical, geographical site of the renewable generation source.

According to the latest rules on grid boundary of version 6 of ACM0002, the regional grid definition is used because China's DNA guidance has been available[10]. And thus NWPG is selected as the connected electricity system and the project boundary of the proposed project activity.

NWPG is composed of Shaanxi Provincial Grid, Gansu Provincial Grid, Qinghai Provincial Grid, Ningxia Provincial Grid and Xinjiang Provincial Grid, and has a mix of hydro power and thermal power. From the statistics of China Electric Power Yearbook (detailed in the following table), it can be foreseen that NWPG is dominated by coal-based thermal power plants, and this trend will be continue in a long term.

Basic Information of NWPG as Baseline Scenario

Year	Installed capacity (MW)			Generation (MWh)		
	Thermal	Hydro	Split of Thermal	Thermal	Hydro	Split of Thermal
1999	14,430.7	8,338	63.2%	65,322,000	27,709,000	70.1%
2000	15,883.6	8,691	64.4%	71,567,870	29,963,750	70.4%
2001	16,794.9	8,872.4	65.2%	81,148,000	27,446,000	74.6%
2002	17,756.8	9,199.9	65.6%	93,428,000	27,427,000	77.2%
2003	20,492.7	9,382.0	68.3%	113,093,000	25,899,000	81.2%
2004	22,247.5	10,835.2	66.7%	131,939,000	34,813,000	78.0%
Data sources: China Electric Power Yearbook 2000-2005						

In addition, since the electricity system has no electricity transaction with other regional grids that might be affected, directly or indirectly by a CDM project activity[11], there is no need to consider electricity import when calculating the emission factors.

In view of analyses above, the system boundary of NWPG can be clearly identified and information on its characteristics is available in transparent way, furthermore relatively independent. Therefore, for the proposed project activity under consideration, the system boundary defined as NWPG is considered appropriate, and the project boundary will include the project and other plants connected to the grid system.

B.5. Details of the baseline and its development:

As explained in Section B.4, the project activity is generation of electricity for a grid system, which is also served by other fossil and non-fossil fuel, based on generating units. Hence, according to AMS-I.D in Appendix B of indicative simplified baseline and monitoring methodologies, the baseline is kWh produced by the renewable generating unit multiplied by an emission co-efficient (measured in kgCO_2equ /kWh), and estimated using the first method (a) specified under clause 9 of Category I.D, which is considered appropriate, conservative and transparent. The baseline formula used is detailed under E.1.2.4**.**

Date of completing the draft of this baseline section:

26/08/2006

Name of person:

Junyang Guo

[10] Clean Development Mechanism in China, Office of National Coordination Committee on Climate Change, http://cdm.ccchina.gov.cn/web/index.asp

[11] Http://www.sp.com.cn/zgdl/spw/12y/wsdljh.htm

Entity determining the baseline:

The center for Development and Promotion of Science and Technology of Gansu Province

Address: Qingyang Road No. 174, Lanzhou city, Gansu Province, China.

Telephone: +86-931-8826221

E-Mail: guojunyang1979@163.com

The entity is not one of the Project Participants listed in Annex 1 of the document

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

01/05/2007 (operation)

C.1.2. Expected operational lifetime of the small-scale project activity:

23y-0m

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

The project activity will use a renewable crediting period as detailed in **C.2.1.**

C.2.1. Renewable crediting period:

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

01/07/2007 or the date of registration whichever is later

C.2.1.2. Length of the first crediting period:

7y-0m

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Application of a monitoring methodology and plan:

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

According to UNFCCC's most recent list in Appendix B of the simplified M&P for small scale CDM project activities, the approved monitoring methodology applied to the proposed project as follows:

Title of the methodology: *Grid connected renewable electricity generation*
Reference of the methodology: *AMS-I.D.（Version 10: EB 28）*[12]

D.2. justification of the choice of the methodology and why it is applicable to the small-scale project activity:

The capacity of the proposed project is only 15 MW, which is satisfied with the qualifying capacity of 15 MW to use simplified methodologies. Further, the project activity is generation of electricity for a grid system using the potential renewable hydropower resources in Bailong River, then connected to NWPG to operate. Hence, the monitoring methodology was selected, which specified in Appendix B of the indicative simplified baseline and monitoring methodologies for small scale CDM project activities.

D.3 Data to be monitored:

Monitoring shall consist of metering the electricity generated by the renewable technology (Hydropower), and the method as described Procedures for SSC projects for Category I.D. Therefore, data to be monitored only includes electricity delivered to the grid by the proposed project activity.

[12] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_88PZMJZZR5KRJ6L9V7AXGGWHG7W2HH

I.D number	Data type	Data variable	Data unit	Measured(m) calculated(c) or estimated(e)	Recording frequency	Proportion of data to be monitored	How will the data be archived(electronic/paper)	For how long is archived data to be kept?	Comment
D.3.1	Electricity quantity	Electricity delivered to NWPG by the project	kWh	m	Monthly	100%	Electronic and paper	Proposed crediting period plus two years	The data required for estimation of baseline emissions, which would be monitored by electricity sales receipt and double checked by metering records. Furthermore, the records would be kept in electronic form, and monthly generation data would be printed out for a back up, for the improbable event of a computer hazard.

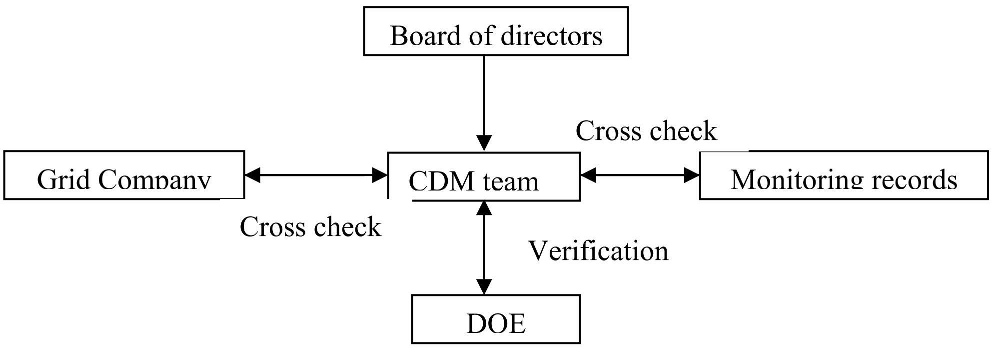
D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

Data item	Uncertainty level of data (High/Medium/Low)	QA/QC procedures planned for the data items
D.3.1	Low	Meters will be installed in both the step-up station and switching station. These instruments will be properly maintained with regular testing and calibration schedules developed as per National Guidelines for accuracy and reliability. Most importantly, the Electricity Sales Receipts and other relevant metering records may be regarded as the hard evidences for data quality control.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

The project entity had set up a CDM project team comprised of five persons for monitoring of the proposed project activity, and the team will assign professional staff to record and compile the necessary data listed in monitoring plan. The amount of electricity delivered to the grid will be recorded every month jointly by designated staff of Gansu Provincial Electric Power Company and the project entity. On a weekly basis, the records must be reported to the CDM team manager to cross check. Moreover, the monthly monitoring records will be compiled in a manner amenable to third party audit and deliverable to the DOE for verification purposes.

Operational and management structure as follows:



In addition, the project entity had planned training for recorders so as to ensure the data quality of the electricity delivered to the grid, and also developed a CDM manual on the motoring and management of the proposed project activity.

Since there no leakage sources identified in the project, no control over leakage is necessary.

D.6. Name of person/entity determining the monitoring methodology:

Name of person:

Junyang Guo

Entity determining the monitoring methodology:

The center for Development and Promotion of Science and Technology of Gansu Province

Address: Qingyang Road No. 174, Lanzhou city, Gansu Province, China.

Telephone: +86-931-8826221

E-Mail: guojunyang1979@163.com

The above person/entity is not a Project Participant for the project activity

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

E.1.1 Selected formulae as provided in appendix B:

No specific formulae are specified for the applicable project category.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

The project introduces run-of-river hydropower technology, and no anthropogenic emissions by sources of greenhouse gases within the project boundary are identified. Hence, no formulae are applicable. Then, PE_y =0.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

No anthropogenic greenhouse gases by sources outside the project boundary were identified. In addition, according to Paragraph 8 of Appendix B of small-scale CDM project activity modalities, project proponents confirm that the renewable energy technology is not equipment transferred from another activity. Hence, no leakage is considered due to the project activity. Thus, L_y=0.

E.1.2.3The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

The net project emissions from the project activity are zero. That is **E.1.2.1**+ **E.1.2.2**= $PEy + Ly$=0

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

As explained in Section **B.5**, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in $kgCO_2$equ/kWh) calculated in a transparent and conservative manner. According to clause 9(a) AMS-I.D[13]（*Version 10: EB 28*）, combined margin (CM) emission factor is calculated as the average of the “approximate operating margin” and the “build margin”.

According to version 6 of “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” ACM0002, the baseline emission factor (EFy) is calculated as the simple average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$). It can be calculated with the steps described below:

Step 1: Calculate the Operating Margin emission factor ($EF_{OM,y}$)

According to ACM0002, dispatch data analysis should be the first methodological choice.

However, in China the dispatch information is not available to the public, and for the most recent 5 years (2000-2004) the low-cost/must run resources constituted less than 50% of total power generation of the

[13]http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

NWPG, the relevant ratios are respectively 29.6%, 25.4%, 22.8%, 18.8% and 22.0% for 2000, 2001, 2002, 2003 and 2004[14]. Hence, 'Simple OM' option has been chosen.

The project activity uses the simple OM emission factor as per (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission:

$$EF_{OM,y} = \frac{\sum_{i,j}(F_{i,j,y} \times COEF_{i,j})}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where:
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume) consumed by relevant power sources j in years y, 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;
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in years y; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by the source j, with regard to it can not be achieved directly by data sources available in a reasonable way in China, the generation is used for conservative purpose.

The CO_2 emission coefficient is equal to the net calorific value of fuel i, multiplied by the oxidation factor of the fuel i and the CO_2 emission factor per unit of energy of the fuel i:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i$$

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i;
$OXID_i$ is the oxidation factor of the fuel i;
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

If available, local values of NCV_i and $EF_{CO2,i}$ shall be used. If not, country-specific values are preferable to *IPCC* default values. In this PDD, NCV_i of different fuels are referred to China Energy Statistical Yearbook 2005. With regard to the fuel types where NCV_i fluctuate in a certain range, the floor values of the fluctuation range are used for conservative purpose. $EF_{CO2,i}$ and $OXID_i$ of fossil fuel come from 2006 *IPCC* default values.

The Simple OM emission factor is calculated ex ante as a 3-year average: $EF_{OM,y}$=1.0234 tCO_2e/MWh (see Annex 3 for details).

Step 2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants m, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m}(F_{i,m,y} \times COEF_{i,m,y})}{\sum_{m} GEN_{m,y}} \quad (2)$$

Where:
$F_{i,m,y}$, $COEF_{i,m,y}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants m.

[14] China Electric Power Yearbook 2001, 2002, 2003, 2004 and 2005, Electric Power Press

The proposed project activity calculates the Build Margin emission factor ($EF_{BM,y}$) ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. ACM0002 provides two options for sample group *m*, as follows:

1) The five power plants that have been built most recently, or
2) The power plant capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

However, the data of power plants is considered commercial confidences in China, and is not available to the public. According to the EB's guidance on DNV deviation request "Request for clarification on use of approved methodology AM0005 for several projects in China", the CDM EB suggested that the project participants use the following alternative solutions in absence of data:

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

2) Use of weights estimated using installed capacity in place of annual electricity generation, and also accepted using the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

In view of the capacities of various power technologies (such as: coal-fired, oil-fired, gas-fired) can not be divided from the thermal power, therefore this proposed project uses the alternative sub-steps below to calculate $\boldsymbol{EF_{BM,y}}$, and the formulae are:

Sub-step 2a Calculation of the split of CO_2 emissions from various power technology in the total emissions

The data can be calculated as per the fuel assumptions in China Energy Statistical Yearbook 2005 for which data are available at the time of PDD submission:

$$\lambda_{coal} = \frac{\sum_{i \in coal, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{3}$$

$$\lambda_{oil} = \frac{\sum_{i \in oil, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{4}$$

$$\lambda_{Gas} = \frac{\sum_{i \in Gas, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \tag{5}$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume) consumed by relevant provinces *j* in years *y*;

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provinces *j* and the percent oxidation of the fuel in years *y*;
Coal, Oil and Gas refer to the fuel categories, respectively solids fuels, liquid fuels, and gas fuels.

Sub-step 2b Calculation of NWPG Emission Factor for the thermal power

Based on China Energy Statistical Yearbook 2005, the fuel structure of thermal power in NWPG is dominated by coal. It can be learned that weights of oil and gas ($\lambda_{oil} + \lambda_{Gas}$ =1.54%) are insignificant, which are mainly for auxiliary energy. Therefore, this calculation uses the following alternative formulae for conservative purpose.

$$EF_{Thermal} = EF_{Coal} = \lambda_{coal} \times EF_{Coal,Adv} \qquad (6)$$

Where: $EF_{Coal,Adv}$ is the emission factor of the most advanced available coal power technology.

The calculation for value of EF_{Coal} is based on the 320g/kWh of power supply coal consumption for coal-fired power generation in China by 2010[15], which corresponds to the supply efficiency 38.43%.

Sub-step 2c Calculation of the BM mission Factor

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

Where: CAP_{Total} is the total capacity additions, $CAP_{Thermal}$ is the capacity added of thermal power.

From the statistics of China Electric Power Yearbook in NWPG in year 2001, 2001 and 2004, it can be seen that the capacity additions during 2001-2004 represents a value that is 22.82% of the total installed capacity in 2004, and it is also obvious that the capacity additions are larger than the capacity of five plants, so the data in years 2001 and 2004 are used to calculate the BM emission coefficient of NWPG. The thermal power plants accounted for 71.63% of the total capacity additions in NWPG during 2001-2004.

Based on the formulae (2) ~ (7) above, the BM Emission Factor of the NWPG is 0.6250 tCO_2e/MWh (see Annex 3 for details).

Step 3. Calculate the baseline emission factor (EFy)

The baseline emission factor is the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \qquad (8)$$

Where: the weights W_{OM} and W_{BM} by default, are 50%.

Based on the emission factors calculated in the previous 2 steps, the baseline emission factor is *EFy*= $EF_{OM,y}/2$+ $\boldsymbol{EF_{BM,y}/2}$=0.8242tCO_2e/MWh

Step 4. Calculate the baseline emissions (BEy)

The annual baseline emissions (*BEy*), as the product of the baseline emissions factor (*EFy*) calculated in step 3 and the electricity (EGy) delivered to NWPG by the proposed project activity, as follows:

[15] Coal-fired Power Generation, http://www.ccchina.gov.cn/source/fa/fa2002082803.htm

BEy = EGy × EFy

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

The annual amount of electricity to be delivered to the grid from the project is *EGy*=92,000MWh.

So, the baseline emissions is *BEy* =*EGy* × *EFy* =75, 827 (tCO_2e).

The annual project emissions by the proposed project activity are zero, then *PEy* +*Ly*=0

The emission reductions (*ERy)* by the project activity during a given year y is the difference between baseline emissions (*BEy*) and project emissions, as follows:

$ER_y = BE_y - PE_y - L_y$ =75,827-0=75,827 (tCO_2e)

Detailed emission reductions during the fix crediting period are given in **A.4.3.1**.

E.2 Table providing values obtained when applying formulae above:

Year	Estimation of Project activity Emission (tonnes of CO_2e)	Estimation of baseline emission (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of Emission reductions (tonnes of CO_2e)
2007	0	75,827	0	75,827
2008	0	75,827	0	75,827
2009	0	75,827	0	75,827
2010	0	75,827	0	75,827
2011	0	75,827	0	75,827
2012	0	75,827	0	75,827
2013	0	75,827	0	75,827
Total (tCO_2e)	0	530,789	0	530,789

SECTION F.: Environmental impacts:

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

The Environmental Impact Assessment (EIA) for this project was carried out by Gansu Environmental Protection Research Institute, which is a grade A environment impact assessment entity certified by the State Environmental Protection Administration. It was approved by Gansu Provincial Environmental Protection Agency in November 2000.

The environmental impacts of the proposed project activity are analyzed as the following:

Construction phase

There is an overall low negative environmental impact during the constructing time. The impacts are intervened in Atmospheric/air pollution, Water pollution, Noise pollution and Solid waste. The solid waste will be transported to the nearby two dumping sites from where construction will take place, including the construction of diversion weir, penstock, forebay and powerhouse etc. Other potential impacts are easily mitigated through the application of good engineering practices including enclosed operation, sewage tank treatment, vibration reduction, sound insulation and other measures.

Operation phase

During the operation time, there are little negative environmental impacts. The generated impacts mainly involve alteration of the hydrology conditions in the section of the river with the intake and the powerhouse. Because there are no residents and cultivable lands nearby this project, the reduction of the present water volume can't cause obvious environment impacts in water availability for this sections. Other potential impacts mainly include alterations of water quality in the downriver sections, flood control and aquatic etc; however these impacts are extremely small. Therefore, the project would have no obvious adverse effect during operation time.

In a word, the project will not have significant negative impacts to the local environment on the whole. There are many beneficial effects, such as increase in local residents' living standards, improvement in electric power supply and infrastructure level etc. Therefore, the proposed project will have positive impacts on local environment.

SECTION G. Stakeholders' comments:

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

The project entity had carried out investigation on the public's comments in the format of questionnaires. 100 questionnaires were distributed, all of the questionnaires had been returned. The investigated stakeholders included local residents, interest groups, and authorities in Dachuan Township.

The issues of the questionnaires main as follows: a) Feeling toward the current environmental status in the proposed project construction site; b) Attitude, requirement, advice towards the construction of the project; c) Recommendations on the participating senses of environmental protection.

G.2. Summary of the comments received:

Detailed comments from the questionnaires are summarized below:

NO.	Comments		Proportion (%)
1	Attitude toward the current environmental status in the local areas	Satisfied	75
		Acceptable	15
		Not satisfied	10
2	Attitude toward the construction of the project	Support	87
		Indifferent	11
		Object	2
3	Contribution of the project to local economic development	Positive impact	83
		No impact	15
		Negative impact	2
4	Major impacts on local environment by this project	Solid waste disposal	22
		Water waste disposal	18
		Gas waste disposal.	7
		Noise control	2
		Ecological protection	61
5	Senses of participation in the supervision of environment	Strong	54
		Common	30
		No	16

As shown above, 90% satisfied with the current environmental status; 98% supported the construction of the project; 83% believed that the project would benefit to the development of local economy. However, 2% objected the construction of the project, most of whom were local villagers. The objection reason is mainly that they are worried about the destruction of ecological environment.

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

The project entity has paid much attention to the concerns of stakeholders, and put all of the measures listed in the EIA into effect during the constructing period. And additional 400 thousand RMB Yuan had been invested to mitigate the destruction of ecological environment, so as to achieve environmental benefits, social benefits and economic benefits. It is clearly that the proposed project would not bring obvious negative effect to the environment, and comments received have been considered seriously.

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 from parties included in Annex to the Convention.

Annex 3

BASELINE INFORMATION

1. Calculate the Simple Operating Margin emission factor ($EF_{OM,y}$)

According to ACM0002, the following steps (Table A1~A4) calculated the simple OM emission factor in 2002, 2003 and 2004, and achieved it using the generation-weighted average emission factor as per electricity unit of all generating sources serving the NWPG of the most recent 3 years, and equals to 1.0234tCO_2e/MWh. Detail information as follows:

Table A1: Calculation of Operating Margin Emission Factor in 2002 for NWPG

Fuel types	unit	Shannxi	Gansu	Qinghai	Ningxia[16]	Xinjiang	Subtotal	Average low caloric value (MJ/t,km^3)	Carbon content (tc/TJ)	Oxidation Factor	**CO_2 emission (tCO_2e)**
		A	B	C	D	E	F=A+···+E	G	H	I	J=F*G*H*I*(44/12)/100
Raw coal	10^4ton	1607.50	1156.02	278.66	738.59	981.75	4762.52	20908	25.8	1.00	94197730.68
Cleaned coal	10^4ton	0.00	0.91	0.00	0.00	0.00	0.91	26344	25.8	1.00	22678.50
Other washed coal	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	8363	25.8	1.00	0.00
Coke	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	28435	29.2	1.00	0.00
Crude oil	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	41816	20.0	1.00	0.00
Gasoline	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	43070	18.9	1.00	0.00
Kerosene	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	43070	19.5	1.00	0.00
Diesel oil	10^4ton	1.96	0.00	0.00	0.00	1.12	3.08	42652	20.2	1.00	97300.02
Fuel oil	10^4ton	0.00	1.70	0.00	0.49	1.27	3.46	41816	21.1	1.00	111936.69
Other petroleum products	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	38369	20.0	1.00	0.00
Natural gas	10^7m^3	0.00	5.30	0.00	0.00	23.30	28.60	38931	15.3	1.00	624632.32
Coke Oven Gas[17]	10^7m^3	0.00	0.40	0.00	0.00	0.00	0.40	16726	12.1	1.00	2968.31
Other Coal Gas[18]	10^7m^3	0.00	0.80	0.00	0.00	0.00	0.80	5227	12.1	1.00	1855.24
LPG	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	50179	17.2	1.00	0.00
Refinery gas	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	46055	15.7	1.00	0.00
Total											95059101.75
Generation by thermal power	MWh	31759000	23426000	5052000	16324000	16443000	93004000				
02 OM emission factor	tCO_2e/MWh						1.0221				

Data sources： China Energy Statistical Yearbook 2000-2002，P[52]，P[456-487]
China Energy Statistical Yearbook 2005，P[365]
2006 IPCC Guidelines for National Greenhouse Gas Inventories: Energy (Introduction, Table 1.4)

[16] In view of China Energy Statistical Yearbook hadn't the year data of fuel consumption, the data for the thermal plants above 6MW in China Electric Power Yearbook 2003 was used for conservative purpose.
[17] Because China Energy Statistical Yearbook did not distinguish the category of the fuel , the lowest caloric value of the fuel is selected for conservative purpose
[18] As described above

Table A2: Calculation of Operating Margin Emission Factor in 2003 for NWPG

Fuel types	unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	Average low caloric value (MJ/t,m^3)	Carbon content (tc/TJ)	Oxidation Factor (%)	**CO_2 emission (tCO_2e)**
		A	B	C	D	E	F=A+···+E	G	H	I	J=F*G*H*I*(44/12)/100
Raw coal	10^4t	2002.26	1479.62	330.67	682.00	1065.75	5560.30	20908	25.8	1.00	109976995.77
Cleaned coal	10^4t	0.00	0.00	0.00	0.00	0.00	0.00	26344	25.8	1.00	0.00
Other washed coal	10^4t	0.00	0.00	0.00	27.00	3.64	30.64	8363	25.8	1.00	242405.23
Coke	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	28435	29.2	1.00	0.00
Crude oil	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	41816	20	1.00	0.00
Gasoline	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	43070	18.9	1.00	0.00
Kerosene	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	43070	19.5	1.00	0.00
Diesel oil	10^4ton	3.12	0.00	0.00	0.04	0.40	3.56	42652	20.2	1.00	112463.66
Fuel oil	10^4ton	0.00	1.19	0.00	0.00	1.02	2.21	41816	21.1	1.00	71497.14
Other petroleum products	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	38369	20	1.00	0.00
Natural gas	10^7m^3	1.00	5.40	0.00	0.00	59.50	65.90	38931	15.3	1.00	1439275.18
Coke over gas	10^7m^3	0.00	15.40	0.00	0.00	0.00	15.40	16726	12.1	1.00	114279.84
Other coal gas	10^7m^3	0.00	1.20	0.00	0.00	0.00	1.20	5227	12.1	1.00	2782.85
LPG	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	50179	17.2	1.00	0.00
Refinery gas	10^4ton	0.00	0.00	0.00	0.00	3.48	3.48	46055	15.7	1.00	92262.90
Total											112051962.57
Generation by thermal power	MWh	37335000	29595000	6388000	19885000	19510000	112713000				
03 OM emission factor	tCO_2e/MWh						0.9941				

Data sources：China Energy Statistical Yearbook 2004，P44，P246-265

China Energy Statistical Yearbook 2005，P365

2006 IPCC Guidelines for National Greenhouse Gas Inventories: Energy (Introduction, Table 1.4)

Table A3: Calculation of Operating Margin Emission Factor in 2004 for NWPG

Fuel types	unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	Average low caloric value (MJ/t,m^3)	Carbon content (tc/TJ)	Oxidation Factor (%)	**CO_2 emission (tCO_2e)**
		A	B	C	D	E	F=A+···+E	G	H	I	J=F*G*H*I*(44/12)/100
Raw coal	10^4ton	2428.70	1595.90	322.80	1270.10	1240.90	6858.40	20908	25.8	1.00	135652074.13
Cleaned coal	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	26344	25.8	1.00	0.00
Other washed coal	10^4ton	0.00	0.00	0.00	102.64	10.50	113.14	8363	25.8	1.00	895095.57
Coke	10^4ton	0.78	0.00	0.00	0.00	0.00	0.78	28435	29.2	1.00	23746.64
Crude oil	10^4ton	0.01	0.00	0.00	0.00	0.06	0.07	41816	20	1.00	2146.55
Gasoline	10^4ton	0.02	0.00	0.00	0.00	0.00	0.02	43070	18.9	1.00	596.95
Kerosene	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	43070	19.5	1.00	0.00
Diesel oil	10^4ton	2.16	0.36	0.00	0.05	0.41	2.98	42652	20.2	1.00	94140.93
Fuel oil	10^4ton	0.01	0.69	0.00	0.00	0.30	1.00	41816	21.1	1.00	32351.65
Other petroleum products	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	38369	20	1.00	0.00
Natural gas	10^7m^3	16.10	5.90	0.00	0.00	62.70	84.70	38931	15.3	1.00	1849872.65
Coke over gas	10^7m^3	0.00	3.00	0.00	0.00	0.00	3.00	16726	12.1	1.00	22262.31
Other coal gas	10^7m^3	7.40	12.60	0.00	0.00	0.00	20.00	5227	12.1	1.00	46380.91
LPG	10^4ton	0.00	0.00	0.00	0.00	0.00	0.00	50179	17.2	1.00	0.00
Refinery gas	10^4ton	0.00	0.00	0.00	0.00	3.26	3.26	46055	15.7	1.00	86430.19
Total											138705098.47
Generation by thermal power	MWh	45590000	33471000	6121000	24399000	22634000	132215000				
04 OM emission factor	tCO_2e/MWh						1.0491				

Data sources：China Energy Statistical Yearbook 2005，P42，P302-321, P365

2006 IPCC Guidelines for National Greenhouse Gas Inventories: Energy (Introduction, Table 1.4)

Table A4: Calculation of OM emission factor

	Annual OM	Generation by thermal power (MWh)	Generation Weight	Modified OM(tCO_2e/MWh)
	A	B	C=B/B	D=A*C
2002	1.0221	93004000	0.275	0.2813
2003	0.9941	112713000	0.334	0.3316
2004	1.0491	132215000	0.391	0.4105
Total		337932000	1.0000	1.0234

2. ***Calculate the Build Margin emission factor ($EF_{BM,y}$)***

Sub-step 2a: Calculation of the split of CO_2 emissions for various electricity technology in the total emissions

Based on the Table A3 above and the formulae (3) , (4), (5) in PDD, the conclusions are: λ coal=98.46% (λ oil=0.09%, λ gas=1.45%)

Sub-step 2b: Calculation of NWPG Emission Factor for the thermal power

Table A5: Calculation of CO_2 emission factor for various power technologies

Variables	Supply power efficiency	Carbon content (tc/TJ)	Oxidation Factor (%)	**CO_2 emission factor (tCO_2e/MWh)**
	A	B	C	D=(3.6/A/1000)*B*C*44/12
$EF_{coal, adv}$	38.43%	25.8	1	0.8862

Therefore, $EF_{Thermal}= EF_{Coal} =\lambda_{coal}*EF_{coal, adv}$ =0.8725(tCO_2e/MWh)

Sub-step 2c: Calculation of the BM mission Factor (Table A6~A9)

Table A6: Installed capacity of NWPG in 2004

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	M W	7640.4	4975.6	889.8	3782	4959.7	22247.5
Hydro power	M W	1876.5	3566.1	4053.4	366.2	973	10835.2
Nuclear power	M W	0	0	0	0	0	0
Wind power and others	M W	0	138.2	0	42.5	95.3	276
Total	M W	9516.9	8679.9	4943.2	4190.7	6028	33358.7

Data source: China Electric Power Yearbook 2005, p[473]

Table A7 Installed capacity of NWPG in 2002

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	M W	6735.4	3881.8	803.8	2386	3949.9	17756.9
Hydro power	M W	1462.3	3238.6	3206.3	307.9	984.8	9199.9
Nuclear power	M W	0	0	0	0	0	0
Wind power and others	M W	0	8.4	0	0	96.7	105.1
Total	M W	8197.7	7128.8	4010.1	2693.9	5031.4	27061.9

Data source: China Electric Power Yearbook 2003, p[593]

Table A8: Installed capacity of NWPG in 2001

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	M W	6302.4	3874.8	766.8	2046	3804.9	16794.9
Hydro power	M W	1450.7	3118.3	3127.4	307.9	868.1	8872.4
Nuclear power	M W	0	0	0	0	0	0
Wind power and others	M W	0	8.4	0	0	70.6	79
Total	M W	7753.1	7001.5	3894.2	2353.9	4743.6	25746.3

Data source: China Electric Power Yearbook 2002, p[616-623]

Table A9: Calculation of BM emission factor of NWPG

A	B	C	D	E=D-B	F=E/E
Parameters	Installed capacity in 2001	Installed capacity in 2002	Installed capacity in 2004	New capacity addition from 2001 to 2004	The fraction of various power plants in installed capacity additions
Unit	MW	MW	MW	MW	%
Thermal power	16794.9	17756.9	22247.5	5452.6	71.63
Hydro power	8872.4	9199.9	10835.2	1962.8	25.78
Nuclear power	0	0		0	0
Wind power and others	79	105.1	276	197	2.59
Total	25746.3	27061.9	33358.7	7612.4	100
Percentage in the installed capacity of 2004	77.18%	81.12%	100%	22.82%	

Therefore, $EF_{BM,y}$=0.8725 *71.63%=0.6250(tCO_2e/MWh)