



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

CONTENTS

- A. General description of project activity
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

Annexes

- Annex 1: Contact information on participants in the project activity
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring information

**SECTION A. General description of project activity.****A.1 Title of the project activity:**

Title: 28MW Jinkouba Hydropower Project

PDD version: 3.3

Date: Dec. 23, 2008.

Revision history of this PDD

Version of PDD	Date	Main revision
1.0	28/08/2006	Applied for LOA and submitted to DOE for public comments
2.0	18/10/2006	Revision based on China DNA's comments
3.0	22/08/2007	Revision based on validation protocol by DOE
3.1	31/09/2007	Update the calculation of baseline emission factor according to the most recent data which are publicly available
3.2	22/01/2008	Revision based on QA results by DOE
3.3	23/12/2008	Revision based on issues of review by EB

A.2. Description of the project activity:

The 28MW Jinkouba Hydropower Project (“JHP” or “the proposed project”), a run-of-river hydropower project, is located on Baishuijiang River in Gansu Province, China. The proposed project will have an installed capacity of 28MW, provided by two 14MW turbines, with an annual net output of 127,900MWh.

The proposed project activity is a renewable energy project, has not any emissions of anthropogenic greenhouse gas (GHGs) by sources itself. Generated electricity will be exported to Northwest Region Power Grid (“NWPG”) through Gansu Grid. NWPG is dominated by thermal power plants until now. In 2005, total power generation was 184,562GWh, among them 133,909GWh came from thermal power plants, which accounted for about 72.6% of the total¹. Under the business as usual scenario, such situation will not be changed in a long time.

In view of the facility and practicality of technology, in short time NWPG have to depend on developing thermal power mainly to meet more and more electricity demand. Without the proposed project activity, the unmet power demand possibly will be supplied by new-built fuel fired power plants or continual operation of existing plants. Generated electricity by the proposed project will displace part of the electricity generated by fuel fired power plants, and thus reduce CO₂ emissions from thermal power plants. The estimated annual GHG emission reductions are 108,689 tCO₂e.

The construction of the proposed project will bring prominent environmental and social benefit, and also contribute to region sustainable development through following aspects:

¹ China Electric Power Yearbook 2006, page 568.



- To Invest and exploit natural resource in western inland areas, in compliance with China Western Development Strategies and Renewable Energy Laws.
- To act as a direct supplement to power grid capacity, and alleviate regional shortage of electricity in a sense.
- To facilitate the local residents to switch from wood to electricity in their daily cooking and heating, this will alleviate vegetation deterioration and it is also conducive to the protection of the ecological environment in the region.
- To pay taxes to local government, promote development of regional economy
- To build a village road, a bridge and other public facilities such as education and medical health for villagers nearby, thus improve the living conditions of them.
- To create new job and skill training opportunities for the local people, thus increase the income and the makings of local residents.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	•Private entity: Jintai Hydropower Co. Ltd of Wen County in Gansu Province	Yes

The proposed project is a unilateral project, the project participant had agreed to the CERs by JHP be firstly transferred into the Chinese National Account in EB, after verified by National Development and Reform Commission(DNA), then transferred out from the account.

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:****A.4.1.1. Host Party(ies):**

P.R. China

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

Gansu Province

A.4.1.3. City/Town/Community etc:

Jinkouba Village, Hengdan Township, Wen County, Longnan Canton

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

The proposed project is located on the Baishuijiang River in Wen County, south of Gansu Province. The pivotal project is located in the Jinkouba village, 28 kilometres away from Wen County seat, and 750 km away from Lanzhou City (capital of Gansu province). Detailed geographic coordinate of plant powerhouse site and map information (see Fig1. and Fig2.) as follows:



Longitude: 104°53'18"

Latitude: 32°50'52"



Fig.1. Location of Gansu Province

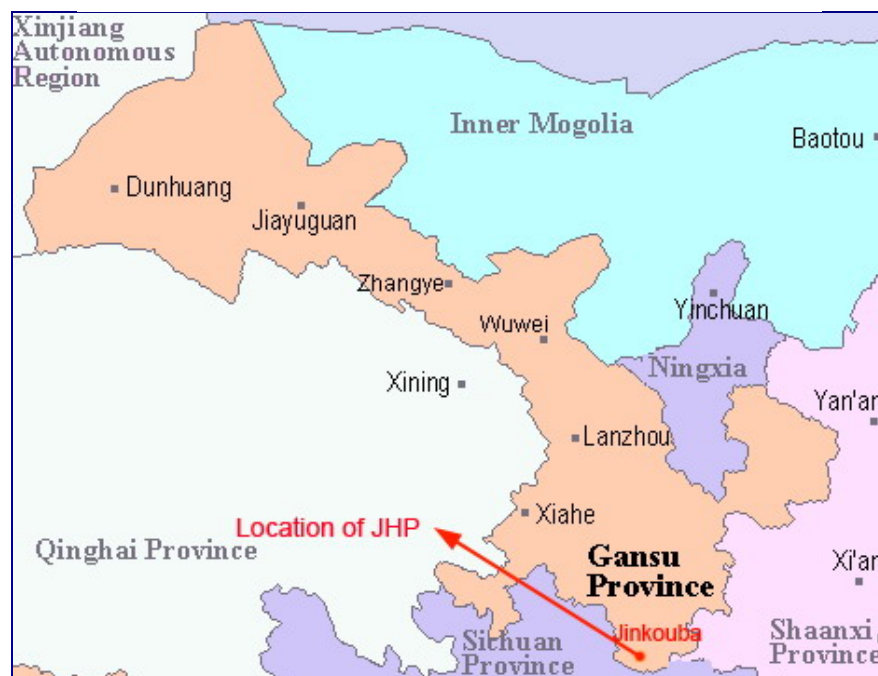


Fig.2. Location of Jinkouba Hydropower Project

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

The proposed project falls into: Category 1, energy industries (renewable sources), the project activity is grid-connected renewable power generation.

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

The Jinkouba hydropower plant uses run-of-river hydropower technology which converts mechanical energy available in the water flow into electrical energy using hydro turbines and alternators and with a conservative operation life of 30 years. The main constructions of the proposed project include a sand washing sluice, a flood discharge sluice, a gravity dam, an open ditch, a tunnel, a forebay, a penstock, a powerhouse, a tail water ditch and a booster station etc, a small reservoir will be formed by barrage during drawing water from river course to an open ditch.

According to the waterpower studies carried out for the proposed project, the control area of watershed within the project boundary is around 8090km²; the net head available has been estimated as 22.0m; the discharge of water available in the stream is measured as 147.0m³/s. So based on the head available and discharge of water, the optimum capacity of JHP has been envisaged at 28.0MW.

The powerhouse of JHP is composed of two 14MW turbines; generated voltage at the alternators terminals is 10.5 KV, which will be stepped-up to 110 KV to match the nearest substation voltage level. The information on key equipments as follows:

Summary of key equipments in the proposed project²

Equipment	Parameter	Unit	Amount
Turbine	Units	-	2
	Model	-	ZZ660-LH-300
	Rated Header	m	22.0
	Rated Flow	m ³ /s	147.0
	Runner Diameter	m	3.33
	Rated Rotation Speed	r/min	214.3
	Rated Power	kW	1458.0
	Rated Model Design Efficiency	%	91.0
Generator	Model	-	SF14-28/5100
	Rated Power	kW	14000
	Rated Voltage	kV	10.5
	Rated Electric Current	A	962.3
	Rated Power Factor	-	0.8
	Rated Rotation Speed	r/min	214.3

² Source: Technical Item on Turbines and Generators of Gansu Jinkouba Hydropower Plant.



The Jinkouba hydropower plant equips domestic turbines and generators; there no any technology is transferred from other countries to the Host Party, the technology to be employed by the project activity also is sound and environmentally safe.

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

The annual estimated amount of emission reductions of the proposed project are 108,689 tCO₂e and the total reductions are 1,086,890 tCO₂e in whole fixed crediting period (from 01/04/2008 to 31/03/2018).

Years	Annual estimation of emission reductions in tonnes of CO₂ e
2008 (begin on 01/04/2008)	81,665
2009	108,689
2010	108,689
2011	108,689
2012	108,689
2013	108,689
2014	108,689
2015	108,689
2016	108,689
2017	108,689
2018 (end at 31/03/2018)	27,024
Total estimated reductions (tonnes of CO₂e)	1,086,890
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	108,689

A.4.5. Public funding of the project activity:

No public funding is involved in this project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title of the approved consolidated baseline methodology applied to the proposed project activity:
“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”.

Title of the approved consolidated monitoring methodology applied to the proposed project activity:
“Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”.



Reference of the methodology applied to the proposed project activity: Version 06 (19 May 2006) of ACM0002.

Title of tool which the approved consolidated methodology ACM0002 drawn upon: “Tool for the demonstration and assessment of additionality”.

Reference of tool: Version 03 (EB29) of “Tool for the demonstration and assessment of additionality”.

The methodology and tool are available on the following website:

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

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

Applying consolidated methodology ACM0002 to the proposed project is justified because:

- The proposed project provide electricity capacity additions from a run-of-river hydro power sources;
- The proposed project is not an activity that involve switching from fossil fuels to renewable energy at the site of the project activity;
- The JHP is connected to the Northwest Power Grid (NWPG) via “Yulei” booster station, the geographic and system boundaries for the NWPG can be clearly identified and information on the characteristics of the grid is available³.

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

Referring to the descriptions in the baseline methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (version 06), the project boundary and emission sources to be included in as follows:

Project boundary:

The spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the Jinkouba power plant is connected to. For the purpose of determining the build margin (BM) and operating margin (OM) emission factor, a (regional) **project electricity system** is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Where the application of this methodology does not result in a clear grid boundary, given country-specific variations in grid management policies:

(a) Use the delineation of grid boundaries as provided by the DNA of the host country if available; or

(b) Use, Where DNA guidance is not available, the following definition of boundary:

- In large countries with layered dispatch systems (e.g. state/provincial/regional/national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity;
- In other countries, the national (or other largest) grid definition should be used by default.

³ “Interpretations on Identifying the Baseline Emission Factor of China Regional Grid” by China DNA, see: <http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235>



China is a large country with layered dispatch system; DNA guidance⁴ is available since 08/08/2006, the electricity system which applies to the proposed project activity is Northwest Region Power Grid.

Emission sources:

According to ACM0002, for the baseline determination, the project participants only need account CO₂ emissions from electricity generation in fossil fuel fired power that is displaced due to the proposed project activity.

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity supplied by NWPG	CO ₂	Yes	Main emission source and the only gas identified in the baseline methodology
		CH ₄	No	Unidentified in the baseline methodology
		N ₂ O	No	Unidentified in the baseline methodology
Project Activity	28MW Jinkouba Hydropower Project	CO ₂	No	Zero-emissions grid-connected electricity generation from renewable energy
		CH ₄	No	Zero-emissions grid-connected electricity generation from a run-of-river hydropower plant
		N ₂ O	No	Zero-emissions grid-connected electricity generation from renewable energy

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

The generation by the proposed project will be connected to Northwest Region Power Grid; NWPG is one of 6 China regional grids and is composed of Gansu Grid, Ningxia Grid, Shaanxi Grid, Qinghai Grid and Xinjiang Grid and has a main mix of hydro power and thermal power. From the statistics of China Electric Power Yearbook, it can be concluded that NWPG is dominated by coal-based thermal power plants nowadays, detailed information as follows:

Year	Installed capacity (MW)			Generation (MWh)		
	Thermal	Hydro	Split of Thermal	Thermal	Hydro	Split of Thermal
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	78.8%
2005	25,362.6	12,219.8	66.8%	133,909,000	42,801,000	72.6%
Data sources: China Electric Power Yearbook 2002, 2003, 2004, 2005, 2006.						

⁴ The same source as list in footnote 3.



In view of the facility and practicality of technology, NWPG will mainly depend on developing thermal power to meet more and more electricity demand. In the next five years, installed capacity of thermal power will be added 8 GW only for Gansu Grid and at the end of the Eleventh Five-year Plan, the total installed capacity of thermal power in Gansu Grid will reach 13 GW⁵. Therefore it is reasonable to foresee the situation of NWPG dominated continuously by thermal in a long term.

According to ACM0002, The baseline scenario for the proposed project is the Electricity delivered to the Northwest Region Power Grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The baseline emission factor (EF_y) is consisting of the weighted average of simple Operating Margin (OM) emission factor ($EF_{OM,y}$) and Build Margin (BM) emission factor ($EF_{BM,y}$) and calculated utilizing an ex-ante most recent 3 years data which are available nowadays, as reflected in the combined margin (CM) calculations described in section B.6. Baseline emissions are equal to electricity delivered to the NWPG by the proposed project, multiplied by the baseline emission factor. A summary on baseline emission factor and Baseline emissions as follows:

Parameter	Unit	Value
$EF_{OM,y}$	tCO ₂ e/MWh	1.1257
$EF_{BM,y}$	tCO ₂ e/MWh	0.5739
EF_y	tCO ₂ e/MWh	0.8498
EG_y	MWh	127,900
BE_y	tCO ₂ e	108,689

The detailed calculation is specified in Section B.6 and Annex 3.

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):

Assessment and demonstration of additionality

The additionality of the proposed project activity is demonstrated and assessed using the latest version of the “Tool for the demonstration and assessment of additionality” (version 03) agreed by the CDM EB 29, as following steps:

Step1. Identification of alternatives to the project activity consistent with current laws and regulations

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

The JHP is an activity that generates power by renewable sources and exports electricity to NWPG. Possible alternatives include:

- 1) To develop the proposed hydropower plant, but not as a CDM project activity.
- 2) To construct a fuel-fired power plant with comparable installed capacity or annual electricity generation.
- 3) To reject the proposed project, equivalent annual generated electricity supplied by NWPG.

⁵ <http://www.cpn.com.cn/dy/200511030042.htm>

***Sub-step 1b. Enforcement of applicable laws and regulations:***

- 1) To develop the proposed hydropower plant, but not as a CDM project activity.

The Chinese government encourages and promotes renewable energy development through a series of laws and regulations. Alternative 1) is in compliance with legal and regulatory requirements. However, if the proposed project is not undertaken as a CDM project activity, according to Step 2, it is economically or financially less attractive, without the revenue from the sales of CERs, therefore Alternative 1) is not a credible alternative.

- 2) To construct a fuel-fired power plant with comparable installed capacity or annual electricity generation.

Alternative 2) is not in compliance with applicable legal and regulatory requirements. According to Chinese regulations, coal-fired power plants of less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids⁶ and fuel-fired power plants with installed capacity less than 100 MW is strictly restricted for construction⁷. In general, the annual operation hours for a fossil fuel-fired power plant are greater than that of a hydropower plant. Therefore the capacity of a fossil fuel-fired power plant to generate equivalent electricity is less than 28MW, the possible alternative of building a similar scale fossil fuel-fired power plant conflicts with these regulations, it is also not a realistic alternative.

- 3) To reject the proposed project, Equivalent annual generated electricity supplied by NWPG.

According to the current policies and regulations in China, NWPG can increase its installed capacity through the possible expansion of existing power plants as well as the new power plants. The installed capacity of the NWPG has been increased for many years (please see section B.4), and NWPG is a fuel-fired dominant power grid. So the alternative 3) is the only realistic and credible choice.

Based on the above analysis, the equivalent electricity service provided by the Northwest Region Power Grid only is a plausible and realistic baseline alternative.

Step 2. Investment analysis

It will be demonstrated by following sub-steps that the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method

Three options are provided to make investment analysis: I) simple cost analysis; II) investment comparison analysis; III) benchmark analysis (sub-step 2b). If the CDM project activity generates no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

The JHP project will sell electricity to NWPG as a financial benefit, so the benchmark analysis (Option III) is chosen.

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

Referred to the parameters for project construction in China, the project entity had identified the financial indicator which most suitable for the proposed project type and decision-making context, that is a project

⁶ General Office of the State Council [Decree No. 2002-6]: Notice on Strictly Prohibiting the Construction of Coal-fired Power Plants with Installed Capacity of 135 MW or Below

⁷ Temporary Stipulation of Construction & Management of Small Scale Fuel-fired Generators, August, 1997



will be financially accepted when the financial inner return rate (FIRR) is better than 8%-benchmark IRR⁸.

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

According to “the notification on the tariff of small-scale hydropower station” in 2005⁹, the topmost tariff rate apply to JHP is 0.22 RMB Yuan per kWh, Considering the VAT and income taxes, the FIRR of the proposed project only is 7.1% at the investment decision, which is lower than the benchmark rate of 8%, so the JHP is financially unattractive. But if it be registered as a CDM project successfully, the economic indicators will be improved taking the incomes from CERs into account. Based on the expecting carbon price of 80 RMB Yuan/ tCO₂, considering the incomes from CERs revenues in the whole fixed crediting period, The FIRR of JHP will rise to 9.8% and the proposed project is economically practical.

Main Parameters for the Calculation of Financial Indicators

Item	Unit	Value	comments
Capacity	MW	28	Feasibility Study
The net electricity supplied to the grid	MWh/year	127,900	Feasibility Study
Static Total Investment	Million RMB Yuan	235.196	Feasibility Study
Interest in Construction Period	Million RMB Yuan	12.750	Feasibility Study
Electricity Tariff (including VAT)	RMB Yuan/kWh	0.22	Documents from Price Bureau in Gansu Province
Operation and maintenance cost	Million RMB Yuan	5.054	Feasibility Study
Value Added Tax (VAT)	%	6	Feasibility Study
Income Tax	%	33	Feasibility Study
Expected CERs Price	RMB Yuan / tCO ₂	80	Estimation
Project Life	Year	30	Feasibility Study
CERs Crediting Period	Year	10	Selected

Financial Indicators of JHP with and without Income from CDM

Financial indicators	Without income from CDM	Benchmark rate	With income from CDM
IRR	7.1%	8.0%	9.8%

Sub-step 2d. Sensitivity analysis

In the context of IRR calculation to the proposed project, when the some critical variables vary from +10% to -10%, the FIRR of the total investment reach the benchmark rate (8%), detailed values are shown in the following table and figure 3.

	Investment	Annual output/Tariff	O&M cost
-10%	8.24%	6.05%	7.38%

⁸ National Development and Reform Commission (NDRC) and Ministry of Construction, “Economical Assessment and Parameters for Construction Project, 3rd edition”, China Planning Press, 2006.

⁹ Document from Price Bureau in Gansu Province (File No. as [2005] 312).

-5%	7.65%	6.58%	7.24%
0	7.11%	7.11%	7.11%
+5%	6.61%	7.62%	6.97%
+10%	6.15%	8.13%	6.84%

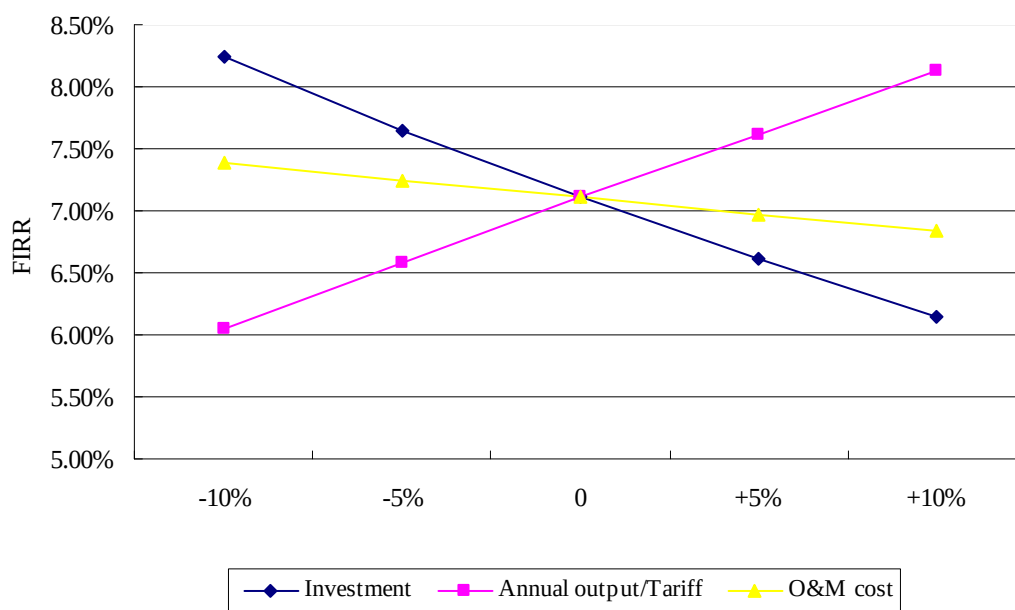


Fig3. Financial Sensitivity Analysis of JHP

For the sake of analysis above scenario, we introduced the critical analysis (i.e., when a scenario touches the benchmark) and discussed the selected critical variables respectively as follows:

- ⊕ In the case that the fixed tariff increases by 8.3% and achieved at 0.238 RMB Yuan/kWh (including 6% VAT), the FIRR of the proposed project equals to the benchmark rate. Accordingly a historical topmost tariff (0.22 RMB Yuan/kWh with 6% VAT) in Gansu province in the IRR calculation had been adopted in comply with conservative purpose, there have a little possibility to increase 8.3% continuously¹⁰.
- ⊕ In the case that the total investment decreases by 7.7%, the FIRR of the proposed project equals to the benchmark rate, but it is impossible for the total investment to decrease so greatly and in fact the total investment to the proposed project is increased compared with Feasibility Study Report as per the statement produced in Barrier analysis.
- ⊕ In the case that the annual output increases by 8.3%, the FIRR of the proposed project equals to the benchmark rate. Considering that the annual output is based on the annual generating hours which are estimated from 30 years measurement and the load factor of 60% is comparable to

¹⁰ The tariff is regulated by the relevant authorities in China, thus to anticipate it correctly in investment decision is impossible. According to “Notice on tariff and involved problems of Partial Hydropower Enterprise in Gansu Province, GPPB, File No. Ganjiadianli [2007]211”, the final approved tariff which apply to the proposed project is 0.227 RMB Yuan/kWh with 17% VAT and that the actual tariff without VAT is 0.1940 Yuan/kWh, the actual tariff is lower than the assumed tariff without VAT (0.2075 Yuan/kWh) in IRR calculation, furthermore this approved tariff rate will persist and fix for a period of time, therefore the assumed fixed tariff in the IRR calculation is certainly conservative.



other hydro power plants in the same river of Baishuijiang River, the probability that annual output is 8.3% higher than the estimated value is very small.

- ⊕ When the annual O&M cost decrease by 33.5%, the FIRR of the proposed project equals to the benchmark, but reducing the annual O&M cost so greatly is also impossible, in fact the salary of in-position employee and the price of equipments and fittings are going up rapidly during recent years in Gansu province.

Therefore, without the income from CERs sales, the proposed project is not financially viable, even when the possible variations of the main parameters are considered; the detailed and comparable information please refers to following table:

Validity of input values in IRR calculation

Parameters	unit	PDD	Actual	Sources or Comments
The net electricity supplied to the grid	MWh/year	127,900	127,900	Be consistent with Feasibility Study
Static Total Investment	Million RMB Yuan	235.196	>245.117	The current value derived from finance audit report up to 2007 ¹¹ . In fact, the ultimate static investment will exceed this and be reflected in Project Final Accounts Report, but this report still in composing and cannot be obtained transparently until now.
Electricity Tariff (including VAT)	RMB Yuan/kWh	0.22	0.227	Documents from Gansu Provincial Price Bureau File No. Ganjiadianli [2007]211
Value Added Tax (VAT)	%	6	17	Qualification Certificate of Ordinary VAT Payer ¹²
Electricity Tariff (excluding VAT)	RMB Yuan/kWh	0.2075	0.1940	The project entity cannot enjoy a preferential VAT ¹³
Operation and maintenance cost	Million RMB Yuan	5.054	5.054	Be consistent with Feasibility Study
Benchmark	%	8	8	The JHP with a capacity less than 50MW, according to technical guidance in IRR calculation and economical assessment to small hydropower project (SHP) in China ¹⁴ , the JHP can refer a benchmark of 10%. But we adopt 8% as benchmark in original PDD also in complies with CDM conservative principle.

¹¹ Audit report, Decree No.: Shaanxi Xinda Audit [2008]037. Shaanxi Xinda Certified Public Accountants Ltd. 17, Apr. 2008.

¹² At last the project entity is qualified as an Ordinary VAT Payer (please see submitted Certificate), according to China tax policy, the VAT rate which applied to Ordinary Payer is 17%.

¹³ Despite the current VAT rate in China is 17%, but to a county level entity such as JHCL who develop a small hydropower project (installed capacity less than 25MW is qualified and installed capacity between 25MW and 50MW can refer to), the JHCL and Jinkouba project have a possibility to enjoy a preferential rate of 6% in VAT and the expert and designer anticipate this in FSR, but they have not enjoy this preferential tax at last, therefore, the actual tariff after VAT is lower than the value assumed in original PDD.

¹⁴ Economic Evaluation Code for Small Hydropower Projects (SL16-95), the Ministry of Water Resources P. R. China, 1995.



Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

Investment barriers

The cost of the electricity transmission line is not be considered in the Feasibility Study on Jinkouba Hydropower Plant (“the Feasibility Study”), but the actual cost of the electricity transmission line construction amount to 6.25 million RMB Yuan¹⁵. In additions, considering social and environmental influence, the preliminary design of JHP had been optimized, the project entity changed reservoir plant in the Feasibility Study to current run-of-river plant to avoid flood land, at the same time constructing a countryside road and two simple bridges to facilitate local people which are not considered in the Feasibility Study. All these things bring an additional investment burden to the project developer, and make the total static investment to the proposed project amount to 247.781 million RMB Yuan¹⁶. In view of conservative purpose, these parts of additional investment are not applied in IRR calculation of investment analysis, just mention in here as a barrier to investment.

According to up to date statistic information derived from State Electricity Regulatory Commission (SERC) who take charge of 67 hydropower plants from 2001 to 2005, the weighted average investment over unit kW is about 7,992 RMB Yuan in China¹⁷. But the total investment over unit kW of the proposed project reaches as high as 8,855 RMB Yuan, which is higher than most recently average level in China, therefore the proposed project activity is not a financially attractive¹⁸. In addition, as a county level private enterprise, the project entity- Jintai Hydropower Co. Ltd of Wen County in Gansu Province (JHCL) have serious difficulty in debt funding, and also no access to international capital markets due to real or perceived risks. The investment barriers would prevent the implementation of the proposed project activity from being carried out if the proposed project activity was not registered as a CDM activity.

Technological barriers

The construction of the proposed project includes digging a tunnel as ditch, there are many uncertainties in geology, but there lack of skilled labors and excellent equipments for implementation of the tunnel technology around project site, and therefore the developer and builder meet many difficulties in the construction of tunnel¹⁹. Such barriers in technology virtually increase the man-days required for construction and prolong construction period, as well as in investment.

In conclusion, the identified barriers above are sufficient grounds for demonstration of additionality; they would prevent potential project proponents from carrying out the proposed project activity if it was not

¹⁵ An agreement on 110kV electricity output line construction from Yulei booster station to Jinkouba plant.

¹⁶ According to “Audit report, Decree No.: Shaanxi Xinda Audit [2008]037. Shaanxi Xinda Certified Public Accountants Ltd. 17, Apr. 2008”, the total static investment to the Jinkouba hydropower project had already reached at 234.008891 Million RMB Yuan at the end of year 2007. If added the pre-payment to the project work of 11.108324 million RMB Yuan which had been reflected in the audit report, the final static investment to the proposed project will exceed 245.117215 million RMB Yuan.

¹⁷ Wang Minhao. Strengthening the Study on the Hydropower Project Cost to Ensure the Essence Safety of Construction Project. Water power, 2007, 33(3): 6 (in Chinese).

¹⁸ When JHP went through submit registration, completeness check, request for registration, request for review, under review and so on procedures, the construction had been completed and the proposed project had been put into commissioning, under current scenario, the IRR of the proposed project only has 5.7%, which is much lower than benchmark (8%), therefore JHP truly is financially unattractive, the detailed information and calculation please see PPs comments to review this project.

¹⁹ Refer to a few notices on geology provided by the Jinkouba hydropower plant builder and the construction supervisor to the project developer.



expected to be registered as a CDM activity.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The identified barriers, however, will not prevent the implementation of the alternative 3), because the grid-connected plants had been put into operation; and the unmet power demand around the proposed project region possibly will be supplied by continual operation of existing plants in NWPG.

Step 4. Common practice analysis

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

According to China sectional standard, hydropower can be classified into three types: small scale (with an installed capacity less than 25MW), middle-scale (with an installed capacity between 25 and 250MW), large-scale (with an installed capacity greater than 250MW). The proposed project belongs to middle-scale hydropower refer to this classification, thus we compare the Jinkouba hydropower with those middle-scale hydropower plants which are commissioned since 2000 and not undertaken as CDM projects in Gansu Grid, the detailed information as following table:

Project name	Installed capacity (MW)	Project entity	Major shareholder and it's background	Commissioning Year	Unit kW investment (RMB Yuan per kW)
Gucheng	25.5	Mingzhu group.	Gansu electricity (Provincial level)	2004	7451
Binggou	36.0	Jiuquan Shanyuan hydropower corp.	Gansu electricity (Provincial level)	2004	6944
Longshou I	52.0	Hexi Hydropower Development Company	Gansu Electricity Investment Company (Provincial level)	2000	7654
Haidianxia	52.5	Gansu Taohe Hydropower Development Ltd.	Gansu Electricity Investment Company (Provincial level)	2005	8571
Caijiaxia	96.0	Gansu Caijiaxia Hydropower	Gansu Mingzhu Group (Provincial level)	2006	8438
Qilinsi	111.0	Gansu Datang Bailongjiang Power Ltd	China Datang Group (State level)	2007	8333
Xiaoxia	230.0	Xiaoxia Hydropower Development Ltd.	China Electricity Power Ltd. (State level)	2005	6609

Related publically available sources:

<http://www.gansudaily.com.cn/20020702/2/2002702A00061001.htm>

<http://www.chinapowerbid.com/NewsView.php?ChannelID=1&NewsID=751>

<http://www.gansudaily.com.cn/20020703/2/2002703A00031001.htm>

<http://www.cnhydro.com/info/project/showContent.asp?id=2204>

<http://xbsb.gansudaily.com.cn/system/2004/11/24/000153123.shtml>



<http://ln.gansudaily.com.cn/system/2007/01/08/010231040.shtml>
http://www.freshpower.cn/news/news_detail.asp?NewsId=14791

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

Firstly, as mentioned in above table, seven hydropower projects were constructed and operated by state or provincial level electric power companies, and the government provided loan guarantee for those companies at that time and the developers did not have to overcome investment or financing barriers, thus to develop of a middle-scale hydropower project by a small county level hydropower company is not a common practice in the proposed project region.

Secondly, the reform of unbundling generation and grid has been implemented in China's electric power sector since 2002, most of medium scale hydropower projects in Gansu Province are facing all kinds of barriers and have to seek support from CDM. Such as Xiaogushan, Erlongshan, Anguoer, Jintieshan and Duoer hydropower projects had been registered, and Hanpingzui, Bazang, Xiacheng, Liuyuan and Daigusi etc. hydropower projects are applying for a CDM project. The developer of the proposed projects is difficult to obtain financial support from national or local government. Without taking CDM mechanism into consideration, the similar hydropower projects are almost not practicable in the region to date.

Thirdly, the investment over unit kW of the Jinkouba hydropower plant amount to 8855 RMB Yuan and higher than all list plants according their feasible study approved by the authorities (Gansu Development and Reform Commission), such undesired development condition must bring additional difficulties to project developer.

Preliminary screening based on the starting date of the project activity

In order to alleviate social and environmental influence by the proposed project, the ultimate design of JHP had been optimized in Mar. 2005, the project entity changed reservoir plant be studied in the feasible stage in Oct. 2004 to current run-of-river plant to avoid flood land, this bring the additional burdens to the project developer. Whereas the CDM can help them conquer those barriers, the project developer-Jintai Hydropower Co. Ltd of Wen County in Gansu Province (JHCL) made a CDM decision in Apr. 2005, then the JHP had been put into practice in Jul. 2005 and main construction began on 20 Nov. 2005.

Impact of CDM registration

If the proposed project be registered as CDM project, taking the income from CERs sales into account, the financial indicators of the proposed project will be improved as described in **Sub-step 2.**, the FIRR will achieve the investment benchmark and the return term will be shorted, thus increase the confidence of the project owner to put the proposed project into practice.

If the proposed project be registered as CDM project, it's also helpful to the developer to overcome the barriers identified in **Step 2.** For example, in view of potential benefits of the proposed project from CDM, Wen County Subbranch of China Industry and Commerce Bank finally agreed to offer a loan to the project entity²⁰.

B.6. Emission reductions:

B.6.1.Explanation of methodological choices:

The JHP project activity is a grid-connected electricity generation from renewable energy sources, the calculation of the baseline emission co-efficient based on approved consolidated baseline methodology

²⁰ Loan Contract of capital asserts between Jintai Hydropower Co.Ltd of Wen County in Gansu Province and Wen County Subbranch of China Industry and Commerce Bank, No.27110906, 2005



ACM0002 (Version 06), also referred to “A Bulletin on Determination of Baseline Emission Factor within China Power Grid”²¹. For detailed information on the key assumptions, rationale and the data used to determine the baselines, please refer to Annex 3 in this document.

According to the approved consolidated baseline methodology ACM0002, for the purpose of determining the Build Margin (BM) emission factor, the spatial extent is limited to the project electricity system; for the purpose of determining the Operating Margin (OM) emission factor, use one of the four options to determine the CO₂ emission factor for net electricity imports from a connected electricity system within the same host country. Because there no exchange of electricity be identified between the NWPG and other China Regional Power Grid nowadays²², so the CO₂ emission for net electricity imports of NWPG from a connected electricity system can be considered as 0 tCO₂, then the baseline emissions of the proposed project are determined as following steps:

STEP1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$) based on one of the four following methods:

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

Each method is described as below.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total grid generation. The proportions of the low-cost/must in Northwest China Power Grid which the proposed project connected to are respectively 25.4%, 22.8%, 18.8%, 22.0%, 23.2%, in most recent five years (from year 2001 to year 2005), the detailed information on NWPG please see upper section **B.4.**, so the simple OM method can be adopted.

Method (b) Simple adjusted OM

The simple adjusted OM needs the annual load duration curve of the grid. As the detailed hourly load data of Northwest China Power Grid are not publicly available, it is difficult to adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$).

Method (c) Dispatch data analysis OM

Dispatch data analysis should be the first choice in calculating the baseline emission factor of operating margin ($EF_{OM,y}$) according to the methodology ACM0002. But nowadays it is inapplicable to the projects in China since the dispatch information is also not publicly available.

Method (d) Average OM

Method (d) can only be used when low-cost/must run resources constitute more than 50% of total grid generation. According to the upper description about NWPG, it is not suitable for the proposed project.

Thus, the method (a) Simple OM be used to calculate the baseline emission factor of operating margin

²¹ <http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889>

²² China Electric Power Yearbook 2006, Page 559.



($EF_{OM,y}$) for the proposed project.

(a) Simple OM. The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO₂/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

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

Where: $F_{i,j,y}$ is the amount of fuel i (in a mass or volume) consumed by relevant power sources j in year y ; j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants;

$COEF_{i,j}$ is the CO₂ emission coefficient of fuel i (tCO₂ per 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 year y ; and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by sources j in year y . with regard to it can not be achieved directly by data sources available in a open way in China, therefore the generation from sources j in year y and consumption rate by relevant power sources j be used to calculate it.

The CO₂ emission coefficient of fuel i ($COEF_i$) is obtained as:

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i \quad (2)$$

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 CO₂ emission factor per unit of energy of the fuel i .

Referred to description in version 06 of ACM002, “Where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values”. Here local values of NCV_i of different fuels are referred to China Energy Statistical Yearbook 2006, when NCV_i fluctuate in a certain range among different fuel types, the floor values are used for conservative purpose. $EF_{CO2,i}$ and $OXID_i$ of fossil fuel come from “2006 IPCC Guidelines for National Greenhouse Gas Inventories”.

The Simple OM emission factor $EF_{OM,simple,y}$ is calculated using the weighted average for the most recent 3 years for which data are available at the time of PDD submission (*ex-ante*) as the $EF_{OM,y}$ of the proposed project activity, the results be generalized as (see Annex 3 for details):

$$EF_{OM,y} = 1.1257 \text{ tCO}_2 \text{e} / \text{MWh}$$

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$) as the generation-weighted average emission factor (tCO₂/MWh) of a sample of power plants m , as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} (F_{i,m,y} \times COEF_{i,m,y})}{\sum_m GEN_{m,y}} \quad (3)$$

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 but for sample plants m .

Refer to the description in ACM0002, there are two options for choosing sample group m , whether which method be adopted, they can not be changed in whole crediting period. Because the proposed project calculate build margin emission factor ($EF_{BM,y}$) *ex-ante*, so the option 1 be adopted to choosing sample group m

Option 1. Calculate 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. The sample group m consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) 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. Restricted by the available data, we have to adopt alternatives, according to the EB's guidance on DNV deviation request "Request for clarification on use of approved methodology AM0005 for several projects in China"²³, the CDM EB suggested that the project participants use the following alternative solutions to calculate BM emission factor in absence of data. In fact, the whole process have to in compliance with conservative principle, this alternative will underestimate BM emission factor of the proposed project. The main points as follows:

- 1) Use of capacity additions during last 1-3 years for estimating the build margin emission factor for grid electricity (alternative method for choosing sample group m).
- 2) Use of weights estimated using installed capacity in place of annual electricity generation.
- 3) Use the efficiency level of the best technology commercially available in the provincial/regional or national grid, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

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 according to guidance by China DNA this proposed project uses the below alternative sub-steps to calculate $EF_{BM,y}$, and the formulae are:

Sub-step 2a Calculation of the split of CO₂ emissions from various power technology in the total emissions

²³ http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

The data can be calculated as per the fuel assumptions in China Energy Statistical Yearbook 2006 for which data are available at the time of PDD submission:

$$\lambda_{coal} = \frac{\sum_{i \in coal, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{oil} = \frac{\sum_{i \in oil, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in Gas, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

Where:

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

$COEF_{i,j}$ is the CO₂ emission coefficient of fuel i (tCO₂ per 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 year y ;

Coal, *Oil* and *Gas* refer to the fuel categories, respectively solids fuels, liquid fuels, and gas fuels.

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

The emission factor for the thermal power calculated as weighted average of the most advanced available various power technologies

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,adv} + \lambda_{Gas} \times EF_{Gas,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} \quad (7)$$

Where: $EF_{Thermal}$ is the emission factor for the thermal power of NWPG;

$EF_{Coal,adv}$ is the emission factor of the most advanced available *coal* power technology;

$EF_{Gas,Adv}$ is the emission factor of the most advanced available *gas* power technology;

$EF_{Oil,Adv}$ is the emission factor of the most advanced available *oil* power technology.

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with an efficiency of power supply of 35.82% and the standard coal consumption on power supply of 343.33gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators, with an efficiency

of power supply of 47.67% and the standard coal consumption on power supply of 258gce/kWh²⁴.

Sub-step 2c Calculation of the BM mission Factor

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

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 2003, 2004 and 2005, it can be seen that the capacity additions during 2003-2005 represents a value that is 21.02% of the total installed capacity in 2005, and it is also obvious that the capacity additions are larger than the capacity of five plants, so the data in years 2003 and 2005 are used to calculate the BM emission coefficient of NWPG (alternative method for choosing sample group m). The thermal power plants accounted for 60.99% of the total capacity additions in NWPG during 2003-2005.

The proposed project calculate build margin emission factor ($EF_{BM,y}$) *ex-ante*, based on the formulae above, the BM Emission Factor of the NWPG is generalized as (see Annex 3 for details):

$$EF_{BM,y} = 0.5739 \text{tCO}_2\text{e} / \text{MWh}$$

STEP 3. Calculate the baseline emission factor EF_y as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

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

Where: the weights w_{OM} and w_{BM} , by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and the baseline emission factor EF_y are expressed in tCO₂/MWh.

The proposed project calculate baseline emission factor (EF_y) *ex-ante*, based on available data for most recent 3 years at the time of PDD submission, and it can not be changed in whole crediting period. Referring to description above, the results is generalized as follows:

$$EF_y = 0.5 \times 1.1257 + 0.5 \times 0.5739 = 0.8498 \text{tCO}_2\text{e} / \text{MWh}$$

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

Data and parameters are adopted to calculate *ex-ante* the emission factor that are available when validation is undertaken, they are not monitored throughout the crediting period but are determined only once and thus remains fixed throughout the crediting period. These data and parameters also characterize the connected grid by the proposed project, including installed capacity, generation, consumption ratio by the

²⁴ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf>



thermal plants, fuel consumption amount, net calorific value, oxidation factor, CO₂ emission factor, the efficiency level of the best technology commercially available etc.

Data / Parameter:	$F_{i,j,y}$
Data unit:	Tons or m ³
Description:	The amount of fuel i consumed by relevant power source j in year y
Source of data used:	China Energy Statistics Yearbook 2000-2002, 2004, 2005
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	Accurate

Data / Parameter:	NCV_i
Data unit:	MJ/t, or MJ/km ³
Description:	The net calorific value per mass or volume unit of a fuel i
Source of data used:	China Energy Statistical Yearbook 2006, page 287.
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	Reasonable

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	The oxidation factor of the fuel i
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume2: Energy (Introduction, Table 1-4)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	Reasonable

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tC/TJ
Description:	The CO ₂ emission factor per unit of energy of the fuel i
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume2: Energy (Introduction, Table 1-4)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value



Any comment:	Reasonable
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Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to NWPG by source j in year y
Source of data used:	China Electric Power Yearbook 2004, 2005, 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	Accurate

Data / Parameter:	η_m
Data unit:	%
Description:	Power supply efficiency of the most advanced available <i>various</i> power technology m .
Source of data used:	National official data source
Value applied:	35.82 for coal power technology and 47.67 for gas and oil power technology
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data refers to “A Bulletin on Determination of Baseline Emission Factor within China Power Grid” by China DNA, please see: http://cdm.ccchina.gov.cn
Any comment:	Reasonable

Data / Parameter:	Capacity
Data unit:	MW
Description:	Installed capacity of unit k in NWPG, k refer to provincial grid.
Source of data used:	China Electric Power Yearbook 2004, 2005, 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	Accurate

Data / Parameter:	$CAP_{Thermal}$ and CAP_{Total}
Data unit:	MW
Description:	Installed capacity additions of thermal power and all sources to the sample group m in NWPG
Source of data used:	China Electric Power Yearbook 2004-2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and	Official released statistic; publicly accessible and reliable data source



procedures actually applied :	
Any comment:	Accurate, calculated from installed capacity of unit k in NWPG for the sample group m , k refer to provincial grid.

B.6.3 Ex-ante calculation of emission reductions:

The JHP is a run-of-river hydropower project, the GHG emissions by sources from the proposed project equal to zero, then $PE_y = 0$.

The JHP is a grid-connected renewable project, referring to the description in methodology ACM0002, there no leakage, then $L_y = 0$.

Based on the feasibility study on the proposed project, the estimation of annual generation by the JHP will be 150,960MWh, among them 128,300MWh are effectual generation (net generation)²⁵, i.e. annual electricity exported to the NWPG by the proposed project will be 128,300MWh; the annual electricity import by the proposed project activity from the connected grid be estimated as 0.3% of annual generation²⁶, i.e. annual electricity imported from the NWPG to the proposed project will be 400MWh; then the estimation of the annual net electricity supplied to the NWPG by the JHP will be 127,900MWh²⁷, the baseline emissions factor (EF_y) is calculated ex-ante in B.6.1 and equal to 0.8498tCO₂/MWh, so the estimated baseline emissions BE_y are expressed in tCO₂ as follows:

$$BE_y = EG_y \times EF_y = 127,900\text{MWh} \times 0.8498 \text{ tCO}_2/\text{MWh} = 108,689 \text{ tCO}_2$$

Finally, the emission reduction ER_y by the proposed project activity during a given year y is calculated as follows:

$$ER_y = BE_y - PE_y - L_y = EG_y \times EF_y = 108,689 \text{ tCO}_2$$

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

Year	Estimation of Project activity Emission (tonnes of CO ₂ e)	Estimation of baseline emission (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of Emission reductions (tonnes of CO ₂ e)
2008 (begin on 01/04/2008)	0	81,665	0	81,665
2009	0	108,689	0	108,689
2010	0	108,689	0	108,689
2011	0	108,689	0	108,689
2012	0	108,689	0	108,689

²⁵ The Feasibility Study Report on Jinkouba Hydropower Plant, Chapter 13.

²⁶ When the turbines and generators of the proposed project are not in work, it is possible to import some electricity from the grid for maintenance of units and daily living of staff in the plant site etc., although compare with electricity exports; the part of electricity imports is very limited, yet in order to determine the emission reductions ex-ant, also in compliance with conservative principle of CDM, here the project developer estimate the annual electricity imports from the grid as 0.3% of the annual generation according to the feasible study to the proposed project.

²⁷ According to the estimation in financial analysis on the proposed project (the same source as list in footnote 18), the annual salable electric quantity by the Jinkouba Hydropower Plant will be around 127,900MWh.



2013	0	108,689	0	108,689
2014	0	108,689	0	108,689
2015	0	108,689	0	108,689
2016	0	108,689	0	108,689
2017	0	108,689	0	108,689
2018 (end at 31/03/2018)	0	27,024	0	27,024
Total (t CO₂e)	0	1,086,890	0	1,086,890

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

B.7.1 Data and parameters monitored:

the related monitoring by the “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” (ACM0002, version 06) requires to the proposed project type as follows:

- Electricity generation from the proposed project activity;
- Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”;
- Data needed to recalculate the build margin emission factor, if needed, consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”;
- For new hydro electric power projects, the surface area of reservoir at the full reservoir level.

Because the proposed project calculates the baseline emission factor ex-ante, just as description in **B.6.1.**, the baseline emission factor for the proposed project equal to 0.8498tCO₂/MWh, which be calculated based on the open data are available at the time of PDD submission and cannot be changed during the whole fixed crediting period. The data needed to calculate the combine margin emission factor will be validated by DOE before the registration, detailed information on validation of baseline emission factor already be described in upper **B.6.2.** In the whole fixed crediting period there do not recalculate the OM and the BM, thus monitoring in not needed.

The proposed project is a run-of-river hydropower, according to approved consolidated monitoring methodology ACM0002, monitoring to the surface area at full reservoir level also is not needed.

The generated electricity by JHP will be supplied to NWPG, net electricity supplied to the grid is needed in calculating emission reductions of the proposed project, which will be measured hourly and recorded monthly by the computed ammeters at the top and end of lines, and two ammeters can measured synchronously and double-checked each other. More importantly, the receipt of electricity sales and purchases will be considered as a good proof for validity of monitoring generation data.

Data / Parameter:	Electricity Exports (EG_{Ex})
Data unit:	MWh
Description:	Annual electricity supplied to the NWPG by the proposed project
Source of data to be	Records of meter according to monitoring plan



used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.6	128,300
Description of measurement methods and procedures to be applied:	Electricity will be measured Directly and continuously by computed and precise ammeters, Recording frequency will be hourly measurement and monthly recording; Proportion of data to be monitored would be 100% throughout whole year; the data will be archived both in electronic and paper; Data monitored are to be kept for two years after the last issuance of CERs for the proposed project activity.
QA/QC procedures to be applied:	Set up a special CDM project team; constitute detailed rules on monitoring management; introduce precision ammeters; two ammeters proofread each other both in booster station and switching station; to calibrate the meters periodically in accordance with related measure standard in China. The meter(s) will be read frequently jointly by the project developer and the grid company; keep the invoice of electricity sales as a hard proof for data quality control etc.
Any comment:	The value of data applied derived from “The Feasibility Report on Jinkouba Hydropower Plant”, only for the purpose of calculating expected emission reductions, the ultimate value applied for the true emission reductions calculation will comply with the records of meters and certificate by DOE.

Data / Parameter:	Electricity Imports (EG_{im})
Data unit:	MWh
Description:	Annual electricity imported to the project from the NWPG
Source of data to be used:	Records of meter according to monitoring plan
Value of data applied for the purpose of calculating expected emission reductions in section B.6	400
Description of measurement methods and procedures to be applied:	The similar measurement methods and procedures as electricity exports.
QA/QC procedures to be applied:	The meter(s) will be read frequently jointly by the project developer and the grid company; keep the invoice of electricity purchase as a hard proof for data quality control. Detailed descriptions also can be founded in monitoring plan.
Any comment:	To monitor the electricity imported from the grid to the plant especially when the turbines and generators not in work and other situations. Comparing with electricity exports, the part of electricity imports is very limited, in order to determine the emission reductions ex-ante conservatively; we estimate annual electricity import from the grid as 400MWh (around 0.3% of the annual generation). But the ultimate value applied for the true emission reductions calculation will also comply with the records of meters and certificate by DOE.



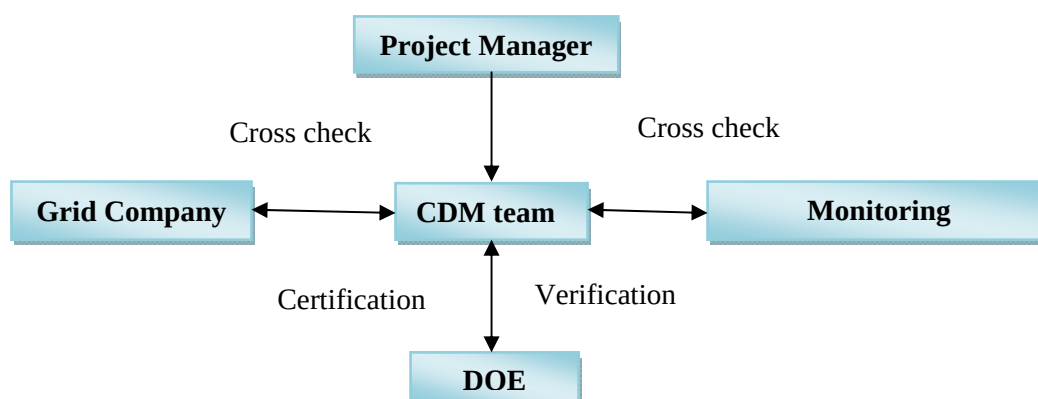
Data / Parameter:	Net Electricity Exports (EG_y)
Data unit:	MWh
Description:	Net electricity supplied to the NWPG by the proposed project in year y .
Source of data to be used:	Subtract electricity imports (EG_{im}) from electricity exports (EG_{ex}), viz. $EG_y = EG_{ex} - EG_{im}$
Value of data applied for the purpose of calculating expected emission reductions in section B.6	127,900
Description of measurement methods and procedures to be applied:	To monitor electricity exports and electricity imports with bidirectional meters synchronously, calculated through subtracting electricity imports from electricity exports by the CDM team of proposed project.
QA/QC procedures to be applied:	Directed and inspected by CDM project team leader, calculated and finished by monitoring charge and monitoring person, keep all original recorders for verification.
Any comment:	Calculated according to recorders from meters accurately, it is the base for the calculation of final emission reductions.

B.7.2 Description of the monitoring plan:

In order to fulfil the requirement set out by Kyoto Protocol that emission reductions projects under the CDM have real, measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity, the Monitoring Plan for this project has been developed to ensure that the proposed CDM project is well operation and management in terms of the collection and archiving of complete and reliable data.

1. management structure

In order to operate and manage the CDM project activities, the project entity-JHLC had constituted detailed rules on CDM project management, the special CDM project manager authorized by the project entity will be in charge of all the management works, training and the fulfillment of the Monitoring Plan. there set up a CDM project team comprised of six persons, the team assigns qualified persons to measure, compile and archive the necessary data of monitoring plan (the further information please see Annex 4). Detailed structure as follows:



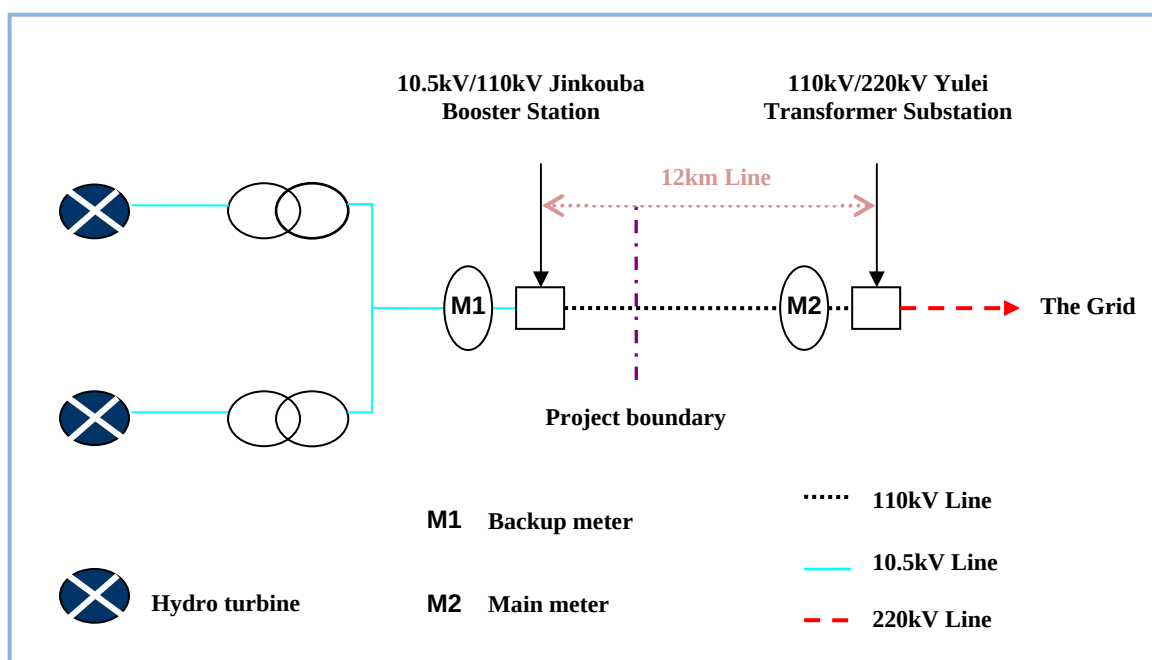
2. Responsibilities for Record, Monitor and Report

In order to effectively monitor and acquire the information of data estimation, measurement, tracking, collection and filing, the CDM project team will assign monitoring responsibilities to personnel, and has plan special training for the team members so as to ensure the data quality of the electricity delivered to the grid. At present, the team has developed a CDM manual on the techniques and procedures of the proposed CDM project activity. In addition, an agreement had been signed between the proposed project entity and the grid that defines the metering arrangements and the required quality control procedures for accuracy²⁸.

3. Installation, Maintenance, Calibration of Meters

According to the requirements in metering of Gansu Electric Power Company, two-way meters and control equipments will be installed in the substation (interconnection facility connecting to the grid) and the power plant. Therefore, the on-off electricity generated by the proposed can be metered so as to cross-checking, detailed information as following figure:

Professional maintenance staff designated by the project entity will be take maintenance tasks, which must be completed. The project entity will prepare backup procedures to deal with any errors occurred to the meters. Calibration is carried out annually by Gansu Electric Power Company, then lead seals to ensure the accuracy and impartiality of the meters. Calibration tests records will be maintained for verification.



4. Process of the data records

The amount of electricity delivered to the grid during the defined crediting period will be recorded every month jointly by designated staff of Longnan Electric Power Company, a subsidiary company of Gansu

²⁸ An agreement on grid connection and generation dispatch between Jintai Hydropower Co.Ltd and Gansu Electric Power Company, 2007



Electric Power Company and the project entity. Moreover, the monthly monitoring records will be compiled in a manner amenable to third party audit and deliverable to the DOE for verification purposes.

According to relevant provisions by Electric Power Company, the hydropower plant should record the operational parameters every hour, and the substation should read the meters every month. On a weekly basis, the CDM project team requires that the records must be reported to the CDM project manager to cross check. Furthermore, the records would be kept in electronic form, and monthly generation data would be printed out for a back up, to deal with the improbable event of a computer hazard. The specific steps for data collection and reporting are listed below:

- ◆ Grid Company together with the project owner reads the main meter and records data every month;
- ◆ Project owner reads the backup meter and records data every month;
- ◆ Grid Company supplies readings to the project owner and provides invoice;
- ◆ Project owner records the data of electricity delivered to the grid
- ◆ Project owner provides two meters' readings and copies of invoices to DOE for verification.

5. Procedures for QA/QC

The quality assurance and quality control procedures for reading, maintaining and archiving data shall be improved as part of this CDM project activity. In order to ensure the accuracy and rationality of metering data, the CDM project team will take charge of the audit tasks. All the records (include the electronic files, paper documents, maintenance and calibration data etc.), should be reported to the team, so as to judge whether there is bias on plant operation and ensure the on-going process through the defined crediting period in terms of the need for verification on an annual basis. At the same time, the metering data by the plant can be cross-checked with the Electricity Sales Invoices issued by Electric Power Company. In addition, the data required for the calculations of reduce emission for verification, should mainly based on the metering data by the substation, and secondary to the data metered by the power plant.

6. Process for suspect data

If any monthly reading of the main meter over the allowable error and be inaccurate, or otherwise functioned improperly, the grid-connected electricity generated by the proposed project shall be determined Firstly by reading the backup meter, unless a test by either party reveals it is also inaccurate. If the backup system is not with acceptable limits of accuracy or is otherwise performing improperly, the Electric Power Company and the project entity will discuss jointly according to the processing procedures for handling accidents. At the same time, the accidents must be reported to the CDM project team. The team manager will analyze the reasonable of the data according to the conservative principles of CDM, and the informed written materials, electronic files also will be supplied in a transparent manner to the DOE for verification purposes.

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 application of the baseline and monitoring methodology to the proposed project activity began on 15/06/2006 and completed on 31/09/2007.

Name of responsible person/entity: Jin Bowen / Clean Development Mechanism Joint Office of Gansu Province; Gansu Huike Center for Technology Transferring on Resource and Environment

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

Telephone: +86-931-8826221



E-Mail: jinbowen@gscdm.cn; jinbw@lzb.ac.cn

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 project activity:****C.1.1. Starting date of the project activity:**

20/11/2005

Date of main construction beginning.

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

30 years

The final analysis of the proposed project has been made using a conservative 30-year operation period.

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

The proposed project activity would select a fixed crediting period as detailed in C.2.2.

C.2.1. Renewable crediting period**C.2.1.1. Starting date of the first crediting period:**

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

01/04/2008 or registered date whichever is later

C.2.2.2. Length:

10y-0m

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

According to Environmental Protection Law of the People's Republic of China, the project entity must assess the environmental impacts of project activity in China before exploiting natural resources and developing project construction. Therefore, the project entity had entrusted Cold and Arid Region Environmental and Engineering Research Institute, Chinese Academy of Science to assess the environmental impacts of the JHP, finally Gansu Provincial Environmental Protection Agency approved the environmental impact assessment (EIA) of JHP in form of official document (approved file NO. [2004] 69), that shows the proposed project in accordance with the claim to environment protection by the host party.

In view of the common practice of China, the environmental impacts of small scale hydropower plant ("SHP", in China installed capacity lower than 25MW be defined and not more than 50MW can refer to) are considered negligible. The direct influenced area of the JHP activity is Hengdan Township of Wen County, and there no the migration of population and the movement of building in process of the proposed project's development, therefore social and environmental influences are direct, partial, short-term and reversible.

Advantageous impacts

- Make best use of waterpower resource on Baishuijiang River and provide clean energy.
- Cut flood peak and alleviate accumulation of mud.
- Improve quality of drinking water within the project area.
- Afford electricity and water to Natural Forest Protection Project

Disadvantageous impacts

- In constructing stage, Quality of atmosphere declined partially.
- In constructing stage, mud and sand content in water flow will increase a little.
- In constructing stage, noise area partially beyond stated standard nearby the project site.
- In operating stage, amount of water on watercourse will decrease obviously.
- In operating stage, reduction of water will bring unapparent impact to vegetation round watercourse.

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:

Construction and operation of the JHP will not result in any significant environmental impacts.

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

By various formats such as site surveys, distribution of questionnaires and discussion, the advices about the proposed hydropower plant are obtained from the stakeholders.

- Formats

Investigation means include site surveys, distribution of questionnaires and discussion



➤ Investigated stakeholders

The stakeholders consist of peasants, workers, residents, teachers, students, technicians and government officials. The investigation had taken full account into the public advices of different ages, sexes, occupations and civilizations. The investigation was complied with the principal of representation and randomness in order to reflect the public opinions about the construction of the proposed project.

➤ Major investigated issues

- 1) Whether know the proposed project
- 2) Attitude towards the location of the proposed project
- 3) Impacts of the proposed project on ecological environment
- 4) What is CDM
- 5) Other special comments

E.2. Summary of the comments received:

It is the general opinion that the Jinkouba hydropower plant is a feasible project depends on viewpoints from experts and officials. The location of the dam was designed aright based on the character of local environment. When the proposed project is put into practice, it will have very positive social, economical and environmental benefits. To minimum the negative impact on ecological ecosystem, water resources and atmospheric environment, the proposed project was designed scientifically and managed strictly.

50 questionnaires were distributed in April. 2005 supported by CDM consultants within project assessment area, and 49 questionnaires were returned. From the view of the informants: 100% of them know the proposed project; 98% of them consider that the location of the proposed project is fit; 98% of them consider that the construction of the proposed project has little influence on region ecological environment; 96% of them had known CDM. In general, the local government and residents have a positive attitude on the proposed project; most of them consider that the construction of the proposed project will promote the economic development in project region.

The special comments concentrate at compensate for the occupied lands, the suggestions including optimize design, enhance management, shorten construction period, protect environment and implement virescence etc.

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

According to the public research in EIA carried out by the Cold and Arid Region Environmental and Engineering Research Institute, CAS, three persons were selected among the informants as volunteer supervisor, to take charge of the environment protection at the construction and operation stage.

Project owners have a positive attitude to gather views and suggestions of local stakeholders, aim at the comments and suggestions list in E.2, the project entity will adopt the flowing measure:

- Give a reasonable financial compensation to farmers for occupying cultivated land;
- Provide employment opportunities to villagers;
- Extend and heighten the breakwater to protect riverain land and avoid submerge;
- Plant trees and grass to reduce soil erosion and protect the local ecological environment;
- Construct a countryside road, two simple bridges and an elementary school to facilitate local people.

**ANNEX 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY****Project Entity**

Organization:	Jintai Hydropower Co. Ltd of Wen County in Gansu Province
Street/P.O.Box:	Chengguan Dongbaxing Village No.187
Building:	/
City:	Wen County
State/Region:	Longnan
Postfix/ZIP:	747000
Country:	People's Republic of China
Telephone:	+86 939-5527798
FAX:	+86 939-5527798
E-Mail:	linfanyou@163.com
URL:	/
Represented by:	Lin Fanyou
Title:	Director
Salutation:	Mr.
Last Name:	Lin
Middle Name:	/
First Name:	Fanyou
Department:	/
Mobile:	+86 13809395688
Direct FAX:	+86 939-5527798
Direct tel:	+86 939-5527798
Personal E-Mail:	linfanyou@163.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in this project activity.

Annex 3

BASELINE INFORMATION

According to ACM0002, China DNA had given a renewed calculation on baseline emission factor of China Power Grid on 9 Aug. 2007, please see: “A Bulletin on Determination of Baseline Emission Factor within China Power Grid”²⁹. Data adopted in the calculation are open and publicly available, here we just refers to the results of Northwest Region Power Grid, detail information as follows:

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

The following steps (Table A1~A8) calculated the simple OM emission factor using the most recent 3 years data.

Table A1. CO₂ emission factors, oxidation factors and Low calorific values of fuels

Fuel Type	CO ₂ Emission Factor $EF_{CO_2,i}$ (tc/TJ)	Oxidation Factor $OXID_i$ (%)	Averaged Low Calorific Value NCV_i (MJ/t,km ³)
Raw Coal	25.8	100	20908
Cleaned Coal	25.8	100	26344
Other Washed Coal	25.8	100	8363
Coke	25.8	100	28435
Coke Oven Gas	12.1	100	16726
Other Gas	12.1	100	5227
Crude Oil	20	100	41816
Gasoline	18.9	100	43070
Diesel Oil	20.2	100	42652
Fuel Oil	21.1	100	41816
LPG	17.2	100	50179
Refinery Dry Gas	18.2	100	46055
Natural Gas	15.3	100	38931
Other petroleum products	20	100	38369
Other coking products	25.8	100	28435
Other energy sources	0	100	0

Data Source: China Energy Statistical Yearbook 2006

2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2. Energy

²⁹ <http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889>



Table A2. Operating Margin Emissions of NWPG in 2003

Fuel Type	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	$EF_{CO_2,i}$ (tc/TJ)	$OXID_i$ (%)	NCV_i (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	$K=G*H*I*J*44/12/10000$ (for mass unit) $K=G*H*I*J*44/12/1000$ (for volume unit)
Raw Coal	10 ⁴ t	2002.26	1479.62	330.67	682	1065.75	5560.3	25.8	100	20908	109976995.8
Cleaned Coal	10 ⁴ t						0	25.8	100	26344	0
Other Washed Coal	10 ⁴ t				27	3.64	30.64	25.8	100	8363	242405.2347
Coke	10 ⁴ t						0	25.8	100	28435	0
Coke Oven Gas	10 ⁸ m ³		1.54				1.54	12.1	100	16726	114279.8375
Other Gas	10 ⁸ m ³		0.12				0.12	12.1	100	5227	2782.8548
Crude Oil	10 ⁴ t						0	20	100	41816	0
Gasoline							0	18.9	100	43070	0
Diesel Oil	10 ⁴ t	3.12			0.04	0.4	3.56	20.2	100	42652	112463.6562
Fuel Oil	10 ⁴ t		1.19			1.02	2.21	21.1	100	41816	71497.13619
LPG	10 ⁴ t						0	17.2	100	50179	0
Refinery Dry Gas	10 ⁴ t					3.48	3.48	18.2	100	46055	106954.4476
Natural Gas	10 ⁸ m ³	0.1	0.54			5.95	6.59	15.3	100	38931	1439275.177
Other petroleum products	10 ⁴ t						0	20	100	38369	0
Other coking products	10 ⁴ t						0	25.8	100	28435	0
Other energy sources	10 ⁴ tce		5.86			2.3	8.16	0	100	0	0
										Total	112066654.1

Data Source: China Energy Statistical Yearbook 2004

**Table A3. Generation and Electricity Supplied to NWPG by Fuel-fired Thermal Power Plants in 2003**

Province	Generation by Fuel-fired Thermal Power Plants (MWh)	Used by Thermal Power Plants (%)	Electricity supplied to Grid by Thermal Power Plants(MWh)
	A	B	C=A*(1-B)
Shannxi	38,144,000	6.94	35,496,806
Gansu	29,494,000	6.35	27,621,131
Qinghai	6,446,000	4.5	6,155,930
Ningxia	19,175,000	5.25	18,168,313
Xinjiang	19,834,000	8.19	18,209,595
Total	113,093,000		105,651,775

Data Source: China Electric Power Yearbook 2004

Table A4. Operating Margin Emissions of NWPG in 2004

Fuel Type	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	$EF_{CO_2,i}$ (tc/TJ)	$OXID_i$ (%)	NCV_i (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	K=G*H*I*J*44/12/10000 (for mass unit) K=G*H*I*J*44/12/1000 (for volume unit)
Raw Coal	10 ⁴ t	2428.7	1595.9	322.8	1270.1	1240.9	6858.4	25.8	100	20908	135652074.1
Cleaned Coal	10 ⁴ t						0	25.8	100	26344	0
Other Washed Coal	10 ⁴ t				102.64	10.5	113.14	25.8	100	8363	895095.5697
Coke	10 ⁴ t	0.78					0.78	25.8	100	28435	20981.6178
Coke Oven Gas	10 ⁸ m ³		0.3				0.3	12.1	100	16726	22262.306
Other Gas	10 ⁸ m ³	0.74	1.26				2	12.1	100	5227	46380.91333
Crude Oil	10 ⁴ t	0.01				0.06	0.07	20	100	41816	2146.554667
Gasoline		0.02					0.02	18.9	100	43070	596.9502
Diesel Oil	10 ⁴ t	2.16	0.36		0.05	0.41	2.98	20.2	100	42652	94140.92571



Fuel Oil	10 ⁴ t	0.01	0.69			0.3	1	21.1	100	41816	32351.64533
LPG	10 ⁴ t						0	17.2	100	50179	0
Refinery Dry Gas	10 ⁴ t					3.26	3.26	18.2	100	46055	100192.9595
Natural Gas	10 ⁸ m ³	1.61	0.59			6.27	8.47	15.3	100	38931	1849872.648
Other petroleum products	10 ⁴ t						0	20	100	38369	0
Other coking products	10 ⁴ t						0	25.8	100	28435	0
Other energy sources	10 ⁴ tce		6.17			3.46	9.63	0	100	0	0
										Total	138716096.2

Data Source: China Energy Statistical Yearbook 2005

Table A5. Generation and Electricity Supplied to NWPG by Fuel-fired Thermal Power Plants in 2004

Province	Generation by Fuel-fired Thermal Power Plants (MWh)	Used by Thermal Power Plants (%)	Electricity supplied to Grid by Thermal Power Plants(MWh)
	A	B	C=A*(1-B)
Shannxi	44,439,000	7.5	41,106,075
Gansu	33,242,000	6.21	31,177,672
Qinghai	6,208,000	7.96	5,713,843
Ningxia	25,298,000	5.45	23,919,259
Xinjiang	22,752,000	9.07	20,688,394
Total	131,939,000		122,605,243

Data Source: China Electric Power Yearbook 2005



Table A6. Operating Margin Emissions of NWPG in 2005

Fuel Type	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	$EF_{CO_2,i}$ (tc/TJ)	$OXID_i$ (%)	NCV_i (MJ/t,km ³)	CO ₂ Emission (tCO ₂ e)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	$K=G*H*I*J*44/12/1000$ 0 (for mass unit) $K=G*H*I*J*44/12/1000$ (for volume unit)
Raw Coal	10 ⁴ t	2461.28	1597	345.1	1467.7	1358.09	7229.17	25.8	100	20908	142985522.1
Cleaned Coal	10 ⁴ t	16.22					16.22	25.8	100	26344	404225.4973
Other Washed Coal	10 ⁴ t	35.56			101.95	10.2	147.71	25.8	100	8363	1168592.599
Coke	10 ⁴ t	3.23					3.23	25.8	100	28435	86885.4173
Coke Oven Gas	10 ⁸ m ³						0	12.1	100	16726	0
Other Gas	10 ⁸ m ³						0	12.1	100	5227	0
Crude Oil	10 ⁴ t					0.18	0.18	20	100	41816	5519.712
Gasoline		0.02				0.01	0.03	18.9	100	43070	895.4253
Diesel Oil	10 ⁴ t	2.24	0.46	0.06		0.5	3.26	20.2	100	42652	102986.3818
Fuel Oil	10 ⁴ t	0.01	0.57			0.25	0.83	21.1	100	41816	26851.86563
LPG	10 ⁴ t						0	17.2	100	50179	0
Refinery Dry Gas	10 ⁴ t					7.71	7.71	18.2	100	46055	236959.4227
Natural Gas	10 ⁸ m ³	1.46	0.52	1.33		7.81	11.12	15.3	100	38931	2428640.359
Other petroleum products	10 ⁴ t						0	20	100	38369	0
Other coking products	10 ⁴ t						0	25.8	100	28435	0
Other energy sources	10 ⁴ tce	8.24	1.3				9.54	0	100	0	0
										Total	147447078.8

Data Source: China Energy Statistical Yearbook 2006

**Table A7. Generation and Electricity Supplied to NWPG by Fuel-fired Thermal Power Plants in 2005**

Province	Generation by Fuel-fired Thermal Power Plants (MWh)	Used by Power Thermal Plants (%)	Electricity supplied to Grid by Thermal Power Plants(MWh)
	A	B	C=A*(1-B)
Shannxi	41,100,000	7.16	38,157,240
Gansu	33,106,000	4.23	31,705,616
Qinghai	5,500,000	2.69	5,352,050
Ningxia	27,643,000	5.73	26,059,056
Xinjiang	26,560,000	8.8	24,222,720
Total	133,909,000		125,496,682

Data Source: China Electric Power Yearbook 2006

Table A8. Calculation of OM Emission Factor

	2003	2004	2005	OM in Weighted Average $EF_{OM,y}$ (tCO ₂ /MWh)
CO ₂ Emission (tCO ₂ e)	112066654.1	138716096.2	147447078.8	1.1257
Electricity supplied to Grid by Thermal Power Plants(MWh)	105,651,775	122,605,243	125,496,682	



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

Sub-step 2a Calculate the split of CO₂ emissions from various power technologies in the total emissions

Table A9. Percentages of CO₂ emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO₂ emissions

		Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Average Low Calorific Value	Emission Factor (tC/TJ)	Oxidation	CO ₂ Emission (tCO ₂ e)
Fuel	Unit	A	B	C	D	E	G=A+...+E	H	I	J	K=G*H*I*J*44/12/100
Raw Coal	10 ⁴ t	2461.28	1597	345.1	1467.7	1358.09	7229.17	20908 kJ/kg	25.8	100%	142985522
Cleaned Coal	10 ⁴ t	16.22					16.22	26344 kJ/kg	25.8	100%	404225
Other Washed Coal	10 ⁴ t	35.56			101.95	10.2	147.71	8363 kJ/kg	25.8	100%	1168593
Coke	10 ⁴ t	3.23					3.23	28435 kJ/kg	25.8	100%	86885
Subtotal											144645226
Crude Oil	10 ⁴ t					0.18	0.18	41816 kJ/kg	20	100%	5519.71
Gasoline	10 ⁴ t	0.02				0.01	0.03	43070 kJ/kg	18.9	100%	895.43
Diesel Oil	10 ⁴ t	2.24	0.46	0.06		0.5	3.26	42652 kJ/kg	20.2	100%	102986.38
Fuel Oil	10 ⁴ t	0.01	0.57			0.25	0.83	41816 kJ/kg	21.1	100%	26851.87
Subtotal											136253
Natural Gas	10 ⁷ m ³	14.6	5.2	13.3		78.1	111.2	38931 kJ/m ³	15.3	100%	2428640
Coke Oven Gas	10 ⁷ m ³						0	16726 kJ/m ³	12.1	100%	0.00
Other Gas	10 ⁷ m ³						0	5227 kJ/m ³	12.1	100%	0.00
LPG	10 ⁴ t						0	50179 kJ/kg	17.2	100%	0.00
Refinery Dry Gas	10 ⁴ t					7.71	7.71	46055 kJ/kg	18.2	100%	236959
Subtotal											2665600
Total											147447079

Data Source: <China Energy Statistical Yearbook 2006>

Therefore, the percentages of CO₂ emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO₂ emissions are calculated as:

$$\lambda_{Coal} = 98.1\%, \lambda_{Gas} = 1.81\%, \lambda_{Oil} = 0.09\%$$

**Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)**

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption on power supply of 343.33gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators, with the standard coal consumption on power supply of 258gce/kWh³⁰.

Table A10. Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO ₂ /MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired Power Plant	$EF_{Coal,adv}$	35.82%	25.8	100%	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.5843

Therefore, the fuel-fired emission factor is calculated as follows:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,adv} + \lambda_{Gas} \times EF_{Gas,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} = 0.9409$$

³⁰ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf>

**Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)****Table A11. Installed capacity of NWPG in 2005**

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9132.1	5715.0	886.8	4577.0	5051.7	25362.6
Hydro power	MW	1578.0	4036.2	4825.0	428.5	1352.1	12219.8
Nuclear power	MW	0	0	0	0	0	0
Wind power and others	MW	46.0	109.1	0	112.2	132.2	399.5
Total	MW	10756.1	9860.3	5711.8	5117.7	6536.0	37981.9

*Data source: China Electric Power Yearbook 2006***Table A12. Installed capacity of NWPG in 2004**

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	7640.4	4975.6	889.8	3782.0	4959.7	22247.5
Hydro power	MW	1876.5	3566.1	4053.4	366.2	973.0	10835.2
Nuclear power	MW	0	0	0	0	0	0
Wind power and others	MW	0	138.2	0	42.5	95.3	276.0
Total	MW	9516.9	8679.9	4943.2	4190.7	6028.0	33358.7

*Data source: China Electric Power Yearbook 2005***Table A13. Installed capacity of NWPG in 2003**

Installed capacity	Unit	Shannxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	7326.4	4745.0	905.8	3102.0	4413.5	20492.7
Hydro power	MW	1462.3	3280.6	3341.1	308.2	989.8	9382.0
Nuclear power	MW	0	0	0	0	0	0
Wind power and others	MW	0	21.6	0	10.0	91.3	122.9
Total	MW	8788.7	8047.2	4246.9	3420.2	5494.6	29997.6

*Data source: China Electric Power Yearbook 2004***Table A14. Newly Added Installed Capacity of NWPG from Year 2003-2005**

	2003	2004	2005	Newly Added Installed Capacity from Year 2003 to 2005	Percentage in Total Newly Installed Capacity
	A	B	C	D=C-A	
Fuel-fired (MW)	20492.7	22247.5	25362.6	4869.9	60.99%



Hydro (MW)	9382	10835.2	12219.8	2837.8	35.54%
Nuclear (MW)	0	0	0	0	0.00%
Wind & Others (MW)	122.9	276	399.5	276.6	3.46%
Total (MW)	29997.6	33358.7	37981.9	7984.3	100.00%
Account for installed capacity in 2005	78.98%	87.83%	100.00%		

It can be concluded from Table A14 that capacity additions of NWPG from year 2003 to 2005 is closer to 20% of the installed capacity in 2005 and it is obvious the capacity additions during year 2003 to 2005 are larger than the capacity of five plants, therefore year 2003 and 2005 are chosen to calculate the BM emission factor of NWPG as follows:

$$EF_{BM,y} = 0.9409 * 60.99\% = \mathbf{0.5739} (\text{tCO}_2\text{e/MWh}).$$

3. Calculate the baseline emission factor EF_y

Table A15. Calculation of Baseline Emission Factor

	OM $EF_{OM,y}$ (tCO2/MWh)	BM $EF_{BM,y}$ (tCO2/MWh)	CM EF_y (tCO2/MWh)
NWPG is defined as project electricity system	1.1257	0.5739	0.8498
Comments: Based on the most recently data which are available in an open way (2003-2005) The weights w_{OM} and w_{BM} , by default, are $w_{OM} = w_{BM} = 0.5$			

**Annex 4****MONITORING INFORMATION****JHLC's CDM project team:**

Mr. Lin Fanyou, Director of JHLC, CDM project team leader

Mr. Cheng Xinping, vice-Director of JHLC, CDM project manager

Mr. Yang bo, general manager of JHLC, CDM project team monitoring majordomo

Mr. Wang keliang, staff of JHLC, monitoring person

Mr. Cheng jianyi, staff of JHLC, monitoring person

Mr. Jin yong, staff of JHLC, file clerk

Main points on Jinkouba CDM project monitoring plan:

Monitoring charge: Mr. Yang bo, general manager of JHLC

Monitoring personnel: Mr. Wang keliang and Mr. Cheng jianyi

Monitoring and recording frequency: hourly measurement and monthly recording

Approach of data achieved: both in electronic and paper

Monitoring parameter: annual electricity supplied to the grid and imported from the grid in MWh

Period of monitoring data delivered to DOE: yearly from 2008 to 2017, at the beginning of next year deliver previous year's data

Forms of monitoring data delivered to DOE: monthly records and receipt of electricity sales and purchases

Data to be monitored:

ID number	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. EG_{Ex}	Electricity exported to the grid by the proposed project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic Paper	Double check by receipt of sales
2. EG_{Im}	Electricity imported to the project from the grid	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic Paper	Invoice of purchases is a good proof



3. EG_y	Net electricity supplied to the grid by the proposed project	MWh	calculated $EG_y =$ $EG_{Ex} -$ EG_{Im}	monthly recording	100%	Electronic Paper	Receipts of electricity sales and purchases also are good proof
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