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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

Project title: Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project
PDD Version: 2.0
PDD completion date: 04/02/2008

Revision History:
Version 1.0: First draft; submitted for Host Country Approval
Version 2.0: Editorial changes; submitted for validation / global stakeholder comments

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

The Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project (hereafter referred to as 'project' or 'project activity') involves the construction and operation of a hydro-electric power station at the main stream of the Datong River (Datonghe) in Liancheng Town in Yongdeng County of Lanzhou City in Gansu Province, China.

The main objective of the project is to generate power from clean renewable hydro power in Gansu Province and contribute to the sustainability of power generation of the North West China Grid. The hydropower station will install 3 turbine / generator units with an individual installed capacity of 4 MW, amounting to a total installed capacity of 12 MW.

The project involves a run-of-river design utilizing the natural water flow of the river and maximum head of 11.8 meters. The project will involve the construction of an integrated dam / power house type hydropower station with a concrete dam, ice sluice, floodgates, and a water intake / power house section. The water intake will lead the water into the turbines after which the water is returned to the river.

The expected operating hours are 4,763 hrs annually, expected annual power generation is 57.156 million kWh, and net expected annual power supply to the grid is 56.59 million kWh.

The project is connected to the local grid (i.e. Tanguo transformer station) through an on-site transformer station that increases the voltage to 35 kV. The local grid connects to the Gansu Grid and finally to the North West China Grid.

The project activity's contributions to sustainable development are:

- Reducing the dependence on exhaustible fossil fuels for power generation;
- Reducing air pollution by replacing coal-fired power plants with clean, renewable power;
- Reducing the adverse health impacts from air pollution;
- Reducing the emissions of greenhouse gases, to combat global climate change;
- Contributing to local economic development through employment creation.

This project fits with the Chinese government objective to reduce the dependence on exhaustible fossil fuels for power generation, make the energy sector in general and the power sector in particular more sustainable.

A.3. Project participants:

The parties involved in the project are shown in Table A.1:

Table A.1 Project participants

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Private entity: Lanzhou Heqiaoguidian Resource Co., Ltd. (as the Project Entity)	No
Japan	Private entity: Daiwa Securities SMBC Principal Investments Co., Ltd. (as the Purchasing Party)	No

For more detailed contact information on participants in the project activities, please refer to Annex 1.

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

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

A.4.1.1. Host Party(ies):

People's Republic of China

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

Gansu Province

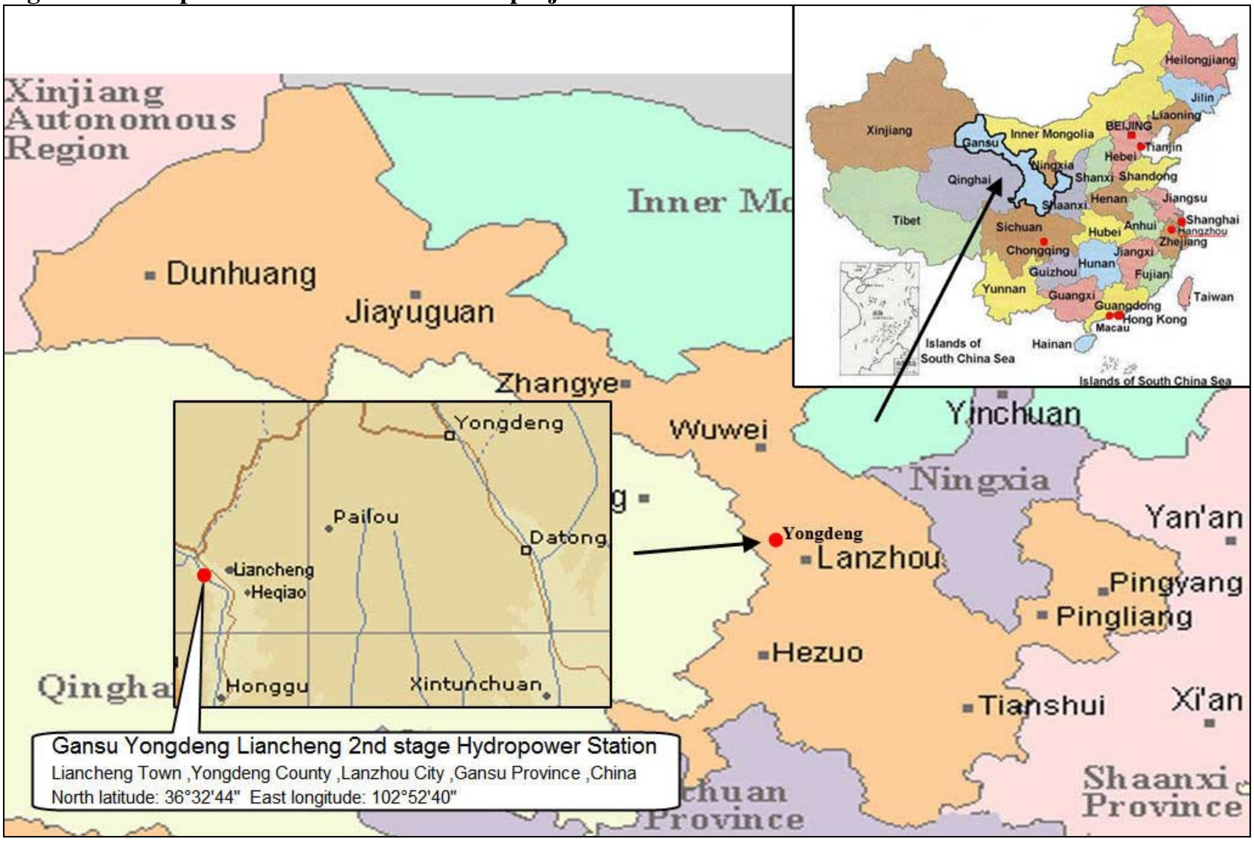
A.4.1.3. City/Town/Community etc:

Liancheng Town, Yongdeng County, Lanzhou City

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

The Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project is located at the main stream of the Datong River (Datonghe) near Tangou Village and Dongheyan Village in Liancheng Town of Yongdeng County in Lanzhou City of Gansu Province, China. The project is located 156 km Northwest of Lanzhou City, the provincial capital. The site location's approximate coordinates are east longitude of 102º52'40" and north latitude of 36º32'44". Figure A.1 shows the location of the project.

Figure A.1: Map of Gansu Province and the project's location



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

Type and category(ies) of the small-scale project activity

Category: I.D Grid connected renewable electricity generation
Sectoral scope: Energy industries (renewable - / non-renewable sources)

The project activity utilizes the hydro potential for power generation. Thus the project type is renewable energy. Since the capacity of the proposed project is 12 MW, it satisfies the requirement that the capacity of the project should be at most 15 MW and the project activity can be regarded as a small scale CDM project activity. The power generated is exported to the grid. Thus, according to the small-scale CDM modalities, the project activity falls under Type – I – Renewable Energy Projects and category I.D – Renewable Electricity Generation for a grid.

The project will not expand beyond 15 MW. For technical reasons, the project cannot expand beyond the current installed capacity of 12 MW; additionally, the approval of the Chinese authorities is based on the current technical design of the project; in other words, expansion beyond the current capacity would not be possible without further government approvals.

Technology of the small-scale project activity

The project design has been prepared by the Northwest Investigation Design & Research Institute of China Hydroelectric Consulting Group. All technologies employed by the project are appropriate for the hydrological conditions and the design of the station is proven as similar designs have been widely used in China. Examples include the Longshou hydropower station, the Xiliushui hydropower station, and the Haidianxia hydropower station. The project entity has previously developed two hydropower stations (i.e. Liancheng 1 hydropower station and Heqiao 2805 kW hydropower station) which are both operating at the moment. We therefore consider the design as appropriate and the project entity as experienced in the development and operation of hydropower stations.

The main design consists of a hydropower station with a maximum head of 11.8 meters. The design mainly consists of an integrated dam / power house type hydropower station with a concrete dam auxiliary dam on the left bank, a water intake / power house section, an overflow dam (25.97 meters high), a water retaining section on the right bank, and a transformer station. The power house is protected by a sand protection barrier and the water intakes include small channels to deal with accumulating sand. The water intake will lead the water into the turbines after which the water is returned to the river.

The project will create a small reservoir to raise the water level to increase the head. The reservoir will have a total volume of 1.47 million m^3 with 440,000 m^3 of active storage capacity. The total surface area of the reservoir is 218,500 m^2, corresponding to a power density of 54.92 W/m^2.

Three vertically mounted Kaplan turbines with an individual installed capacity of 4 MW will be installed, amounting to a combined installed capacity of 12 MW. The turbines will have adjustable blades that are suitable for projects with variable water flow. Three generators will be matched with the turbines. All technology is domestic and will be produced by Guandong province Shaoguan Zhongli Power Equipment Co., Ltd. The specific technical data of the turbines / generators units are listed in Table A.2.

Table A.2 Key technological parameters to be employed for the proposed project

Main Technical Data		Value (per unit)
Turbines	Units	3
	Type number	ZZ660-LH-300
	Type	Vertically mounted Kaplan turbine
	Capacity	4.167 MW
	Nominal flow rate	48.5 m^3/s
	Nominal rotation	150 r/min
	Nominal head	9.5 meters
Generators	Units	3
	Type number	SF4000-40/3800
	Type	Synchronous hydro turbine Generator
	Capacity	4 MW
	Nominal rotation	150 r/min
	Nominal voltage	6.3 KV
	Nominal current	458.2 A

The project is connected to the local grid (i.e. Tanguo transformer station) through an on-site transformer station that increases the voltage to 35 kV. The local grid connects to the Gansu Grid and finally to the North West China Grid.

The project is expected to start constructions in November 2007. The estimated start of operations is in November 2009, which will be the start of the first crediting period. Because the estimated start of constructions is not in the near future, the project owner has not yet organized training sessions for its staff members.

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

A 7-year renewable crediting period (renewable twice) is selected for the proposed project activity. The estimation of the emission reductions in the first crediting period is presented in Table A.4.

Table A.4 Estimation of the Emission Reductions in the First Crediting Period

Years	Annual estimation of emission reductions (tCO_2e)
1 November 2009 – 31 October 2010	48,090
1 November 2010 – 31 October 2011	48,090
1 November 2011 – 31 October 2012	48,090
1 November 2012 – 31 October 2013	48,090
1 November 2013 – 31 October 2014	48,090
1 November 2014 – 31 October 2015	48,090
1 November 2015 – 31 October 2016	48,090
Total estimated reductions (tCO_2e) of the first crediting period	**336,630**
Total number of the first crediting period years	7
Annual average reductions over the first crediting period (tCO_2e)	48,090

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

There is no public funding from Annex I countries available for the project.

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

The project is a small-scale project activity of category I.D, because the capacity of the hydropower station is 12 MW. The project will not expand beyond 15 MW. Proof is that the project entity does not have government approval to expand the project above 12 MW; in other words, expansion beyond the current capacity would not be possible without further government approvals.

According to Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; And
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

A proposed small-scale project activity shall not be deemed to be a debundled component of a large project activity if one of the criteria mentioned above does not apply to the project. It is possible to demonstrate that the project is not a debundled component of a larger project activity, because the project entity is not operating, developing or planning to develop another project in the direct vicinity of the project boundary.

Therefore, there is no other registered CDM project activity or another application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

Therefore, the project is not a debundled component of a larger 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 small-scale project activity:

Title: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories: I.D 'Grid connected renewable electricity generation' (version 13), approved at EB 36
Reference: The methodology can be found at:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

The AMS-I.D. methodology refers to the 'Tool to calculate the emission factor for an electricity system' (version 01) for the calculation of baseline emissions. This methodology can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2 Justification of the choice of the project category:

The AMS-I.D. methodology is applicable to small-scale project activities, under the following restrictions (see version 13 of AMS.I.D):

1. This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.
2. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.
3. Combined heat and power (co-generation) systems are not eligible under this category.
4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[1] from the existing units.
5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.

The proposed project activity satisfies these applicability criteria:

- The project is a small-scale project activity; see Section A of this PDD. The project has an installed capacity of 12 MW. Therefore, the project will not surpass the threshold of 15 MW for the applicability of the AMS.I.D methodology. (Satisfying the general precondition for the use of an AMS methodology)
- The project involves hydro energy resources, one of the renewable energy generation technologies listed (see restriction 1 above).

[1] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

- The project provides power to the power grid. The existing power grid partially utilizes fossil fuels as a power source, as described in Section A.2 and Section B.6 (see restriction 1 above).
- The project does not have a non-renewable component, meaning that the restrictions mentioned under point 2 above are not applicable.
- The project does not involve combined heat and power systems, meaning that the restrictions mentioned under point 3 above are not applicable.
- The project does not involve the addition of renewable energy generation units at an existing renewable power generation facility, meaning that the restrictions mentioned under point 4 above are not applicable.
- The project does not seek to retrofit or modify an existing facility for renewable energy generation, meaning that the restrictions mentioned under point 5 above are not applicable.

We therefore conclude that the project satisfies all conditions for the application of small-scale methodology AMS.I.D.

B.3. Description of the project boundary:

The project boundary, as stated in Appendix B of the simplified modalities and procedures for small-scale CDM project activities, is limited to the physical project activity. Project activities that displace energy supplied by external sources shall earn certified emission reductions (CERs) for the emission reductions associated with the reduced supply of energy by those external sources.

The spatial extent of the project boundary includes all power plants connected physically to the electricity system that the CDM project power plant is connected to (as defined below), including the project power plant itself, which includes:

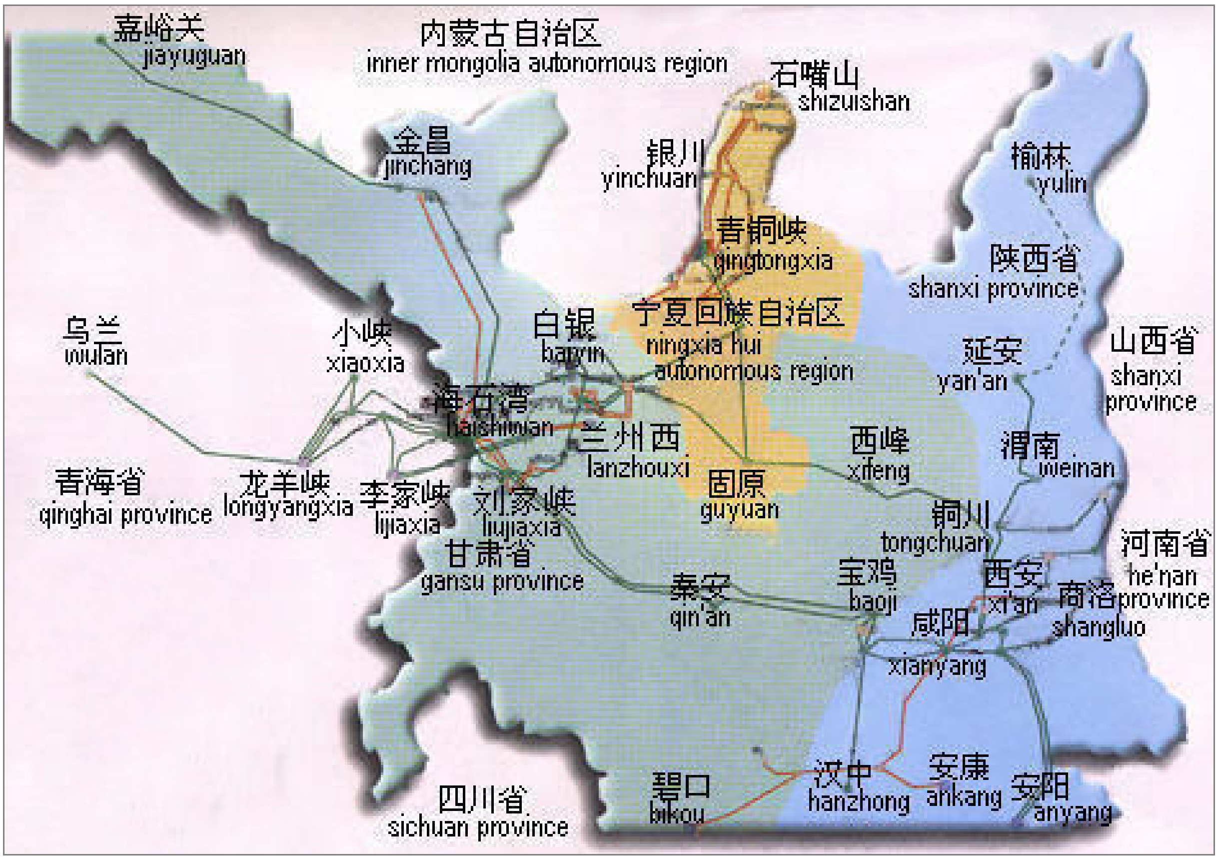
- Small reservoir at the dam site
- Dam structure including flood gates and water retaining section
- Power house including turbines/generators and auxiliary equipment
- On-site switching / transformer station (owned by the project entity)
- transmission lines to the grid

The AMS.I.D methodology does not provide guidance on how the system boundary of the project is to be determined. We therefore have applied the guidance available in the 'Tool to calculate the emission factor for an electricity system' for the definition of an electricity system. According to this tool, the relevant grid definition should be based on the following considerations:
1. Use the delineation of the project electricity system and connected electricity system as provided by the DNA of the host country if available; or
2. Use, where DNA guidance is not available and the electricity system does not have spot markets for electricity or were it is impossible to determine the operational rate of the transmission line, the following definition of boundary:
In large countries with layered dispatch system (e.g. state/provincial/regional/national) the regional grid definition should be used.

According to above requirements, the regional grid (North West China Grid) is selected as the project boundary.

As mentioned above, the boundary of the project is marked by the point where the project connects to the grid. The project is connected to the Gansu Grid, which is part of the North West China Power grid (illustrated in figure B.1), which includes the Gansu, Ningxia, Shaanxi, Qinghai and Xinjiang power grids. The geographical boundaries for the determination of the baseline emissions are therefore defined as the North West China Grid and direct emissions from all generation sources serving the grid. Figure B.1 shows a graphic representation of the North West China Power Grid.

B.1 North West China Power Grid



B.4. Description of baseline and its development:

The baseline scenario of proposed project is the continued operation of the existing power plants in the system and the addition of new generation sources to meet electricity demand. The project activity involves a construction of a zero-emission power source.

Leakage associated with the project does not have to be taken into account as the project employs new turbines / generators and does not involve the transfer of equipment from another activity. Furthermore, the project is a run-of-river hydropower station with no significant water storage capacity. In fact, the power station has a power density of approximately 54.92 W/m^2. Therefore, in accordance with the Executive Board decision on "Thresholds and criteria for the eligibility of hydroelectric power plants with reservoirs as CDM project activities" (EB23), the project emissions from the reservoir can be ignored. Thus, the emission reductions are equal to the baseline emissions.

In accordance with the small scale methodology I.D, baseline emissions are equal to power generated by the project activity and delivered to the grid, multiplied by the baseline emission factor. According to the small scale methodology I.D the baseline emission factor is calculated as either the "average of the approximate operating margin and the build margin", or the "weighted average emissions (in kg

CO2/kWh of the current generation mix)”. Power consumption in the North West China Grid is growing rapidly, which requires the construction of additional generating capacity. The Gansu Yongdeng Liancheng 2nd Stage Hydropower Station project is therefore expected to displace predominantly new capacity that is added to the grid and power generated by plants at the operating margin. Therefore, the baseline emission factor has been calculated as the average of the approximate operating margin and the build margin.

The small scale methodology I.D refers to the ‘Tool to calculate the emission factor for an electricity system’ for the calculation of the operating margin and the build margin. We therefore refer to this Tool for the calculation of the baseline emission factor.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Additionality

Hydropower has made significant contributions to the expansion of power supply in Gansu Province over the last few decades. However, new hydropower additions to the grid, in particular small hydropower stations, experience increasingly unattractive economic returns on investment. The reasons for this are that the most suitable locations for hydropower projects have already been used, and new projects are located in remote areas driving up the costs of hydropower per kWh. In addition, the engineering costs in China are rapidly rising. In the absence of the project activity, the North West China Grid is expected to expand through the least-cost expansion, which in the case of North West China is through predominantly coal-fired thermal power generation, excluding the proposed project activity.

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities the following categories of barriers are recognized as a basis for the additionality argument:
1. Investment barriers
2. Technological barriers
3. Barriers due to prevailing practice
4. Other barriers

The additionality argument is based on the proposition that the project faces an investment barrier that prevents the implementation of this type of project activity. The investment barrier is argued on the basis of two separate strands of argument: the project faces a barrier due to 1) poor economic return on investment, and 2) limited access to financial resources.

Return on investment

The project faces a barrier to implementation due to the poor returns on investment. To illustrate this, we performed a benchmark analysis in which we compare the Internal Rate of Return (IRR) of the proposed project activity to an industry benchmark. The parameters used are all from the Feasibility

Study, with the exception of the CER price.[2] The parameters used in the calculation are presented in Table B.1.

Table B.1 Parameters used in the investment analysis.

Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project	
Capital outlay	108,090,000 RMB
Annual power supply	56,590,000 kWh
Annual Operation and Maintenance costs 1st ten years	2,026,000 RMB
Annual Operation and Maintenance costs after ten years	1,920,000 RMB
Investment horizon	20 years
Grid price (gross)	0.238 RMB / kWh (inclusive 6% VAT)
Estimated CER price	8 EUR / tCO2

The investment analysis compares the project on the basis of internal rate of return (IRR) to an industry benchmark for hydropower projects, which in the case of small-scale hydropower projects in China is set at 10% (see Economic Evaluation Code for Small Hydropower Projects, 1995). The results of the analysis are provided in Table B.2.

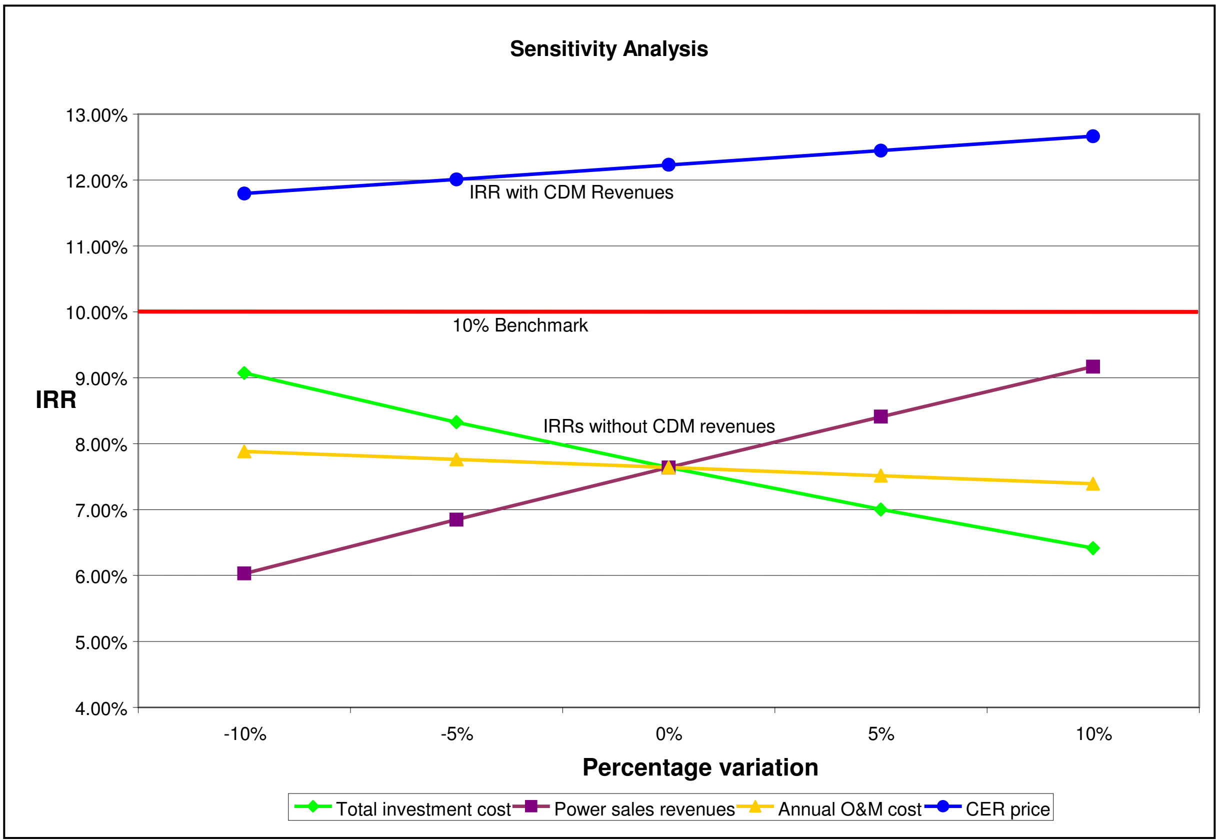
Table B.2 Results of economic analysis

IRR of proposed project activity		
Internal rate of return (IRR), over a 25 year period	Without CDM revenues	7.64%
	With CDM revenues	12.23%

The results clearly indicate that the return on investment of the proposed project activity is below the 10% benchmark. To confirm this we have considered variation of 10% in the critical assumptions. Figure B.2. shows the results of variations in critical assumptions on the IRR with and without CDM revenues.

Figure B.2 Result of variations in the critical assumptions

[2] The Chinese DNA has set a minimum price necessary to obtain host country approval for CDM projects. Although the minimum price has not been published, commonly 8 EUR/tCO2 is regarded as the minimum price the NDRC will accept. The CER price agreed for this project is either equal to or above 8 EUR/tCO2, but is considered a commercial secret. Taking the minimum CER price is conservative.



The sensitivity analysis confirms that the project's IRR without CDM revenues is substantially below the benchmark and that revenues from the sale of CERs are required to make the project financially attractive. Therefore, the proposed project activity faces an investment barrier due to its commercial unattractiveness.

Access to financial resources:

In addition to the poor economic return on investment as argued above, the Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project also faces an investment barrier due to the limited access to financial resources. The financial services sector of Gansu Province is not well developed and lacks the instruments to deal with financing of high-risk projects. Additionally, the banking sector is reluctant to extend loans to small hydropower stations unless special circumstances apply. National banking authorities have introduced credit rationing regulations leaving banks no option but to ration their credit and be especially careful to invest in small-scale projects with an installed capacity below 50MW in Central and Western China (Gansu Province is classified as part of Western China) due to the low anti-risk ability of small and medium-sized enterprises in these areas.[3] The high risks and poor returns associated with small hydropower projects make it difficult for project developers to receive loans without putting up a high share of equity capital.

Conclusion:

[3] The reform was formalised in 2005 in the national "Bank Credit Policy Direction 2005". This statement, and a statement from the Industrial and Commercial Bank of China confirming that their restrictive policies were already implemented before that (summer 2004) is available to the validator.

The above-mentioned obstacles present a prohibitive barrier to attract financing. To conclude, the project faces an investment barrier due to the unattractive return on investment and problematic access to financial resources. The additional revenues from registration of the proposed project activity as a CDM activity help overcome this barrier. The project owner was aware of the possibilities of CDM in an early stage of the project and the prospect of CDM revenues has been an important factor in the decision to implement the project. This is evidenced by the fact that long before the estimated start of constructions (November 2007), which can be considered as the irreversible decision to implement the project, the project owner signed a CDM development contract with CDM advisors (on the 4th of January 2006), and signed a Letter Of Intent (LOI) for the purchase of the CERs with Daiwa SMBC Securities Principal Investments Co., Ltd. In conclusion, the prospects of CDM revenues have played a crucial role in the decision to implement the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The small scale methodology refers to the "Tool to calculate the emission factor for an electricity system (Version 1)" for the determination of the CO_2 emission factor of the electricity ($EF_{Elec,\ ,y}$) in case the displaced electricity is supplied by a connected grid system. In accordance with this tool, the baseline emission factor is calculated as a combined margin: a weighted average of the operating margin emission (OM) factor and the build margin (BM) emission factor. Both the OM and BM emission factors are calculated *ex ante* and will not be updated during the first crediting period.

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA on 09 August 2007. We will refer to these emission factors as the 'published emission factors'.

For more information on the published OM and BM emission factors, please refer to:

http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=2190

-Baseline emission factors: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
-Calculation of OM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
-Calculation of BM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

We calculate the OM and BM Emission Factors on the basis of the published emission factors but deviate at some points by using the original data sources. Our calculation results in the same combined margin emission factor as can be calculated based on the published OM (1.1257) and BM (0.8489).

The description below focuses on the key elements in the calculation of the published emission factors and the subsequent calculation of emission reductions. The full process of the calculation of the emission factors and all underlying data are presented in English in Annex 3 to this PDD.

Selection of values for net calorific values and CO_2 emission factors of various fuels.

As mentioned above, the Chinese DNA has entrusted key experts with the calculation of the grid emission factors. In these calculations choices have been made for the values of net calorific values and CO2 emission factors. In the calculation files of the published emission factors, the net calorific values are based on the China Energy Statistical Yearbook, and the CO_2 emission factors are based on IPCC 2006 default values. The following table summarizes the values used. Note that the table lists the carbon emission factor of the fuels, while the CO_2 emission factor has been obtained by multiplying with 44/12. Rounded figures have been reported but exact figures have been used in the calculations in this PDD. The IPCC 2006 default carbon emission factors assume as a default value 100% oxidation in the combustion process. The calculation by the Chinese DNA and the calculations presented here follow the same approach by assuming complete combustion of the fuels. The 'Tool to calculate the emission factor for an electricity system' does not take into account oxidation rates, which is equivalent to assuming 100% oxidation.

Table B.3. Default values used for net calorific values and CO_2 emission factors of fuels

Fuel	Unit	NCV	Carbon emission factor	CO_2 emission factor
		(TJ/unit)	(TC/TJ)	(TCO_2e/TJ)
Raw coal	10^4 Tons	209.08	25.8	94.6
Clean coal	10^4 Tons	263.44	25.8	94.6
Other washed coal	10^4 Tons	83.63	25.8	94.6
Coke	10^4 Tons	284.35	29.2	107.1
Coke oven gas	10^8 m^3	1672.60	12.1	44.4
Other gas	10^8 m^3	522.70	12.1	44.4
Crude oil	10^4 Tons	418.16	20.0	73.3
Gasoline	10^4 Tons	430.7	18.9	69.3
Diesel	10^4 Tons	426.52	20.2	74.1
Fuel oil	10^4 Tons	418.16	21.1	77.4
LPG	10^4 Tons	501.79	17.2	63.1
Refinery gas	10^4 Tons	460.55	15.7	57.6
Natural gas	10^8 m^3	3893.1	15.3	56.1
Other petroleum products	10^4 Tons	383.69	20.0	73.3
Other coking products	10^4 Tons	284.35	25.8	94.6
Other E (standard coal)	10^4 Tce	292.70	0.0	0.0

Data source: All data are from the files mentioned above, and have been crosschecked against the original sources cited, as follows:

- Net calorific values: China Energy Statistical Yearbook, 2004 p. 302;
- Carbon emission factors and oxidation rates: IPCC default values; see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy);
- CO_2 emission factors: calculated from carbon emission factors.

<u>Description of the calculation process</u>

The key methodological steps according to the 'Tool to calculate the emission factor for an electricity system' are:

1. Identify the relevant electric power system;
2. Select an operating margin (OM) method;
3. Calculate the operating margin emission factor according to the selected method;

4. Identify the cohort of power units to be included in the build margin (BM);
5. Calculate the build margin emission factor, and;
6. Calculate the combined margin (CM) emission factor.

Step 1. Identify the relevant electric power system

According to the 'Tool to calculate the emission factor for an electricity system', step 1 involves the identification of the relevant electric power system which is described in section B.3 of this PDD. In accordance with the tool the North West China Power Grid has been selected as the relevant electric power system. See for details section B.3.

Step 2. Select an operating margin (OM) method

The 'Tool to calculate the emission factor for an electricity system' offers several options for the calculation of the OM emission factor. Of these, dispatch analysis, cannot be used, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used. The average OM does not take into account the non-dispatchable nature of low-cost/must-run resources and as low-cost/must-run resources constitute less than 50% of total grid generation (see table B.4), we have selected the Simple OM method as the most appropriate method.

Table B.4 Installed capacity and electricity generation of the North West China Grid, 2001-2005

Year	Installed capacity (MW)					Electricity generation (GWh)				
	Thermal	Hydro	Others	Total	% Low cost/must run	Thermal	Hydro	Others	Total	% Low cost/must run
2001	16,795	8,872	Na	25,746	34.46	81,148	27,447	Na	108,595	25.27
2002	17,757	9,200	105	27,062	34.84	93,428	27,427	198	121,053	22.82
2003	20,493	9,382	123	29,998	31.69	113,093	25,899	242	139,234	18.77
2004	22,248	10,835	276	33,359	33.31	131,939	34,813	705	167,457	21.21
2005	23,515	12,220	400	37,982	33.23	133,909	42,777	944	172,402	25.36

Source: China Electric Power Yearbook (editions 2002, 2003, 2004, 2005 and 2006).

Data vintage selection

In accordance with the 'Tool to calculate the emission factor for an electricity system', the OM is calculated according to the 'ex ante option': A three-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period.

Step 3. Calculate the operating margin emission factor according to the selected method

According to the Simple OM method, the OM emission factor is calculated as the generation-weighted average tCO_2 emissions per unit of net electricity generation (tCO_2/MWh) of all generating power plants serving the system, excluding the low-cost/must-run power plants/units. We calculate the OM emission factor according to option C of the Simple OM method, as data required for option A and B (i.e. electricity generation, fuel consumption data, etc for specific power plants/units serving the grid) is not available to the public or to the project participants. Where option C is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,j} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_y} \quad \text{(B.1)}$$

Where:

- $EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y (tCO_2/MWh);
- $FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (in a mass or volume unit);
- $NCV_{i,y}$ is the Net Calorific Value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit);
- $EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);
- EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);
- i are all fossil fuel types combusted in power sources in the project electricity system in year y, and;
- y is the three most recent years for which data is available.

Choice of aggregated data sources

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, power supply to the grid and IPCC default values for the CO_2 emission factor.

Calculation of the OM emission factor as a three-year full generation weighted average

On the basis of these data, the Operating Margin emission factors for 2003, 2004 and 2005 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Annex 3. We calculate the Operation Margin Emission Factor as **1.12559** tCO_2e/MWh.[4]

The calculation of the OM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions.

<u>Step 4. Identify the cohort of power units to be included in the build margin (BM)</u>

According to the 'Tool to calculate the emission factor for an electricity system', the sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

[4] The published Operating Margin Emission Factor is 1.1257 tCO_2e/MWh.

A direct application of this approach is difficult in China. The Executive Board (EB) has provided guidance on this matter with respect to the application of the AMS-1.D and AM0005 methodologies for projects in China on 7 October 2005 in response to a request for clarification by DNV on this matter. The EB accepted the use of capacity additions to identify the share of thermal power plants in additions to the grid instead of using power generation. The relevance of this EB guidance extends to the 'Tool to calculate the emission factor for an electricity system'. The calculation in step 5 and the calculation of the published BM Emission factor by the Chinese authorities are based on this guidance. The approach is explained below in step 5 and is the one that has been followed in numerous PDDs using the similar ACM0002 methodology since the EB decision.

Data vintage selection

In accordance with the 'Tool to calculate the emission factor for an electricity system', the BM is calculated according to option one: For the first crediting period, the build margin emission factor is calculated ex-ante based on the most recent information available. For the second crediting period, the build margin emission factor will be updated based on most recent data available at the time of submission of the request for registration. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used.

<u>Step 5. Calculate the build margin emission factor</u>

The Build Margin Emission Factor is, according to the 'Tool to calculate the emission factor for an electricity system', calculated as the generation-weighted average emission factor (measured in tCO_2/MWh) of all power units *m* during the most recent year *y* for which data is available:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{(B.2)}$$

Where:

- $EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year *y* (tCO_2/MWh);
- $EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
- $EF_{EL,m,y}$ is the CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
- *m* are the power units included in the build margin, and;
- *y* is the most recent historical year for which power generation data is available.

The sample *m*, according to the methodology, should be over the latest 5 power plants added to the grid, or over the last added power plants accounting for at least 20% of power generation. We apply an indirect approach based on the EB decision as mentioned in step 4.

First we calculate the newly–added installed capacity and the share of each power generation technology in the total capacity. Second, we calculate the weights of each power generation technology in the newly-added installed capacity.[5] Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology and a weighted average carbon emission factor on the basis of IPCC default carbon emission factors of individual fuels.

Since the exact data are aggregated, the calculation will apply the following method: We calculate the share of the CO_2 emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

Using the emission factor for advanced efficient technology we calculate the emission factor for thermal power; the BM emission factor of the power grid will be calculated by multiplying the emission factor of the thermal power with the share of the thermal power in the most recently added 20% of total installed capacity.

Detailed steps and formulas are as below:

First, we calculate the share of CO_2 emissions of the solid, liquid and gaseous fuels in total emissions respectively.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad (B.3)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad (B.4)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad (B.5)$$

Where:

- $F_{i,j,y}$ the amount of the fuel *i* consumed in *y* year of *j* province (measured in tce);
- $COEF_{i,j,y}$ the emission factor of fuel i (measured in tCO_2/tce) while taking into account the carbon content and oxidation rate of the fuel *i* consumed in year *y*, and;
- *COAL,OIL* and *GAS* subscripts standing for the solid fuel, liquid fuel and gas fuel.

Second, we calculate the emission factor of the thermal power:

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5 Newly added capacity is determined as follows. First, the latest year (2005) for which data on total installed capacity is available is identified. Then, the last year is identified in which the total installed capacity was below 80% of the total installed capacity in 2005. This defines "newly added capacity". Note that this approach does not follow the EB decision in response to the DNV request as mentioned in the main text to the letter, but the approach taken is the one that has been followed in numerous PDDs since the EB decision.

$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv} \tag{B.6}$$

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

Third, we calculate BM of the power grid:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \cdot EF_{Thermal} \tag{B.7}$$

Where CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity.

The λs are calculated on the basis of the weight of CO_2 emissions of each type of fuel in the total CO_2 emissions from thermal power. Subsequent calculation of the Build Margin emission factor yields a baseline emission factor of **0.57399** tCO_2e/MWh.[6]

For details we refer to Annex 3.

The calculation of the BM emission factor for the first crediting period is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the advantage of simplifying monitoring and verification of emission reductions.

Step 6. Calculate the combined margin (CM) emission factor

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \cdot W_{om} + EF_{grid,BM,y} \cdot W_{BM} \tag{B.8}$$

The “Tool to calculate the emission factor for an electricity system” provides the following default weights: Operating Margin, $W_{OM} = 0.5$; Build Margin, $W_{BM} = 0.5$

Applying the default weights and the calculated emission factors, we calculate a combined margin Baseline Emission Factor of **0.8498** tCO_2e/MWh.[7]

Calculation of Baseline Emissions

Baseline Emissions are calculated by multiplying the Baseline Emission factor by the net quantity of electricity supplied to the grid by the project according to formula B.9 below:

$$BE_y = (EG_Y - EG_{baseline}) * EF_y \tag{B.9}$$

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[6] The published Build Margin Emission Factor is 0.5739 tCO2/MWh.

[7] This is the same as the combined margin emission factor that can be calculated based on the published build margin and operating margin emission factors.

In the case of the proposed project activity, $EG_{baseline}$ is zero and hence we can revide formulea B.9 as follows:

$$BE_y = EG_Y * EF_y \qquad \text{(revised B.9)}$$

Calculation of Emission Reductions

The project does not involve project emissions or leakage as further explained in section B.6.3, and therefore emission reductions are equal to baseline emissions. Using the results of the preceding sections, we can calculate the emission reductions using formula B.10:

$$ER_y = EG_y * 0.8498 \qquad \text{(B.10)}$$

The estimated emission reductions (see Section B.6.3) are based on expected net power supply to the grid and an *ex ante* calculation of the emission factor in the first crediting period, and will hence be revised during the implementation of the project activity on the basis of actual power supply to the grid.

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

Data / Parameter:	**Power generation by source**
Data unit:	GWh (per annum)
Description:	Provincial level power generation data by source
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best and most recent data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Internal power consumption of power plants**
Data unit:	Percentage
Description:	Internal consumption of power by source
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best and most recent data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Amount of each fossil fuel consumed by each power source
Data unit:	10^4 tons, 10^8 m^3, 10^4 tce, depending on the specific fuel. We refer to Annex for details.
Description:	Physical amount of fuel input, for 17 different fuels
Source of data used:	China Energy Statistical Yearbook 2006, 2005 and 2004 Editions
Value applied:	For detailed values, see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Efficiency of advanced thermal power plant additions
Data unit:	%
Description:	
Source of data used:	See the downloadable files mentioned above for the full data set. Data are based on the best technologies available in China.
Value applied:	Coal: 35.82%; Oil: 47.67%; Gas: 47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Capacity by power generation source
Data unit:	MW
Description:	For the different power generation sources, installed capacity in 2003, 2004 and 2005 in the North West China Grid. Calculated by summing provincial data.
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values, see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Fuel Emission Coefficients
Data unit:	Tons C/TJ
Description:	Carbon emission factors for 17 different fuels
Source of data used:	Data used are IPCC default values. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Value applied:	For detailed values see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These are the most recent data.
Any comment:	

Data / Parameter:	**Electricity imports from connected grids**
Data unit:	MWh (per annum)
Description:	Electricity imports of power from other grids
Source of data used:	Original data are from China Electric Power Yearbook (Editions 2004, 2005 and 2006) and the China State Power Information Network online at: http://www.sp.com.cn/zgdl/dltj/default.htm
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	Note that the North West China power grid does not import electricity and imports are therefore zero in the calculation of the emission factor.

Data / Parameter:	**Net Calorific Value**
Data unit:	$TJ/10^4$ tons; $TJ/10^4$ tce; $TJ/10^8m^3$
Description:	Net calorific values of 17 different fuels in TJ per unit.
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Energy Statistical Yearbook, (2004) p. 302.
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Surface area reservoir**
Data unit:	m^2
Description:	Surface area at full reservoir level
Source of data used:	Feasibility study report
Value applied:	218,500 m^2
Justification of the choice of data or description of measurement methods and procedures actually applied:	This is the best data available
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The annual net power supply to the North West China Grid is estimated to be 56,590 MWh. Applying the formulas presented in Section B.6.1, we obtain the values for the baseline emissions during the first crediting period provided in Table B.5:

Table B.5 The estimation of the baseline emissions in crediting period

Year	**Year**	**Annual net power supply to the grid (EGy) (MWh)**	**Baseline emission factor (tCO_2/MWh)**	**Baseline emissions (tCO_2e)**
1	01/11/2009 – 31/10/2010	56,590	0.8498	48,090
2	01/11/2010 – 31/10/2011	56,590	0.8498	48,090
3	01/11/2011 – 31/10/2012	56,590	0.8498	48,090
4	01/11/2012 – 31/10/2013	56,590	0.8498	48,090
5	01/11/2013 – 31/10/2014	56,590	0.8498	48,090
6	01/11/2014 – 31/10/2015	56,590	0.8498	48,090
7	01/11/2015 – 31/10/2016	56,590	0.8498	48,090
	Total			**336,630**
	Average			48,090

In a given year, the emission reductions realized by the project activity (ER_y) is equal to baseline GHG emissions (BE_y) minus project direct emissions and leakages during the same year:

$$ER_y = BE_y - PE_y - L_y$$

Leakage:

The project activity involves the construction of a new hydropower station with a power density greater than 10 W/m2 and therefore emissions from the reservoir do not have to be taken into account. In accordance with the methodology, leakage and project emissions are equal to zero, and hence, the emission reductions due to the project are equal to the baseline emissions. The emission reductions will be calculated *ex post* on the basis of actual power supply to the grid, using the baseline emission factor presented above in Section B.6.1.

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

Table B.6 provides the annual emission reductions in tabular form.

Table B.6 *Ex ante* estimate of emission reductions due to the project

Year	Project Emissions (tCO2)	Baseline emissions (tCO2)	Leakage (tCO2)	Emission Reductions (tCO2)
Year 1: 01/11/2009 - 31/10/2010	0	48,090	0	48,090
Year 2: 01/11/2010 - 31/10/2011	0	48,090	0	48,090
Year 3: 01/11/2011 - 31/10/2012	0	48,090	0	48,090
Year 4: 01/11/2012 - 31/10/2013	0	48,090	0	48,090
Year 5: 01/11/2013 - 31/10/2014	0	48,090	0	48,090
Year 6: 01/11/2014 - 31/10/2015	0	48,090	0	48,090
Year 7: 01/11/2015 - 31/10/2016	0	48,090	0	48,090
Subtotal	**0**	**336,630**	**0**	**336,630**
Average	0	48,090	0	48,090

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Electricity supplied to the grid by the project (net)
Source of data to be used:	Directly measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	56,590 MWh
Description of measurement methods and procedures to be applied:	The net supply of power to the grid by the proposed project activity is measured through national standard electricity metering instruments. The metering instruments will be calibrated annually in accordance with the *"Technical administrative code of electric energy metering (DL/T448－2000)"*. The net amount of power supplied is measured and recorded monthly.
QA/QC procedures to be applied:	These data will be directly used for calculation of emission reductions. The records of the grid company (evidenced by sales records) will be cross-checked by readings recorded by the project entity
Any comment:	See also Section B.7.2 for more details

B.7.2 Description of the monitoring plan:

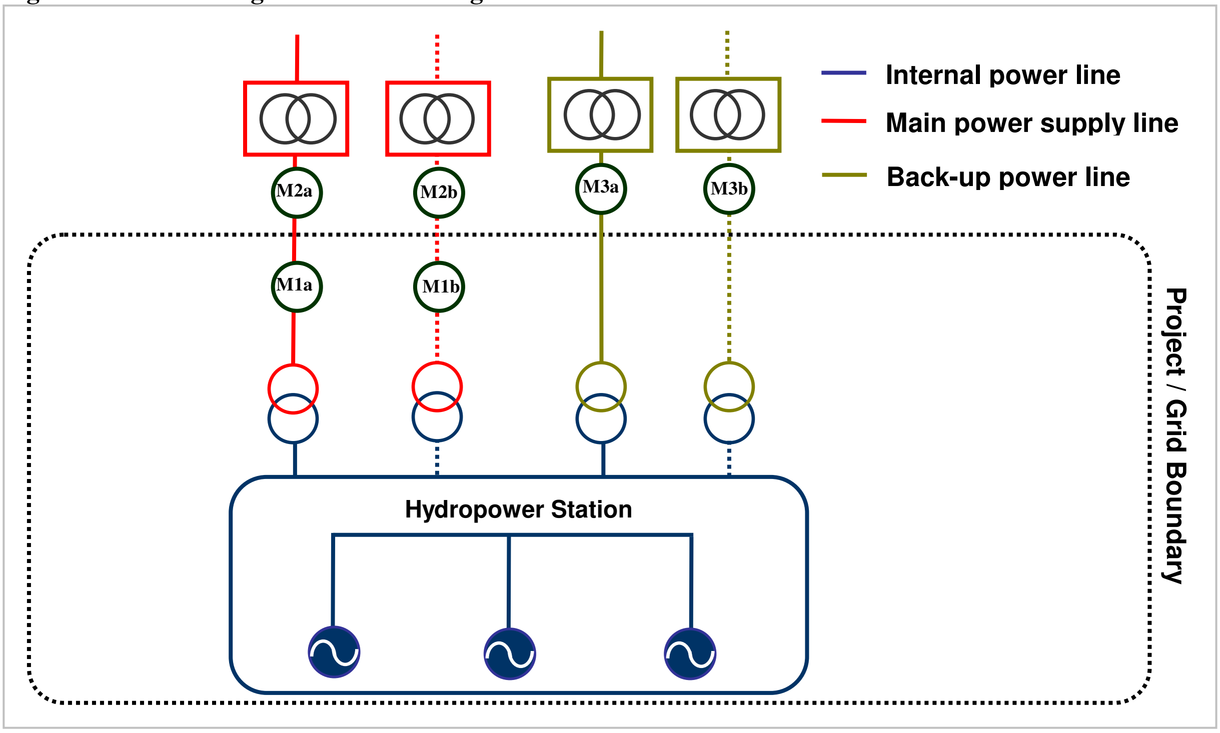
This monitoring plan outlines the principles which shall be followed in the monitoring of the parameters listed in section B.7.1. A monitoring manual with detailed procedures will be prepared on the basis of the principles outlined below. The monitoring manual may be updated to reflect the actual implementation of the project will not deviate from the monitoring plan as presented in this section.

Monitoring of net electricity supplied by the project to the grid

The proposed project activity is connected to the Gansu Provincial Power Grid through one or more on-site transformer stations. The project is connected to the Gansu Provincial Power Grid by a 35 kV line through the Tanggou 35kV Transformer Station and might in the future also connect to the grid through other main power lines. The project will furthermore be connected to at least one back-up power line to provide emergency power in case the project is not operational. An indicative grid connection diagram is provided in figure B.3.

The grid connection diagram indicates the principles for positioning of metering instruments that will be used in the monitoring of emission reductions. A separate monitoring manual is prepared with detailed procedures and a detailed grid connection diagram which is updated on the basis of the actual implementation of the project's grid connection and which will serve as the basis for periodic verification. The project entity will ensure that the actual implementation of grid connection will not deviate from the procedures outlined in this section.

Figure B.3 Indicative grid connection diagram



The project entity will meter electric power according to the following principles:

- **Power supplied to the grid through main power lines:**
  As indicated in Figure B.3 the project is connected by one or multiple main power supply lines (indicated in red) which will deliver power generated by the project to the grid. Net power supplied to the grid is metered as below:
  - Project entity: The power supplied to the grid is metered by the project entity at a point after power has been transformed to high voltage. Therefore, no further transformer losses will occur before the project is connected to the grid. The power supply of the project to the grid will be metered with standard electricity meters in accordance with national regulations. The metering instruments should record the net supply as the main power supply lines can transfer power in both directions. The

metering instruments may record either a net figure of power delivered to the grid or two readings, i.e. power delivered to the grid and power received from the grid.
- Grid company:
  The grid company will meter the power supply also at the high voltage side of the on-site transformer station with its own metering equipment. The regulations of the grid company require annual calibrations of both metering instruments.
- Calibration:
  Calibrations are carried out by the grid company or by a certified company appointed by the grid company. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, both instruments will be recalibrated.

- **Power received through back-up power lines:**
  As indicated in Figure B.3 the project is connected by one or multiple back-up emergency power lines (indicated in brown) which will deliver power from the grid to the project in case of emergencies or when the turbines of the proposed project activity are not in operation. Net power received from the grid is metered as below:
  - Grid company:
    The grid company will meter the power supplied to the project with its own metering equipment in accordance with national regulations.
  - Calibration:
    Calibrations are carried out by the grid company or by a certified company appointed by the grid company.

The project entity will collect the sales receipts for power supplied to the grid and billing receipts for power received from the grid as evidence. The net supply (i.e. gross supply minus supply by the grid to the project) will be used in the calculations of emission reductions. In case of discrepancies between the metering instruments of the grid company and the project entity, the readings of the grid company will prevail. All records of power delivered to the grid, sales receipts and the results of calibration will be collated in a central place by the project entity.

An overview of detailed information on minimum accuracy requirements of the metering instruments, measuring intervals, recording form, calibration and available documentation is provided in Table B.7.

Determination of net power supply:

Net electricity supplied to the grid by the project (EG_y in section B.7.1.) is calculated on a monthly basis as:

$$EG_y = ES_y - ED_y$$

With:
- ES_y, electricity supplied by the project through the main power line(s) (in MWh) metered by the grid company (evidenced by monthly sales receipts) and cross-checked against the readings of metering instruments of the project entity.
- ED_y, electricity delivered to the project through back-up power line(s) metered by the grid company (evidenced by monthly billing receipts).

Table B.7 Details of metering instruments

Meter	Operated by	Electronic measurement	Manual logging	Recording	Calibration	Accuracy	Documentation
$M1_x$	Project entity	Hourly	Daily (optional) [8]	Monthly	Grid Company (Annually)	Accuracy Class 1 or more accurate	Print out of electronic record and optional paper log. Data will consist of two readings, i.e. power delivered to the grid and power received from the grid or combined as net supply.
$M2_x$	Grid company	-	-	Monthly	Grid Company (Annually)	Accuracy Class 1 or more accurate	Monthly sales receipts (for power delivered to grid) and billing invoices (for power received from the grid), or alternatively a single receipt which shows net power received.
$M3_x$	Grid company	-	-	Monthly	Grid Company (Annually)	Accuracy Class 1 or more accurate	Monthly billing invoices (for power received from the grid).

[8] The project entity intends to log the readings of meters M1x and M1x manually in daily logs, but these logs will not form a formal requirement during verification. The ACM0002 methodology only requires hourly electronic measurement and these manual log records will only be maintained for back-up purposes. The project entity may deviate from this procedure during actual operation of the project.

Reporting, archiving and preparation for periodic verification

The project entity will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. The project entity will ensure that all required documentation is made available to the verifier. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

Damages to metering equipment:

In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the proposed project activity according to the following procedure:

1. **In case metering equipment operated by project entity is damaged only:**
   The metering data logged by the grid company, evidenced by sales receipts will be used as record of net power supplied to the grid for the days for which no record could be recorded.
2. **In case both metering equipment operated by project entity and grid company are damaged:**
   The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating
   ► the background to the damage to metering equipment
   ► the assumptions used to estimate net supply to the grid for the days for which no record could be recorded
   ► the estimation of power supplied to the grid
   The statement will be signed by both a representative of the project entity as well as a representative of the grid company.

The project entity will furthermore document all efforts taken to restore normal monitoring procedures.

Emergencies:

In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

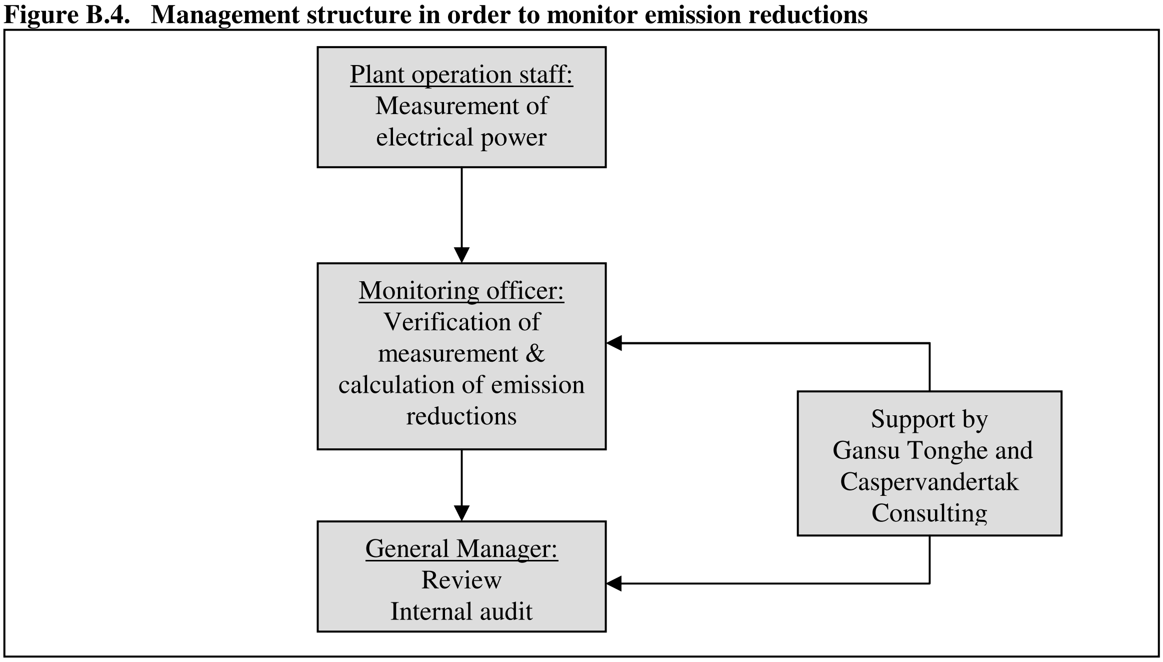
1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.4. The Director of the Safe Production Department will hold the overall responsibility for the monitoring process, but as indicated below parts of the process are delegated. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant operation staff.

The project owner will appoint a monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the hydropower plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the hydropower station including operating periods, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by the General Manager.

Figure B.4. Management structure in order to monitor emission reductions



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

Date of completion of the baseline study and monitoring methodology: 04/02/2008

Name of persons determining the baseline study and the monitoring methodology:

Caspervandertak Consulting

Tel: +86-10-84505756 / Fax: +86-10-84505758

-Meskes Berkouwer:	Consultant:	Meskes@caspervandertakconsulting.com
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-Christophe Assicot: Consultant: Christophe@caspervandertakconsulting.com
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Gansu Tonghe Investment Project Consulting Co., Ltd.

Tel: +86-931-8440722 / Fax: +86-931-8440721

-Zhao Yonghong: Consultant: mei.yang@126.com
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Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd. are both not project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/11/2007 (start of main construction activities)

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

25 years 0 months

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

C.2.1. Renewable crediting period

A renewable crediting period will be used.

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

01/11/2009

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Not applicable, a renewable crediting period will be applied.

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

An Environmental Impact Assessment (EIA) was carried out and was accepted by the Environmental Protection Bureau of Gansu Province in January 2006. A summary of the main findings of the EIA is provided below:

SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT

Feasibility of the plant location:
The proposed location is near Lujiawan Village (i.e. considered part of Dongheyan village) of the Datong River, which is 7km upstream of Liancheng Town. The geological condition is suitable for construction and the land which will be flooded by the project is limited. No local residents will be relocated. The design consists of a run-of-river hydropower station without regulation capacity. The reservoir storage capacity is 1.03 million m³, the installed capacity of the project is 12MW, the annual power generation is 57.16 million kWh. The construction of the project is in accordance with the development scheme of cascade hydropower stations of the Datonghe River reaches and applicable industry policies. Considering both the construction requirements and the environmental impacts, the location of the proposed project is reasonable and feasible.

Current environment quality condition:
The Gansu Yongdeng Liancheng 2nd Stage Hydropower Station Project is located at the lower reaches of the Datong River. The water catchment area is around 13,862 m² and the average annual rainfall is 420.4mm. The natural biological conditions in the project location are fine, but the large population in this area has caused some soil erosion and stress on the current biological conditions. The quality of the surface water of the river reaches in the proposed project area is fine and satisfies the standards for Ⅲ-style water in the "Environmental quality standards for surface water" (GB 3838-2002), except that the COD and ammonia nitrogen factor in the Liancheng and Xiangtang River sections exceeds the standard. 32 species of fish are present in the Datong River. The construction of several hydropower stations on the Datong River threatens the populations of fish in the lower and middle reaches of the Datong River. The proposed project is located northwest of a Ferro-alloy plant. The local residents (from Dongheyan village and Tanggou village) on both banks of the dam earn their living with agriculture. At the moment, the noise in the local area satisfies the Ⅱ-stage standards of "environment noise standards in urban areas" (GB3096-93).

Environment Impact Assessment:

1) The proposed project is located at the lower reaches of the Datong River in Liancheng Town of Yongdeng County in Gansu Province. The project is the first hydropower station belonging to the development scheme of cascade hydropower stations in the Datong River reaches between Gangzigou and Tanggou. The installed capacity of the project is 12MW, the annual power generation is 57.16 million kWh. The annual sales revenue of the electricity is around 13.6041 million RMB. Compared to the costs of occupying land, which is estimated to be 642,600 RMB, the project benefits are significantly larger than the economic losses due to the occupation of land by the project. The project will improve the quality of power supply to the local electric power system and ease the conflict between power supply and demand. Besides increasing the local

financial revenues of Yongdeng County, the project will also promote the local economy and industrial reforms in Yongdeng County (at the moment, the local economy is mainly based on agriculture and the secondary industry is not developed). Additionally, the project will promote sustainable development of the local economy, replacing coal and firewood with clean renewable energy. The project could employ around 20 staff members. In conclusion, the project has significant social, economic and environmental benefits.

2) The proposed project will occupy 6.1 ha of land, including 4.1 ha of permanently occupied land and 2 ha of temporary occupied. The total amount of land consists of 3.67 ha of plowland, 0.6 ha of overflow land, 1.6 ha of deserted land, and 0.2 ha of forest land. The project will have some impact on the environmental biology. Plants will be impacted by the land occupation and soil erosion will increase due to the generation of waste slag. Due to proper environmental protective measured taken during the construction process, the impact on vegetation and soil erosion will be reduced.
3) The proposed project adopts a design plan without regulation capacity. The reservoir storage capacity is 1.03 million m^3. The width of the reservoir is 88 meters and the length is 2.64 kilometers. The project is a small-scale (I stage) project which does not involve the relocation of local residents or houses. Only a small pump room will be displaced. The flooded area is 2.4 ha, including 2 ha of plow land, 0.2 ha of forest land, and 0.2 ha of unutilized land. The flooded plow land will have some negative impact on local agriculture. The project construction will not change the hydrological regime of the river. The flow of the river will not be impacted, so the impact on aquatic organisms and agricultural environment is small.
4) The total amount of excavated soil and stone is 64,800m^3. Around 22,600m^3 will be utilized and the remaining 42,200m^3 consist of waste soil and sand. The waste materials will be stocked in two designated areas; one on right bank and the other is on the left bank of the river. Around 18,100m^3 of waste materials will be stocked on the left bank, and around 24,200m^3 will be stocked on the right bank. To prevent additional soil erosion, the project will adopt a cascade protection wall to retain the waste. The waste slag will be compacted by rolling. The project will also undertake afforestation activities to minimize the impact on environment.
5) The total cost of prevention and restoration works due to the environmental impacts will be around 1.2347 million RMB, which accounts for 1.24% of the total project investment.

In conclusion, if the proposed project is properly designed (taking into account the environment impacts) and is constructed in accordance with necessary environmental measures, the project will have no significant impact on the environment. After investigation, it is clear that the local public supports the project. The construction of proposed hydropower station on the Datong River is feasible.

Recommendations:

- The project entity should emphasize the environmental protection work during the construction period and employ a qualified construction company to supervise the environmental work.
- The project entity should implement water & soil conservation works and undertake afforestation activities on land disturbed due to the construction works.

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:

The environmental impacts of the project are not considered significant by the Chinese government and the project participants. The Environmental Impact Assessment Form (EIA) was approved by the Environmental Protection Bureau of Gansu Province in January 2006.

SECTION E. Stakeholders' comments

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

During the preparation for Gansu Yongdeng Liancheng 2nd Stage Hydropower Station, local authorities held several meetings to discuss the impact of the project on stakeholders and agree on compensation. The project entity carried out a separate stakeholder consultation to confirm the impacts of the project on the relevant stakeholders. The consultation lasted for one month, from the 19th of September to the 19th of October 2006, and consisted of the following elements:

- **Establishment of a website:**
  The website (http://www.cdmasia.org/CDMprojects.htm) contained information on the project, CDM, the stakeholder consultation process and provided an opportunity to post comments by e-mail or by telephone.
- **Organization of a stakeholder consultation meeting on project site:**
  Date / time: 29th of September 2006, from 09:00 till 11:30.
  Location: Meeting room on the fifth floor of the administration building, northwest ferro-alloy plant, Yongdeng County of Lanzhou city, Gansu Province.

  Agenda of the meeting:
  - Opening of the meeting
  - Introduction of the project
  - Introduction of the Clean Development Mechanism
  - Explanation of the stakeholder consultation process
  - Round of comments by each participant
  - Further questions and answers
  - Closing of the meeting

To ensure wide participation of stakeholders, announcements of the stakeholder consultation meeting and website were made through the following channels:

- Newspaper announcement on September 19th, 2006 in the Gansu Daily (Gansu's leading daily newspaper)
- Online announcement on the Gansu Economic News Site: www.gsei.com.cn

In addition to the above announcements, important stakeholders received personal invitations to attend the meeting. See for attendance of the meeting Table E.1. A report of the main comments and outcomes of the meeting is provided in section E.2.

Table E.1. List of stakeholders that attended the stakeholder consultation meeting

No	Organization	Position / Occupation
1	Lanzhou Heqiao Guidian Resource Co., Ltd.	Project Manager
2	Development & Reform Commission, Yongdeng County	Vice Director
3	Development & Reform Commission, Yongdeng County	Section Chief
4	Environment Protection Bureau, Yongdeng County	General Director
5	Liancheng Town, Yongdeng County	Vice Leader of the Town
6	Liancheng Town, Yongdeng County	Director of the Economic Commission

7	Territory Resource, Yongdeng County	General Director
8	Territory Resource, Yongdeng County	Staff
9	Dongheyan Village, Liancheng Town	Secretary
10	Dongheyan Village, Liancheng Town	Village Leader
11	Dongheyan Village, Liancheng Town	Secretary
12	Dongheyan Village, Liancheng Town	Villager
13	Dongheyan Village, Liancheng Town	Villager
14	Tanggou Village, Yongdeng County	Secretary
15	Tanggou Village, Yongdeng County	Village Leader
16	Tanggou Village, Yongdeng County	Secretary
17	Tanggou Village, Yongdeng County	Villager
18	Tanggou Village, Yongdeng County	Villager

E.2. Summary of the comments received:

Comments received at stakeholder consultation meeting:

The project entity (Lanzhou Heqiao Guidian Resource Co., Ltd.) was represented by Mr. Jin Guoqing, the hydropower projects manager.

Attendants of the stakeholder consultation meeting are listed in table E.1 (names withheld for reasons of confidentiality). The majority of comments raised during the meeting express support for the project for its positive impact on economic development. Main issues brought forward concerned safety during construction period as well as compensation for expropriated land. Eventually, answers given by the project owner came forth as satisfactory.

An overview of the main comments/questions expressed during the meeting is provided below:

Name: Mr. Lai Fude
Position / Affiliation: Secretary, Tangou Village, Liancheng Town
Comments:
Mr. Lai supports the construction of the hydropower station, since the construction of the project will benefit local economic development. However, he expressed his concern about the safety measures during construction. He hopes the project will abide by the safety standards during construction and will choose experienced contractors.
Response by project entity:
Mr. Jin Guoqing explained that the project design was executed by a company that has Chinese government's "A" qualification and has acquired genuine experience in the field of hydropower stations. Furthermore, he ensured to take special attention to experience during contractors' selection process.

Name: Mr. Yang Xiang
Position / Affiliation: General Director, Territory Resource Bureau, Yongdeng County
Comments:
Mr. Yang said that the land expropriated by the project accounts for 24 hectares, including 22 hectares of plough land, which is not much. He added that expropriation policy is to compensate villagers with other parcels of land whenever possible. If no land is available, financial compensation

will be offered according to National standards. Another alternative is to provide permanent employment opportunity for expropriated villagers.

Name: Mr. Lu Jiaquan
Position / Affiliation: Secretary, Dongheyan village's committee
Comments:
Mr. Lu declared that all villagers are happy that the project will be constructed near their village. He said the project will not have negative impacts on their daily life. Therefore, Mr Lu supports the project. He thinks some employment opportunities will appear during construction.

Name: Mr. Wang Fuyao
Position / Affiliation: vice-director, Development & Reform commission, Yongdeng County
Comments:
Mr. Wang brought forward that the project would help promote local economy and benefit the local residents since it is a clean energy project.

Name: Mr. Li Tianchang
Position / Affiliation: Village leader, Tanggou village, Liancheng town
Comments:
Mr. Li explains that land expropriation won't affect villagers' daily life as most people work outside the village. 180 people are employed by the ferro-alloy factory. Revenues from agriculture have always been too low to rely on.

Other comments:
Other comments discussed by various people included:

- Support for the project, since the project will improve the reliability of the power supply
- Support for the project since fossil fuel power will be replaced by renewable energy, which in return will lead to less GHG emissions

Comments received through website:

No comments were received by e-mail through the stakeholder consultation website or by telephone.

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

Given the generally positive (or neutral) nature of the comments received, no action will been taken to solve the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Entity:

Organization:	Lanzhou Heqiaoguidian Resource Co., Ltd.
Street/P.O.Box:	475 Xijin east road of Qilihe district of Lanzhou City of Gansu Province
Building:	The 6th floor of No.4 building of Yineng Huanghe jiayuan
City:	Lanzhou City
State/Region:	Gansu Province
Postfix/ZIP:	730030
Country:	China
Telephone:	0931－7756121
FAX:	/
E-Mail:	/
URL:	http://www.gs-hq.com/
Represented by:	Jin Guoqing
Title:	/
Salutation:	Mr
Last Name:	Jin
Middle Name:	/
First Name:	Guoqing
Department:	/
Mobile:	13609308143
Direct FAX:	0931-7756776
Direct tel:	0931-7756121
Personal E-Mail:	jgq8143@126.com

The Purchasing Party:

Organization:	Daiwa Securities SMBC Principal Investments Co., Ltd.
Street/P.O.Box:	1-8-1, Marunouchi, Chiyoda-ku
Building:	/
City:	Tokyo
State/Region:	Tokyo
Postfix/ZIP:	100-8289
Country:	Japan
Telephone:	81-3-5533-6058
FAX:	/
E-Mail:	/
URL:	www.daiwasmbcpi.co.jp
Represented by:	Hiromasa Kawashima
Title:	Deputy General Manager
Salutation:	/
Last Name:	Kawashima
Middle Name:	/
First Name:	Hiromasa
Department:	Green House Gas Business Team
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Direct FAX:	+81-3-3286-1815
Direct tel:	+81-3-5533-6710
Personal E-Mail:	hiromasa.kawashima@daiwasmbc.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The Project does not receive any public funding from Annex I countries.

Annex 3

BASELINE INFORMATION

Our baseline calculation follows the methodology used in the OM and BM emission factors baseline calculation published by the office of national coordination committee on climate change on the Internet. Full information on this can be found at their website:

http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=2190

For more detailed information, please see:
-Baseline emission factors: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
-Calculation of OM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
-Calculation of BM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Note: Below we provide the main data used in the calculation of the baseline emission factor. Please note that all primary data are from the files downloaded and mentioned above, crosschecked against the data sources mentioned in these documents. For example, if we cite below the China Energy Statistical Yearbook, then that is the primary data source used in the published calculations. Where the primary data source differed from the data used in the calculation of the published emission factor, we have relied on the primary data source. Our calculation results in the same combined margin emission factor as can be calculated based on the published OM (1.1257) and BM (0.5739) emission factors.

Below we provide the main data used in the calculation of the baseline emission factor.

Table A1. Calculation of the Combined Margin Emission Factor

	Emission factor A	Value and Source B	Weight C	Weighted value D = B * C
1	EF_{OM}	1.12559	0.5	0.5628
		Table A2		
2	EF_{BM}	0.57399	0.5	0.2870
		Table A5, C		
3	CM			0.8498
				D1 + D2

Table A2. Calculation of the Operating Margin Emission Factor

	Variable	2003 A	2004 B	2005 C	Total D
1	Supply of thermal power to North West China grid (MWh)	105,651,775	122,605,243	125,496,682	353,753,700
		Table A3c, C6	Table A3b, C6	Table A3a, C6	D1 = A1 + B1 + C1
2	Imports of power from other grids (MWh)	0	0	0	0
		Files cited above	Files cited above	Files cited above	D2 = A2 + B2 + C2
3	Total power supply for calculation EF_{OM} (MWh)	105,651,775	122,605,243	125,496,682	353,753,700
		A3 = A1 + A2	B3 = B1 + B2	C3 = C1 + C2	D3 = D1 + D2
4	CO2 emissions associated with thermal power generation on North West China grid (tCO2)	112,051,963	138,705,098	147,425,979	398,183,040
		Table A4c, E	Table A4b, E	Table A4a, E	D4 = A4 + B4 + C4
5	CO2 emissions associated with power imports from other grids (tCO2)	0	0	0	0
		Table A9c, E	Table A9b, E	Table A9a, E	D5 = A5 + B5 + C5
6	Total CO2 emissions for calculation EF_{OM} (tCO2)	112,051,963	138,705,098	147,425,979	398,183,040
		A6 = A4 + A5	B6 = B4 + B5	C6 = C4 + C5	D6 = D4 + D5
7	EFOM (tCO2/MWh)	1.06058	1.13131	1.17474	1.12559
		A6 / A3	B6 / B3	C6 / C3	D6 / D3

Table A3a. Calculation of thermal power supply to North West China Grid, 2005

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
	Shaanxi	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	8.80	24,222,720
	Total			125,496,682
				C6 = C1 + C2 + C3 + C4 + C5

Source: Files mentioned above, original data are from China Electric Power Yearbook 2006, p. 559-560, 568.

Table A3b. Calculation of thermal power supply to North West China Grid, 2004

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Shaanxi	44,439,000	7.50	41,106,075
2	Gansu	33,242,000	6.21	31,177,672
3	Qinghai	6,208,000	7.96	5,713,843
4	Ningxia	25,298,000	5.45	23,919,259
5	Xinjiang	22,752,000	9.07	20,688,394
6	Total			122,605,243
				C6 = C1 + C2 + C3 + C4 + C5

Source: Files mentioned above, original data are from China Electric Power Yearbook 2005, p. 472-474.

Table A3c. Calculation of thermal power supply to North West China Grid, 2003

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Shaanxi	38,144,000	6.94	35,496,806
2	Gansu	29,494,000	6.35	27,621,131
3	Qinghai	6,446,000	4.5	6,155,930
4	Ningxia	19,175,000	5.25	18,168,313
5	Xinjiang	19,834,000	8.19	18,209,595
6	Total			105,651,775 C6 = C1 + C2 + C3 + C4 + C5

Source: Files mentioned above, original data are from China Electric Power Yearbook 2004, p. 670 and 709

Table A4a. Calculation of CO2 emissions from fuels for thermal power production, North West China Grid, 2005.

Fuel	Unit	Gansu	Shaanxi	Ningxia	Qinghai	Xinjiang	Northwest China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
							A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,597.00	2,461.28	1,467.70	345.1	1,358.09	7,229.17	209.08	1	25.8	142,985,522
Clean coal	10^4 Tons	0	16.22	0	0	0	16.22	263.44	1	25.8	404,225
Other washed coal	10^4 Tons	0	35.56	101.95	0	10.2	147.71	83.63	1	25.8	1,168,593
Coke	10^4 Tons	0	3.23	0	0	0	3.23	284.35	1	29.2	98,335
Coke oven gas	10^8 m^3	0	0	0	0	0	0.00	1672.6	1	12.1	0
Other gas	10^8 m^3	0	0	0	0	0	0.00	522.7	1	12.1	0
Crude oil	10^4 Tons	0	0	0	0	0.18	0.18	418.16	1	20.0	5,520
Gasoline	10^4 Tons	0	0.02	0	0	0.01	0.03	430.7	1	18.9	895
Diesel	10^4 Tons	0.46	2.24	0	0.06	0.5	3.26	426.52	1	20.2	102,986
Fuel oil	10^4 Tons	0.57	0.01	0	0	0.25	0.83	418.16	1	21.1	26,852
LPG	10^4 Tons	0	0	0	0	0	0.00	501.79	1	17.2	0
Refinery gas	10^4 Tons	0	0	0	0	7.71	7.71	460.55	1	15.7	204,410
Natural gas	10^8 m^3	0.52	1.46	0	1.33	7.81	11.12	3893.1	1	15.3	2,428,640
Other petroleum products	10^4 Tons	0	0	0	0	0	0.00	383.69	1	20.0	0
Other coking products	10^4 Tons	0	0	0	0	0	0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	1.3	8.24	0	0	0	9.54	292.7	1	0	0
Total											147,425,979
											$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2006. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A4b. Calculation of CO_2 emissions from fuels for thermal power production, North West China Grid, 2004.

Fuel	Unit	Gansu	Shaanxi	Ningxia	Qinghai	Xinjiang	Northwest China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
							A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,595.90	2,428.70	1,270.10	322.8	1,240.90	6,858.40	209.08	1	25.8	135,652,074
Clean coal	10^4 Tons	-	-	-	-		0.00	263.44	1	25.8	0
Other washed coal	10^4 Tons	-	-	102.64	-	10.5	113.14	83.63	1	25.8	895,096
Coke	10^4 Tons	-	0.78	-	-		0.78	284.35	1	29.2	23,747
Coke oven gas	10^8 m^3	0.3	-	-	-		0.30	1672.6	1	12.1	22,262
Other gas	10^8 m^3	1.26	0.74	-	-		2.00	522.7	1	12.1	46,381
Crude oil	10^4 Tons	-	0.01	-	-	0.06	0.07	418.16	1	20.0	2,147
Gasoline	10^4 Tons	-	0.02	-	-		0.02	430.7	1	18.9	597
Diesel	10^4 Tons	0.36	2.16	0.05	-	0.41	2.98	426.52	1	20.2	94,141
Fuel oil	10^4 Tons	0.69	0.01	-	-	0.3	1.00	418.16	1	21.1	32,352
LPG	10^4 Tons	-	-	-	-		0.00	501.79	1	17.2	0
Refinery gas	10^4 Tons	-	-	-	-	3.26	3.26	460.55	1	15.7	86,430
Natural gas	10^8 m^3	0.59	1.61	-	-	6.27	8.47	3893.1	1	15.3	1,849,873
Other petroleum products	10^4 Tons	-	-	-	-		0.00	383.69	1	20.0	0
Other coking products	10^4 Tons	-	-	-	-		0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	6.17	-	-	-	3.46	9.63	292.7	1	0	0
Total											138,705,098
											$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2005. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A4c. Calculation of CO2 emissions from fuels for thermal power production, North West China Grid, 2003.

Fuel	Unit	Gansu	Shaanxi	Ningxia	Qinghai	Xinjiang	Northwest China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
								(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
							A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	1,479.62	2,002.26	682	330.67	1,065.75	5,560.30	209.08	1	25.8	109,976,996
Clean coal	10^4 Tons	-	-	-	-		0.00	263.44	1	25.8	0
Other washed coal	10^4 Tons	-	-	27	-	3.64	30.64	83.63	1	25.8	242,405
Coke	10^4 Tons	-	-	-	-		0.00	284.35	1	29.2	0
Coke oven gas	10^8 m^3	1.54	-	-	-		1.54	1672.6	1	12.1	114,280
Other gas	10^8 m^3	0.12	-	-	-		0.12	522.7	1	12.1	2,783
Crude oil	10^4 Tons	-	-	-	-		0.00	418.16	1	20.0	0
Gasoline	10^4 Tons	-	-	-	-		0.00	430.7	1	18.9	0
Diesel	10^4 Tons	-	3.12	0.04	-	0.4	3.56	426.52	1	20.2	112,464
Fuel oil	10^4 Tons	1.19	-	-	-	1.02	2.21	418.16	1	21.1	71,497
LPG	10^4 Tons	-	-	-	-		0.00	501.79	1	17.2	0
Refinery gas	10^4 Tons	-	-	-	-	3.48	3.48	460.55	1	15.7	92,263
Natural gas	10^8 m^3	0.54	0.1	-	-	5.95	6.59	3893.1	1	15.3	1,439,275
Other petroleum products	10^4 Tons	-	-	-	-		0.00	383.69	1	20.0	0
Other coking products	10^4 Tons	-	-	-	-		0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	5.86	-	-	-	2.3	8.16	292.7	1	0	0
Total											112,051,963
											$\Sigma(E_i)$

Data source: Fuel consumption data are from China Energy Statistical Yearbook 2004. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A5. Calculation of the BM Emission Factor, North West China Grid

$EF_{thermal}$ (tCO2/MWh)	Share of thermal power in added capacity, 2005-2003	EF_{BM} (tCO2/MWh)
A	B	C = A * B
0.94107	60.99%	0.57399
Table A6	Table A9	

Table A6. Calculation of EF thermal

		λ A	EF_{adv} B	$EF_{thermal}$ calculation C = A * B
1	Coal	98.12%	0.95083	0.93297
		Table A8	Table A7	
2	Gas	1.79%	0.42450	0.00758
		Table A8	Table A7	
3	Oil	0.09%	0.56360	0.00052
		Table A8	Table A7	
4	$EF_{thermal}$			0.94107

Table A7. Calculation of Emission factors of fuel using advanced technologies

Fuel	Efficiency (%) A	Carbon coefficient (tc/TJ) B	Oxidation factor C	EF_{adv} (tCO2/MWh) D=(3.6/(A*1000))*B*C*44/12
		Table A8		
Coal	35.82%	25.80	1	0.9508
Gas	47.67%	15.33	1	0.4245
Oil	47.67%	20.35	1	0.5636

Source: Files downloaded and mentioned above. Carbon emission factors are from table A8.

Table A8. Calculation of λs for the calculation of the BM, North West China Grid.[9]

Fuel	Unit	Northwest China Grid	NCV	Total energy consumption	Oxidation factor	Carbon coefficient	CO2 emissions
			(TJ/unit)	(TJ)	(Fraction)	(TC/TJ)	(tCO2)
		A	B	C=A*B	D	E	E = A*B*D*E*44/12
Raw coal	10^4 Tons	7229.17	209.08	1,511,475	1	25.8	142,985,522
Clean coal	10^4 Tons	16.22	263.44	4,273	1	25.8	404,225
Other washed coal	10^4 Tons	147.71	83.63	12,353	1	25.8	1,168,593
Coke	10^4 Tons	3.23	284.35	918	1	29.2	98,335
Other coking products	10^4 Tons	0	284.35	0	1	25.8	0
Coal, total				***1,529,019***			***144,656,676***
Coke oven gas	10^8 m^3	0	1672.6	0	1	12.1	0
Other gas	10^8 m^3	0	522.7	0	1	12.1	0
LPG	10^4 Tons	0	501.79	0	1	17.2	0
Refinery gas	10^4 Tons	7.71	460.55	3,551	1	15.7	204,410
Natural gas	10^8 m^3	11.12	3893.1	43,291	1	15.3	2,428,640
Gas total				***46,842***			***2,633,050***
Crude oil	10^4 Tons	0.18	418.16	75	1	20	5,520
Gasoline	10^4 Tons	0.03	430.7	13	1	18.9	895
Diesel	10^4 Tons	3.26	426.52	1,390	1	20.2	102,986
Fuel oil	10^4 Tons	0.83	418.16	347	1	21.1	26,852

9 Data are from Table A4a.

Other petroleum products	10^4 Tons	0	383.69	0	1	20	0
Oil total				***1,826***			***136,253***
Total							***147,425,979***
							Σ(E_i)

Share of fuel group in total CO2 emissions	
λcoal	98.12%
λgas	1.79%
λoil	0.09%

Weighted average carbon emission factors (tc/TJ)	
Coal	25.80
Gas	15.33
Oil	20.35

Note: *λ is calculated as the share of coal, gas respectively oil in total CO_2 emissions.* The carbon emission factor of the fuel groups (coal, gas and oil) have been calculated as a weighted average with the share of the fuels in terms of energy contents as weights.

Table A9. Calculation of the share of thermal power in recently added capacity

Installed capacity	2003 A	2004 B	2005 C	Capacity added in 2003-2005 D=C-A	Share in added capacity
Thermal (MW)	20492.7	22247.5	25362.6	4869.9	60.99%
Hydropower (MW)	9382	10835.2	12219.8	2837.8	35.54%
Nuclear (MW)	0	0	0	0	0.00%
Other (MW)	122.9	276	399.5	276.6	3.46%
				0	
Total (MW)	29997.6	33358.7	37981.9	7984.3	100.00%
Percentage of 2005 capacity	78.98%	87.83%	100%		

Source: China Electric Power Yearbook 2006, p. 571; China Electric Power Yearbook 2005, p. 473; and China Electric Power Yearbook 2004, p. 670, p.709

Annex 4

MONITORING INFORMATION

Selection procedure:
The monitoring officer will be appointed by the general manager of Lanzhou Heqiaoguidian Resource Co., Ltd. The monitoring officer will be selected from among the senior technical or managerial staff. Before he/she commences monitoring duties, he/she will receive training on monitoring requirements and procedures by Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd. Because the project will not start operations in the near future, the monitoring officer has not been appointed yet.

Tasks and responsibilities:
The monitoring officer will be responsible for carrying out the following tasks

- **Supervise and verify metering and recording:**
  The monitoring officer will coordinate with the plant manager to ensure and verify adequate metering and recording of data, including power delivered to the grid.
- **Collection of additional data, sales / billing receipts:**
  The monitoring officer will collect sales receipts for power delivered to the grid, billing receipts for power delivered by the grid to the hydropower station and additional data such as the daily operational reports of the hydropower station.
- **Calculation of emission reductions:**
  The monitoring officer will calculate the annual emission reductions on the basis of net power supply to the grid. The monitoring officer will be provided with a calculation template in electronic form by the project's CDM advisors.
- **Preparation of monitoring report:**
  The monitoring officer will annually prepare a monitoring report which will include among others a summary of daily operations, metering values of power supplied to and received from the grid, copies of sales/billing receipts, a report on calibration and a calculation of emission reductions.

Support:
The monitoring officer will receive support from Caspervandertak Consulting and Gansu Tonghe Investment Project Consulting Co., Ltd in his/her responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions
- Continuous advice to the monitoring officer on a need basis
- Review of monitoring report