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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Sandaowan Hydropower Project in Gansu Province, P.R. China
Version: 3.3
Date: November 30, 2007

A.2. Description of the project activity:

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Sandaowan Hydropower Project (hereinafter referred to as this project) is located in the middle of the upper reaches of the Heihe River within the territory of Su'nan Yugu Autonomous County and about 150 km far from Zhangye City in Gansu Province, China. It has a total installed capacity of 112 megawatts (MW) and is expected to generate annually 400.3 gigawatt-hours (GWh) electricity and supply annually 380.5 GWh electricity to the Northwest Power Grid of China (NWPG) to which the project is connected through Gansu Provincial Power Grid.

Electricity generated by the project activity will displace part of the electricity from the NWPG which is dominated by coal-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are 320,000 tCO_2e.

As a renewable power project, this project will produce positive environmental benefits and contribute to the local sustainable development in the following aspects:

- To be consistent with China's national energy policy and the country's Western Development Strategy, and to alleviate power shortage in the local areas;
- To displace part of the electricity supplied by NWPG which is dominated by coal-fired power plants, and thus to avoid environmental pollution caused by coal burning.
- To create new job opportunities for the local people: 1564 jobs at most will be available during the construction period and 60 permanent jobs during the operation time.
- To increase the income of local governments and residents, and thus to alleviate poverty in Su'nan Yugu Autonomous County, where the project is located and which is one of the poorest areas in Gansu Province.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Gansu Xixing Energy Investment Co., Ltd (project owner and operator)	Yes

For detailed information, please refer to Annex I.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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P.R. China

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

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Gansu Province

A.4.1.3. City/Town/Community etc:

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Yangge Town, Su'nan Yugu Autonomous County, Zhangye City

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

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This project activity is located in the middle of the upper reaches of the Heihe River, within the territory of Su'nan Yugu Autonomous County of Gansu Province, approximately 150 km far from Zhangye City. It will utilize water resource between 2.5 kilometres lower of Jiadaogou and Liushuyuan of the Heihe River, an about 21 km long area. The geographical coordinates of the project are east longitude of 99°59′00″ and north attitude of 38°30′2″, as shown in figure 1.

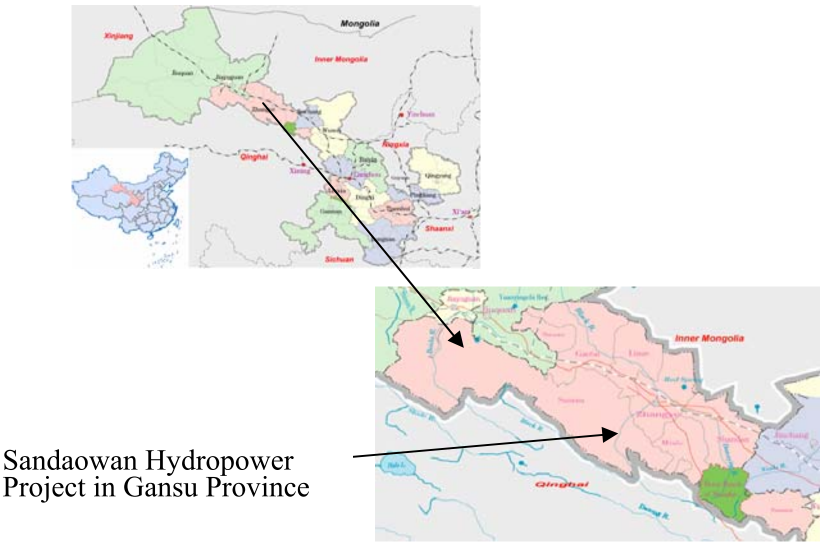

Figure 1. Location of Sandaowan Hydropower Project

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

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Category 1: energy industries (renewable sources)

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

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This project has a total install capacity of 112MW (2×45 + 1×22 MW) and a designed operation life of 30 years.

The project is consisted of a diversion weir, a penstock, high pressure pipelines, a power station and a step-up substation. Through the penstock, a water head is formed taking advantage of the natural height drop, which then enters into the pressure adjustment well. The hydraulic pressure of the water is increased through high pressure pipeline, and then the water flows into the power station and drives the generator to produce electricity. Finally, voltage of the generated electricity is increased to 110 kV through the step-up substation and the electricity is delivered to the NWPG.

The diversion weir capacity of this project activity is 4.56 million m^3 and the surface area at full reservoir level is 327,000 m^2, thus the power density of this project activity is 342.5 W/m^2. The high pressure pipeline is 9.3 km long. The utilized water head is 136.5 meters and the rated feed water flow is 98 m^3/s.

The hydro turbine used in this project activity is HL150A type and the generator used is SF45 type. Both the hydro turbine and the generator are domestic technologies and no technology will be transferred to China through this project activity.

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

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Renewable crediting period has been chosen for this project activity and the starting date of the first crediting period is estimated to be May 1, 2008. The estimated annual emission reductions during the first crediting period are estimated to be 320,000 CO_2 e.

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2008 (5-12)	213,334
2009	320,000
2010	320,000
2011	320,000
2012	320,000
2013	320,000
2014	320,000
2015 (1-4)	106,666
Total estimated reductions(tonnes of CO_2 e) (7 years)	2,240,000
Total number of the crediting years	7
Annual average over the first crediting period of estimated reductions (tonnes of CO_2 e)	320,000

A.4.5. Public funding of the project activity:

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No public funding is involved in this project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Version 06 of the approved methodology ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable source" and Version 03 of "Tool for the Demonstration and Assessment of Additionality" are used. For more information, please refer to the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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ACM0002 (Version 06) is applicable to this project for the following reasons:

- This project activity is a grid-connected (connected to Northwest China Power Grid through Gansu Provincial Grid) hydro power project;
- The power density of this project activity is 342.5 W/m^2, much greater than 4 W/m^2;
- This project activity does not involve switching from fossil fuels to renewable energy at the project site;
- The power grid is clearly identified as the Northwest China Power Grid of which information on the characteristics is publicly available.

To conclude, ACM0002 (Version 06) is applicable to this project activity.

According to ACM0002 (Version 06), the latest version (version 3) of "Tool for the Demonstration and Assessment of Additionality" approved by the EB is used in this project activity.

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

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	Source	Gas	Included?	Justification/Explanation
Baseline	Power generation by NWPG	CO_2	Yes	Main emissions source.
		CH_4	No	Excluded from simplification. This is conservative.
		N_2O	No	Excluded from simplification. This is conservative.
Project Activity	Emission from reservoir	CO_2	No	In accordance with the methodology, excluded from simplification.
		CH_4	No	The power intensity of this project activity is 342.5W/m2, greater than 10 W/m^2. According to the methodology, it is not necessary to consider emission from reservoir.
		N_2O	No	In accordance with the methodology, excluded from simplification.

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

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To provide the same service, the possible alternatives to this project activity may include:

1) This project activity is undertaken not as a CDM project activity;
2) Grid-connected power projects utilizing other renewable sources (wind, biomass) supply the same amount of electricity as this project activity;
3) Grid-connected fossil fuel-fired power plant supplying the same annual amount of electricity are built;
4) NWPG provides the same amount of electricity as this project activity.

Without the income from CERs, the financial internal rate of return (FIRR) of total investment of this project activity is lower than the benchmark FIRR and thus the project not undertaken as CDM project is not financially feasible. Then alternative 1) is excluded (for detailed analysis, please refer to Step 1b of B5).

Currently, all wind power projects in Gansu Province, where this project is located, are developed under CDM, so it is very clear that wind power project is not financially viable without the support of CDM in Gansu. Up to now, there's no biomass power project in Gansu Province and it is thus clear that biomass power project faces prohibitive barriers in Gansu. Therefore, alternative 2) is not viable.

Alternative 3) is not consistent with China's relevant laws and regulations, and thus is excluded (for detailed analysis, please refer to Step 2 of B5).

Thus the NWPG as the provider for the same capacity and electricity output as the proposed project is selected as the baseline scenario in this PDD.

Therefore, alternative 4) (NWPG provides the same amount of electricity as this project activity) is the baseline scenario of this project activity.

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

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According to ACM0002 (Version 06), Version 03 of "Tools for the demonstration and assessment of additionality" is used to demonstrate the additionality of this project activity.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

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

Possible alternatives to the project may include:

1) This project activity is undertaken not as a CDM project activity;
2) Grid-connected power projects utilizing other renewable sources (wind, biomass) supply the same amount of electricity as this project activity;
3) Grid-connected fossil fuel-fired power plant supplying the same annual amount of electricity are built;

4) NWPG provides the same amount of electricity as this project activity.

Currently, all wind power projects in Gansu Province, where this project is located, are developed under CDM, so it is very clear that wind power project is not financially viable without the support of CDM in Gansu. Up to now, there's no biomass power project in Gansu Province and it is thus clear that biomass power project faces prohibitive barriers in Gansu. Therefore, alternative 2) is not viable.

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

Considering that the annual operating hours of fossil fuel-fired power plants and hydro power project and quite different, fossil fuel-fired power plants supplying the same annual amount of electricity will have installed capacity much less than 100MW. According to China's relevant laws and regulations, it is forbidden to build coal-fired power plants with installed capacity of 135MW within regions covered by large power grid, and the building of fossil fuel-fired power plants with unit capacity below 100MW is strictly controlled[1]. Therefore, alternative 3) is not consistent with China's relevant laws and regulations and is thus excluded.

Both alternative 1) and alternative 4) are consistent with China's relevant laws and regulations. Furthermore, alternative 1) is not a compulsory requirement by relevant laws and regulations.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

In "Tools for the demonstration and assessment of additionality" (V3), three options are given for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.

The simple cost analysis is not applicable for the proposed project because the project activity will produce economic benefit (from electricity sale) other than CERs income. The investment comparison analysis is also not applicable for the proposed project because the other possible alternative 4) is not a specific investment choice. The benchmark analysis is thus used for investment analysis, and the Financial Internal Return Rate (FIRR) for total investment is used to analyze whether this project activity is financially feasible or not.

Sub-step 2b. Apply benchmark analysis

According to the "Interim Measures for the Economic Evaluation of Renovation of Power Project" formulated by the State Power Corporation, the benchmark FIRR on total investment for projects within the power sector is 8%. Therefore, this indicator is selected to evaluation the financial performance of this project activity.

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

Table 1: Main financial parameters of the project

Items	Unit	Value	Source
Installed Capacity	MW	112	Feasibility Study Report (FSR)
Total Investment	Million Yuan	700.46	FSR
Annual operation and maintenance cost	Million Yuan	13.53	FSR

[1] "Notice by the Office of the State Council on Forbidding the Building of Fossil Fuel-Fired Power Plants with Capacity of and below 135MW", The Office of the State Council 2002-6; "Interim Measures on the Building of Fossil Fuel-Fired Power Plants" (1997.8).

Annual output	GWh/year	380.5	FSR
Feed-in Tariff (Excluding VAT)	Yuan/kWh	0.227	National policy
Value Added Tax (VAT)	%	17	FSR
Income tax	%	33	FSR
Project life time	Years	30	FSR

Without income from CERs sales, the FIRR of total investment of the proposed project is 6.39%, lower than the 8% benchmark FIRR, so the project activity is not economically feasible.

Sub-step 2d. Sensitivity analysis

Three factors are considered in the following sensitivity analysis:

1) Total investment.

2) Annual operation and maintenance cost.

3) Annual output.

The feed-in tariff is not considered in the sensitivity analysis because it is regulated by the relevant authorities and cannot be changed once approved.

Assuming the above three factors vary in the range of -10%-+10%, the FIRR of the proposed project (without income from CERs sales) varies to different extent, as shown in Figure 2. It can be seen that when they vary within the range of -10%-+10%, the FIRR of this project activity is always below 8% and is thus not economically feasible.

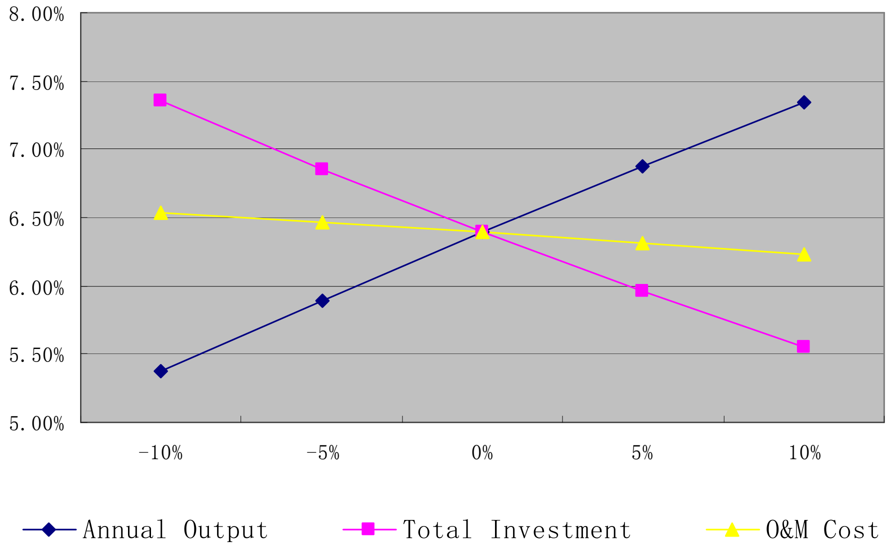

Figure 2: Sensitivity Analysis of the Project

To conclude, without the income from CERs sales, the project is not financially attractive, thus the project owner will choose not to implement this project activity and the electricity will be supplied by the NWPG.

Step 4. Common practice analysis

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

Hydro power plants with an installed capacity above 50MW built in Gansu Province while not implemented as CDM projects since 2000 are listed in the following table.

Table: Hydropower Projects (above 50 MW) Developed since 2000 in Gansu Province

Name	Project Owner	Commissioning time	Installed capacity	Memo
Longshou II	Hexi Hydropower Development Company	2004	157MW	Controlled by Gansu Electricity Investment Company (Provincial level)
Xiaoxia	Xiaoxia Hydropower Development Ltd.	2004	230MW	China Electricity Power Ltd. (State level)
Caijiaxia	Gansu Caijiaxia Hydropower	2004	96 MW	Gansu Mingzhu Group (Provincial level)
Qilinsi	Gansu Datang Bailongjiang Power Ltd	2005	150 MW	Controlled by China Datang Group (State level)

Data Source: Gansu Statistics Yearbook 2005; "New Construction Project in Gansu Province in 2006", 01/06/2006, Gansu Economic Daily.

It can be seen that all of the four hydropower projects listed above were developed by state-owned big electricity investment companies and thus the development of a hydropower project with installed capacity of above 50MW by a small county-level hydropower company is not a common practice.

Sub-step 4b. Discuss any similar options that accruing

There are essential distinctions between this project and the other already existing hydropower project with installed capacity of above 50MW in Gansu Province. All of the similar projects are developed by large state-owned companies who have easier access to finance, have stronger ability against project and financial risk and stronger negotiating power against the grid company. The owner of this project, as a county-level developer, has however very limited financial capacity and thus weak ability to deal with the project risk and weak negotiating power.

Furthermore, the feed-in tariff of Longshou II Project is 0.262 yuan/kWh and that of Xiaoxia Project is 0.293 yuan/kWh[2], about 16% and 29% higher than the feed-in tariff of this project respectively; and their annual operating hours are 3850 hours/year[3] and 4156 hours/year[4] respectively, also higher than that of this project (3574 hours/year). As for the Caijiaxia Project and Qilinsi Project, their feed-in tariffs are the same as that of this project; however, their annual operating hours are 5116 hours/year and 4017

[2] Gansu Provincial Price Bureau, *Approval of the Feed-in Tariffs for Some Hydro Power Projects in Gansu Province.*

[3] Approval of the feasibility study of Longshou II Project by Gansu Provincial Development and Reform Commission.

[4] http://video.zhulong.com/shipin/detail.asp?id=196286, http://www.freshpower.cn/news/news_detail.asp?NewsId=14791.

hours/year[5] respectively, about 43% and 12% than the annual operating hours of this project (3574 hours/year).

It can be seen obviously that the other fours projects enjoy either substantial higher feed-in price or better water resources and thus there are essential differences between this project and the other four similar projects. Therefore, this project is not a common practice.

To conclude, the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Step 0: Grid Boundary Selection

According to the version 06 of ACM0002, for the purpose of determining the build margin (BM) and operating margin (OM) emission factor, a (regional) project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Similarly, a connected electricity system, e.g. national or international, is defined as a (regional) electricity system that is connected by transmission lines to the project electricity system and in which power plants can be dispatched without significant transmission constraints. In determining the project electricity system, project participants should justify their assumptions. When the application of this methodology does not result in a clear gird boundary, the following choices could be adopted:

(a) Use the delineation of grid boundaries as provided by the DNA of the host country if available; or
(b) Use, where DNA guidance is not available, the following definition of boundary: In large countries with layered dispatch systems (e.g. state/provincial/regional/national) the regional grid definition should be used. A state/provincial grid definition may indeed in many cases be too narrow given significant electricity trade among states/provinces that might be affected, directly or indirectly, by a CDM project activity; In other countries, the national (or other largest) grid definition should be used by default.

The Chinese DNA has given its guidance for the grid boundary selection (see also: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1053.pdf), the NWPG is selected as the grid boundary.

Step 1: Baseline Emission Calculation

Sub-step 1a: Calculate the Operating Margin emission factor ($EF_{OM,y}$)

According to The Methodology, four alternatives could be used to calculate the OM:
a) Simple OM
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

Dispatch data analysis should be the first methodological choice. Where this option is not selected project participants shall justify why and may use the simple OM, the simple adjusted OM or the average

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[5] http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?id=116142; http://news.ieicn.com/4854.html; http://www.gcxm.com.cn/info0.php?id=40314&keyword=; http://www.freshpower.cn/news/news_detail.asp?NewsId=15138.

emission rate method taking into account the provisions outlined hereafter.

The Simple OM method (a) can only be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production.

The average emission rate method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply option (b) is not available, and where detailed data to apply option (c) above is unavailable.

The Simple OM, simple-adjusted OM, and average OM emission factors can be calculated using either of the two following data vintages for years(s) y:

- (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

For the project, the simple Operating Margin emission factor was chosen based on the following two reasons:

1. In China, the State Grid Corporation runs the interregional dispatch system, and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2. For the most recent 5 years (2000-2004), the low-cost/must run resources constitute less than 50% of total generation of Northwest Power Grid: 32.3%, 27.1%, 23.8%, 19.3% and 22.12% for 2000, 2001, 2002, 2003 and 2004.

As a result, the simple OM method can be used.

The OM in this PDD is calculated ex-ante based on the most recent 3 years (2002-2004) data.

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

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

Where,

$F_{i,j,y}$ is the amount of fuel i consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources j in years y,

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in years y, and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

In China Electric Power Yearbook and other data resources, only generation data are available. The generation from source *j* can be translated into electricity delivered to the grid by source *j* by the following formulation:

$$GEN_{j,y}=G_{j,y} \times (1-e_{j,y}), \quad (1)$$

Where $G_{j,y}$ is the amount of generation (in MWh) by source *j* in year *y*; $e_{j,y}$ is station service power consumption rate of source *j* in year *y*

The CO_2 emission coefficient of fuel *i* consumed by source *j* $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i \times 44/12 \quad (3)$$

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i* (national data from China Energy Statistical Yearbook are used),
$OXID_i$ is the oxidation factor of the fuel (default values from the 1996 Revised IPCC Guidelines are used since local and national data are not available),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i* (default values from the 1996 Revised IPCC Guidelines are used since local and national data are not available).

The Simple OM emission factor is calculated *ex ante* as a 3-year average (2002-2004), based on the most recent statistics available:

Sub-step 1b. Calculate the Build Margin emission factor ($EF_{BM,y}$)

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

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \quad (4)$$

Where

$F_{i,m,y}$ is the amount of fuel *i* (tce) consumed by plant *m* in year *y*.

$COEF_{i,m,y}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*.

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m*, equals to generation minus plant self consumption:

Project participants shall choose between one of the following two options.

Option 1. Calculate the Build Margin emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2. For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

In this PDD, the BM is determined ex-ante based on option 1.

Because project-level data are not publicly available, at present it is not possible to know how much generation of Northwest Power Grid was from the newly built power plant and to find the exact newly built plants which comprise the 20% of the system generation. According to the EB's guidance on DNV's Request for clarification on use of approved methodology AM0005 for several projects in China, the EB accepted the following deviation[6]:

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

- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

From the above EB guidance, it can be seen that Board accepted the proposed method used for calculation of the BM emission coefficient.

Although the request for deviation was related to AM0005 and AMS-I.D, the deviation is also clearly applicable to ACM0002 for the following reasons:

- AM0005 was valid from 14 April 2004 to 2 March 2006 and after this period, it was replaced by ACM0002.
- The calculation procedure of OM and BM in ACM0002 is the same as that described in AM0005.

Because it is not possible to distinguish power capacities for coal-fired, oil-fired and gas-fired power plants from the current statistical data for fossil fuel-fired power capacity, following method is used to calculate BM. First, calculate the respective ratios of CO_2 emissions from coal, oil and gas combustion for power generation in the whole emissions from fossil fuels combustion for power generation; secondly, based on the these ratios and the emission factors of the most advanced and commercially available power technologies, calculate the emission factor of fossil fuel-fired power generation; thirdly, calculate BM by multiplying this emission factor and the ratio of fossil fuel-fired power capacity in the whole newly increased 20% capacity. The detailed calculation process is described in annex 3.

Sub-step 1c. Calculate the Baseline emission factor (EF_y)

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

$$EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y} , \quad (5)$$

Where the weight w_{OM} and w_{BM} by default, are 50%.

Sub-step 1d. Calculate the Baseline emission (BE_y)

The baseline emissions are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity (EG_y in MWh), then

$$BE_y = EG_y \times EF_y , \quad (6)$$

[6] http://cdm.unfccc.int/Projects/Deviations

Step 2. Calculate Project Emission

According to The Methodology, the new hydro electric power projects with reservoirs should account for project emissions estimated as follows:

a) If the power density of project is greater than $4W/m^2$ and less than or equal to $10\ W/m^2$, the project emission should be accounted based on relevant formula in The Methodology.

b) If the power density of project is greater than $10W/m^2$, then $PE_y=0$.

The power density of the proposed project is much larger than $10W/m^2$, then the project emission is zero.

Step 3. Leakage

According to The Methodology, project participants do not need to consider leakage in applying this methodology, then $L_y=0$.

Step 4. Calculate Emission Reduction

The emission reduction ER_y by the proposed project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y) as follows:

$$ER_y=BE_y-PE_y-L_y \quad (7)$$

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mt, Mm^3
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data used:	China Energy Statistical Yearbook (2000~2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

Data / Parameter:	NCV_i
Data unit:	*TJ/ mass or volume unit of a fuel*
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook (2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	National and official data
Any comment:	

Data / Parameter:	$\boldsymbol{OXID_i}$
Data unit:	%
Description:	the oxidation factor of the fuel *i*
Source of data used:	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	see Annex3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	National data not available, so IPCC default values are used.
Any comment:	

Data / Parameter:	$\boldsymbol{EF_{CO2,i}}$
Data unit:	tCO_2e/TJ
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	see Annex3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	National data not available, so IPCC default values are used.
Any comment:	

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	the amount of electricity generation by source *j* in year *y*
Source of data used:	China Electric Power Yearbook (2000~2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

Data / Parameter:	$e_{j,y}$
Data unit:	%
Description:	station service power consumption rate of source *j* in year *y*
Source of data used:	See Annex 3 for details
Value applied:	Official statistical data
Justification of the choice of data or description of measurement methods	China Energy Statistical Yearbook (2000~2005)

and procedures actually applied :	
Any comment:	

Data / Parameter:	$EE_{coal,adv}$
Data unit:	%
Description:	Efficiency of most advanced coal-fired power technology that is commercially available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value applied:	36.53
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics of state power authority
Any comment:	

Data / Parameter:	$EE_{oil,adv}$
Data unit:	%
Description:	Efficiency of most advanced oil-fired power technology that is commercially available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value applied:	45.87
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics of state power authority
Any comment:	

Data / Parameter:	$EE_{gas,adv}$
Data unit:	%
Description:	Efficiency of most advanced gas-fired power technology that is commercially available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value applied:	45.87
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics of state power authority
Any comment:	

Data / Parameter:	$CAP_{,j,y}$
Data unit:	MW
Description:	Installed capacity of source *j* in year *y* in Northwest Power Grid
Source of data used:	China Energy Statistical Yearbook (2000~2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Project emissions:

The power intensity of this project is 342.5 W/m^2, much greater than 10 W/m^2, so PE_y=0 tCO_2.

Leakage

According to ACM0002, the leakage of this project is 0, i.e. L_y=0 tCO_2.

Baseline Emissions

According to the procedures described in section B.6.1 and the data listed in annex 3, the OM of Northwest Power Grid is 1.0329 tCO_2/MWh and the BM is 0.6491 tCO_2/MWh.

The baseline emission factor is calculated as the 50/50 weighted sum of OM and BM: EF_y=(1.0329+0.6491)/2=0.841 tCO_2/MWh.

The baseline emissions are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity (EG_y in MWh). The annual electricity delivered by the proposed project is estimated as 380500 MWh/year and will be monitored ex-post.

Then the baseline emissions are: $BE_y=EG_y \times EF_y$=380500×0.841=320,000 tCO_2.

Emission Reductions

The emission reduction of the project is: $ER_y=BE_y - PE_y - L_y$=320,000-0-0=320,000 tCO_2.

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

Year	**Estimation of Project activity Emission (tonnes of CO_2e)**	**Estimation of baseline emission (tonnes of CO_2 e)**	**Estimation of leakage (tonnes of CO2e)**	**Estimation of Emission reductions (tonnes of CO_2 e)**
2008 (5-12)	0	213,334	0	213,334
2009	0	320,000	0	320,000
2010	0	320,000	0	320,000

2011	0	320,000	0	320,000
2012	0	320,000	0	320,000
2013	0	320,000	0	320,000
2014	0	320,000	0	320,000
2015 (1-4)	0	106,666	0	106,666
Total (t CO_2e)	0	**2,240,000**	0	**2,240,000**

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

B.7.1 Data and parameters monitored:

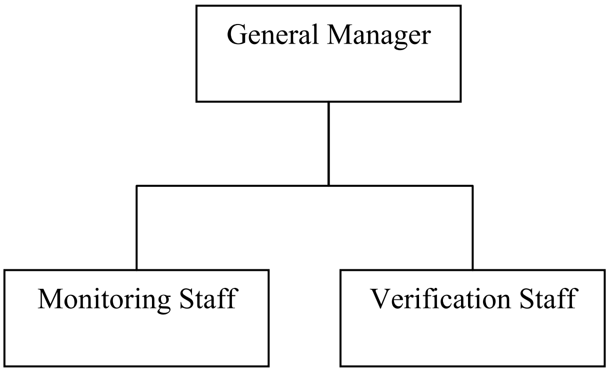
Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Annual electricity delivered to the grid by the proposed project, measured at the exit of Heihe Electric Substation
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	380,500
Description of measurement methods and procedures to be applied:	This parameter will be hourly measured and monthly recorded. The relevant data will be kept during the crediting period and two years after. The electricity meter will be operated by the power distribution company and adjusted according to relevant national standard including “Technical administrative code of electric energy metering” DL/T 448-2000, “Verification regulation of electric energy metering appliance” SD 109-83, “Electricity Law”, “Metrology law of the PR China”. The accuracy of the electric meter is 0.5s and will be calibrate annually.
QA/QC procedures to be applied:	This data is monitored through the ammeter, and rechecked by comparing with the electricity sales receipt from power corporation.
Any comment:	

Data / Parameter:	**Area**
Data unit:	km^2
Description:	Surface area at full reservoir level
Source of data to be used:	Reservoir map
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.327
Description of	This variable will be measured through reservoir map once at the start of the

measurement methods and procedures to be applied:	project activity.
QA/QC procedures to be applied:	The QA/QC procedure is not necessary because the official or professional map will be used for such calculation.
Any comment:	

B.7.2 Description of the monitoring plan:

This monitoring plan will be implemented by professional staff authorized by the project sponsor. The management structure is illustrated as follows:



This monitoring plan includes the management and implementation structures of monitoring activity, parameter to be monitored and quality control process.

Management and implementation structure for monitoring plan

This monitoring plan will be implemented by professional staff authorized by the project sponsor.

Parameter to be monitored

Please refer to B.7 of this PDD.

Quality Control

Firstly, the project owner and Gansu Provincial Electric Power Company will identify jointly the exact points at which the amount of electricity delivered to the electric grid will be measured.

Secondly, the amount of electricity that has been delivered by the project to the electric grid will be recorded every month jointly by designated staff of project sponsor and Gansu Provincial Electric Power Company. After that, Gansu Provincial Electric Power Company will pay to project sponsor a certain period and project sponsor will give corresponding receipt.

Thirdly, the installation and calibration of related kilowatt-hour meters will be in compliance with the regulations of State Electricity Regulatory Commission and relevant articles in the power purchase agreement.

Procedures for ensuring effective monitoring of the proposed project are described in a document "CDM Project Management and Operating Procedures" that the Project Company will utilize. The document contains the following sections:

Chap 1 Introduction

Chap 2 Overall Project Management

Chap 3 CDM Project Management and Calculations

Sec 3.1 Data to be monitored and recorded

Sec 3.2 Emissions Reduction Calculation for the Project

Chap 4 Procedures to be followed

4.1 Monitoring Procedures

4.2 Calibration Procedures

4.3 Maintenance Procedures

4.4 Procedure for Training of Personnel engaged in the MVP

Chap 5 Records Keeping, Error Handling and Reporting Procedures

5.1 Records Keeping and Internal Reporting Procedure

5.2 Error Handling Procedure

5.3 External Reporting Procedure

5.4 Procedure for corrective actions arising

5.5 Change of CDM Manager

Chap 6 Confirmation of the adoption of these CDM Operating Procedure.

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

The baseline study of the proposed project activity was completed on January 20, 2007.

Names of the persons determining the baseline:

Dr Maosheng DUAN, Institute of Nuclear and New Energy Technology, Tsinghua University.

Dr Fei TENG, Institute of Nuclear and New Energy Technology, Tsinghua University.

Dr Sheng ZHOU, Institute of Nuclear and New Energy Technology, Tsinghua University.

Email: duanmsh@mail.tsinghua.edu.cn; tengfei@tsinghua.edu.cn; zhshinet@tsinghua.edu.cn

Tsinghua University is not one of the project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
04/04/2005 (construction)

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

>>
30 years

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

C.2.1. Renewable crediting period

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

>>
01/05/2008 (expected)

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

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

>>

The environmental impact assessment (EIA) for this project was carried out by Gansu Environmental Science Design and Research Institute (GESDI), which is a grade A environment impact assessment entity certified by the State Environmental Protection Administration (SEPA). The EIA report has already been approved by Gansu Provincial Environmental Protection Bureau.

The project will have positive impact on the local environment generally.

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:

>>

Major conclusions of the approved EIA report are summarized as follows:

1. Vegetation and Bio Diversity

This project will have little impact on vegetation and bio diversity since there's very sparse vegetation on the riverside mountains located by the project. After project construction, the rehabilitation of vegetation will be conducted on the project site, which will improve the vegetation further. Furthermore, the plant species in the construction site are common species existing in extensive areas and will move near areas during the construction period with little negative impact. When the project is put into operation, the reservoir capacity is very small and will make little impact on the species.

Therefore, the project has no obvious adverse effect on bio diversity; expect very little adverse impact on aquatic organism within the area where water supply will be reduced by the project.

2. Waste water and solid waste

During the operation period, the waste water, mainly sanitary waste from the plant staffs, will be treated by an integrated sewage disposal equipment of 10 cubic meters to meet the standard of GB8978-1996, and then will be used for irrigation purpose in the project site.

During the construction period, the solid waste includes the engineering waste residue and the domestic garbage. The engineering waste residue will be disposed in dumping sites or enhance the river bank to prevent or control flood. And the domestic garbage will be collected and carried to Zhangye municipal landfill site regularly for disposal.

3. Noise

Noise will mainly impact the construction workers and management staffs. Vibration reduction, sound insulation and other measures will be carried out to protect them.

4. Wild animals and protected animals

The project is located in the experimental zone of Qilianshan Natural Reserve (QNR). The natural reserve area is classified into core, buffer and experimental zones according to the nature characteristics. In the core zone any kind of exploitation is prohibited, while in the experimental zone, production and living areas activities are allowed. The project area is not the habitat of wild animals, so through rationally designing and carrying out construction activities, the adverse impact on the wild animals will be very little.

5. Reduce the pollution resulting from coal-fired consumption

When the project is put into operation, the electricity displacement will reduce 128.6 kilo tons of coal consumption, 2.3 kilo tons of CO emission, 840 tons of SO2 emission and 4000 tons of TSP emission, which not only mitigate the local shortage pressure of coal and water, and also improve the local environment quality.

In a word, the proposed project is a renewable energy project and will reduce both GHG emissions and local environmental pollutants caused by coal combustion. The project is a run-of-river hydropower plant flooding no soil or farmland and causing no migration. The project will have positive impact on local environment.

SECTION E. Stakeholders' comments

>>

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

>>

The project owner has carried out investigation on the public's comments on this project in the formats of questionnaires, consultations on experts and officers.

1. Stakeholders participation method

Investigation means include site surveys, distribution of questionnaires and stakeholder meetings, etc.

2、Major investigated issues

(1) Attitude towards the current environmental status in the proposed project construction site

(2) Key environmental problems currently existing in the project construction area

(3) Main impacts on the local environment of the proposed project activity

(4) Contribution of the project to local economic development

(5) Necessity of the proposed project activity

(6) Major impacts of the project on local public living quality

(7) Recommendations on the construction of the project and environmental protection in the construction area

3、Investigated stakeholders scope

Questionnaires have been distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner.

The investigated stakeholders include herdsman, forestry authority staff, residents, students, teachers, technicians, environmentalists and governmental officials in Su'nan county and Zhangye city. In order to receive the all-sided stakeholders' options to the proposed project, the investigation had taken full account into the public advice of different ages, civilizations and occupations.

100 questionnaires were distributed in June 2004, and by the end of June 2004, all of the distributed questionnaires had been returned.

E.2. Summary of the comments received:

>>

Comments from the questionnaires are summarized below：

The major public concerns regarding this project are landscape destroy (38%) and noise pollution (34%); regarding the attitude towards the project, 98% support it and 2% object. The objection reason is that they worry about the possible negative impact on the local eco-environment. Most of the stakeholders think that it should be scientific design, make effort to protect the eco-environment and make full use of the hydro energy resource.

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

>>

The project owner will pay much attention to the comments and suggestions of stakeholders and will put all of the measures listed in the EIA into effect during construction and operation, so as to achieve environmental benefits, social benefits and economic benefits.

And the rehabilitation of vegetation will be conducted to mitigate landscape degradation. Meanwhile, vibration reduction and sound insulation measures will be carried out to protect construction workers. As for the 2% stakeholders who worry about the possible negative impact on the local eco-environment, the project owner has take effort to make them understand the little impact on the eco-environment as the EIA conclusion. The project owner will also keep regular communication with the public regarding the construction and operation of this project.

At the same time, according to the stakeholders' requirements, 2 stakeholders among them have been selected and assigned to be the volunteer supervisor of environment protection, who will supervise the environment issue during the construction and operation period at any time.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in this project.

Annex 3

BASELINE INFORMATION

Table A3-1. Electricity generation from fossil fuels in 2002

Province	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Electricity generation from fossil fuels (MWh)	31941000	23504000	4980000	15505000	17498000	
station service power consumption rate（%）	7.87	6.83	8.4	6.54	10.24	
Electricity delivered to the grid from fossil fuels（MWh)	29427243.3	21898676.8	4561680	14490973	15706204.8	86084777.9

Source：China Electric Power Yearbook 2003

Table A3-2. Electricity generation from fossil fuels in 2003

Province	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Electricity generation from fossil fuels (MWh)	38144000	29494000	6446000	19175000	19834000	
station service power consumption rate（%）	6.94	6.35	4.5	5.25	8.19	
Electricity delivered to the grid from fossil fuels（MWh)	35496806.4	27621131	6155930	18168312.5	18209595.4	105651775.3

Source：China Electric Power Yearbook 2004

Table A3-3. Electricity generation from fossil fuels in 2004

Province	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Electricity generation from fossil fuels (MWh)	44439000	33242000	6208000	25298000	22752000	
station service power	7.5	6.21	7.96	5.45	9.07	

consumption rate（%）						
Electricity delivered to the grid from fossil fuels（MWh)	41106075	31177671.8	5713843.2	23919259	20688393.6	122605242.6

Source：China Electric Power Yearbook 2005

Table A3-4 Calculation of emissions of Northwest Power Grid in 2002

		Shaan xi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	A	B	C	D	E	F=A+B+C+D+E	G	H	I	J=F*G*H*I*44/12/10000 (mass unit) J=F*G*H*I*44/12/1000 (volume unit)
Raw coal	10000 t	1607.5	1156.02	278.66		981.75	4023.93	25.8	98	20908	77997399.05
Cleaned coal	10000 t		0.91				0.91	25.8	98	26344	22224.92592
Other washed coal	10000 t						0	25.8	98	8363	0
Coke	10000 t						0	29.5	98	28435	0
Coke oven gas	100 Mm^3		0.04				0.04	13	99.5	16726	3173.145213
Other gas	100 Mm^3		0.08				0.08	13	99.5	5227	1983.263187
Crude oil	10000 t						0	20	99	41816	0
Gasoline	10000 t										
Diesel oil	10000 t	1.96				1.12	3.08	20.2	99	42652	96327.017
Fuel oil	10000 t		1.7			1.27	2.97	21.1	99	41816	95123.54277
LPG	10000 t						0	17.2	99.5	50179	0
Refinery gas	10000 t^3						0	18.2	99.5	46055	0
Natural gas	100 Mm^3		0.53			2.33	2.86	15.3	99.5	38931	621509.161
Other petroleum products	10000 t						0	20	99	38369	0
Other coking products	10000 t						0	25.8	98	28435	0
Other energy	10000 tce		5.07			1.74	6.81	0	0	0	0
Total											78837740.11

Date source：Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual; China Energy Statistical Yearbook 2003.

Table A3-5 Calculation of emissions of Northwest Power Grid in 2003

		Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	A	B	C	D	E	F=A+B+C +D+E	G	H	I	J=F*G*H*I* 44/12/10000 (mass unit) J=F*G*H*I* 44/12/1000 (volume unit)
Raw coal	10000 t	2002.26	1479.62	330.67	682	1065.75	5560.3	25.8	98	20908	107777455.9
Cleaned coal	10000 t						0	25.8	98	26344	0
Other washed coal	10000 t				27	3.64	30.64	25.8	98	8363	237557.13
Coke	10000 t						0	29.5	98	28435	0
Coke oven gas	100 Mm^3		1.54				1.54	13	99.5	16726	122166.0907
Other gas	100 Mm^3		0.12				0.12	13	99.5	5227	2974.89478
Crude oil	10000 t						0	20	99	41816	0
Gasoline	10000 t										
Diesel oil	10000 t	3.12			0.04	0.4	3.56	20.2	99	42652	111339.0197
Fuel oil	10000 t		1.19			1.02	2.21	21.1	99	41816	70782.16482
LPG	10000 t						0	17.2	99.5	50179	0
Refinery gas	10000 t^3					3.48	3.48	18.2	99.5	46055	106419.6754
Natural gas	100 Mm^3	0.1	0.54			5.95	6.59	15.3	99.5	38931	1432078.801
Other petroleum products	10000 t						0	20	99	38369	0
Other coking products	10000 t						0	25.8	98	28435	0
Other energy	10000 tce		5.86			2.3	8.16	0	0	0	0
Total											109860773.6

Date source：Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual; China Energy Statistical Yearbook 2004.

Table A3-6 Calculation of emissions of Northwest Power Grid in 2004

		Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	A	B	C	D	E	F=A+B+C +D+E	G	H	I	J=F*G*H*I* 44/12/10000 (mass unit) J=F*G*H*I* 44/12/1000 (volume unit)
Raw coal	10000 t	2428.7	1595.9	322.8	1270.1	1240.9	6858.4	25.8	98	20908	132939032.6
Cleaned coal	10000 t						0	25.8	98	26344	0
Other washed coal	10000 t				102.64	10.5	113.14	25.8	98	8363	877193.6583
Coke	10000 t	0.78					0.78	29.5	98	28435	23510.79731
Coke oven gas	100 Mm^3		0.3				0.3	13	99.5	16726	23798.5891
Other gas	100 Mm^3	0.74	1.26				2	13	99.5	5227	49581.57967
Crude oil	10000 t	0.01				0.06	0.07	20	99	41816	2125.08912
Gasoline	10000 t	0.02					0.02	18.9	99	43070	590.980698
Diesel oil	10000 t	2.16	0.36		0.05	0.41	2.98	20.2	99	42652	93199.51645
Fuel oil	10000 t	0.01	0.69			0.3	1	21.1	99	41816	32028.12888
LPG	10000 t						0	17.2	99.5	50179	0
Refinery gas	10000 t^3					3.26	3.26	18.2	99.5	46055	99691.99474
Natural gas	100 Mm^3	1.61	0.59			6.27	8.47	15.3	99.5	38931	1840623.284
Other petroleum products	10000 t						0	20	99	38369	0
Other coking products	10000 t						0	25.8	98	28435	0
Other energy	10000 tce		6.17			3.46	9.63	0	0	0	0
Total										小计	135981376.3

Date source：Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual; China Energy Statistical Yearbook 2005.

Table A3-7 Calculation of simple OM emission factor of Northwest Power Grid

Year	2002	2003	2004
Emissions (tCO_2)	78837740.11	109860773.6	135981376.3
Electricity delivery to the grid (MWh)	86084777.9	105651775.3	122605242.6
Simple OM (tCO_2e/MWh)	0.915815107	1.039838406	1.109099198
Weighted average OM (tCO_2e/MWh)	1.0329		

Table A3-8 Calculation of emissions from solid, liquid and gas fuels combusted for power generation

fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Raw coal	10000 t	2428.7	1595.9	322.8	1270.1	1240.9	6858.4	25.8	98	20908	132939032.6
Cleaned coal	10000 t						0	25.8	98	26344	0
Other washed coal	10000 t				102.64	10.5	113.14	25.8	98	8363	877193.6583
Coke	10000 t	0.78					0.78	29.5	98	28435	23510.79731
Sub-total											133,839,737
Crude oil	10000 t	0.01				0.06	0.07	20	99	41816	2125.08912
Gasoline	10000 t	0.02					0.02	18.9	99	43070	590.980698
Kerosene	10000 t	0.00	0.00	0.00	0.00	0.00	0.00	19.6	19.60	0.990	0
Diesel oil	10000 t	2.16	0.36		0.05	0.41	2.98	20.2	99	42652	93199.51645
Fuel oil	10000 t	0.01	0.69			0.3	1	21.1	99	41816	32028.12888
Other petroleum products	10000 t	0.00	0.00	0.00	0.00	0.00	0.00	20.00	99	38369	0
Sub-total											127,944
Natural gas	100 Mm^3	1.61	0.59			6.27	8.47	15.3	99.5	38931	1840623.284
Coke oven gas	100 Mm^3		0.3				0.3	13	99.5	16726	23798.5891
Other gas	100 Mm^3	0.74	1.26				2	13	99.5	5227	49581.57967
LPG	10000 t						0	17.2	99.5	50179	0

Refinery gas	10000 t					3.26	3.26	18.2	99.5	46055	99691.99474
Sub-total											2,013,695
Total											135,981,376

$EF_{thermal}$=0.9062 (tCO_2e/MWh)

Table A3-9 Installed Capacity of Northwest Power Grid in 2004

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal	MW	7640.4	4975.6	889.8	3782	4959.7	8748
Hydro	MW	1876.5	3566.1	4053.4	366.2	973	10835.2
Nuclear	MW	0	0	0	0	0	0
Wind and others	MW	0	138.2	0	42.5	95.3	145
total	MW	9516.9	8679.9	4943.2	4190.7	6028	33358.7

Source: China Electric Power Yearbook 2005

Table A3-10 Installed Capacity of Northwest Power Grid in 2002

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal	MW	6735.4	3881.8	803.8	2386	3949.9	6344
Hydro	MW	1462.3	3238.6	3206.3	307.9	984.8	9226
Nuclear	MW	0	0	0	0	0	0
Wind and others	MW	0	8.4	0	0	96.7	103
total	MW	8197.7	7128.8	4010	2693.9	5031.4	11747

Source: China Electric Power Yearbook 2003

Table A3-11 Installed Capacity of Northwest Power Grid in 2001

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal	MW	6302.4	3874.8	766.8	2046	3804.9	5859
Hydro	MW	1450.7	3118.3	3127.4	307.9	868.1	8894
Nuclear	MW	0	0	0	0	0	0
Wind and others	MW	0	8.4	0	0	70.6	76
total	MW	7753.1	7001.5	3894.1	2353.9	4743.6	25766

Source: China Electric Power Yearbook 2002

Table A3-12 Calculation of BM of Northwest Power Grid

	Installed capacity in 2001	Installed capacity in 2002	Installed capacity in 2004	Increase between 2000-2004	Ratio of the increase
	A	B	C	D=C-A	
Thermal（MW）	16794.9	17756.9	22247.5	5452.6	71.63%
Hydro（MW）	8872.4	9199.9	10835.2	1962.8	25.78%
Nuclear (MW）	0	0	0	0	0.00%
Wind and others（MW）	79	105.1	276	197	2.59%

total（MW）	**79**	**106**	**276**	**197**	**100.00%**
Ratio of 2004	77.18%	81.12%	100%		

$EF_{BM,y}$=0.9062×71.63%=0.6491 tCO_2/MWh

So, CM = 0.5*OM + 0.5*BM = 0.841 tCO_2/MWh

Annex 4

MONITORING INFORMATION

No Additional information.