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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

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Qinghai Ge-ermu Gas Turbine Power Plant Project
Version number of the document: 05
Date: 20/06/2008

The version history of the PDD is summarized as below:

Version number of PDD	Date	Main revision and purpose
01	01/12/2006	Prepared for internal experts review
02	05/12/2006	Revised based on internal experts comments for LOA application
03	10/12/2006	Revised based on DNA's comments and submitted to DOE for public comments
04	16/08/2007	Revised based on validation protocol
05	20/06/2008	Revised to add corrections required by EB40

A.2. Description of the project activity:

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Qinghai Ge-ermu Gas Turbine Power Plant Project (hereafter referred to as the Project) is sited at the southeast of Ge-ermu City, Haixi Mongolian-Tibetan Autonomous Prefecture, Qinghai Province, P.R.China. The Project including installation of two sets of 150 MW level gas-steam combined cycle power generation equipments which use natural gas from local gas field to generate electricity. Annual consumption of natural gas by the Project is 321,795,500 Nm^3. It is estimated that the feed-in electricity to the Northwest China Grid from the Project is approximately 1559.151 GWh per year via two 110 kV outlet circuits.

The Project satisfies the national energy policy that requires adjusting and optimizing energy mix, enhancing energy security and achieving diversified energy supply. The Project will not only supply low-carbon electricity by means of utilization of natural gas, but also contribute to sustainable development of the local community, the host country and the world by means of:

- Reducing GHG emissions compared to a business-as-usual scenario;
- Compared with coal-fired power plant which installs desulphurizing equipment and has a commensurate scale to the Project, the Project can reduce emissions of 663 tons of SO_2, 3996 tons of NO_X, 193 tons of CO, 222 tons of TSP and 104 thousand tons of ash per year[1];
- Meeting the requirements of electricity balance in drought season and keeping the voltage level of the local grid, improving reliability and safety of power supply in local grid as a peak regulation power plant, improving the level of integrated utilization of local resources at the Project site and promoting economic development of local area[2];
- Promoting and strengthening transfer of gas-steam combined cycle power generation technology and knowledge;
- Creating employment opportunities during construction of the Project and creating 115 positions for local people during operation of the Project.

1 *Environmental Cost Analysis of Power Plant*, Lu Hua, Zhou Hao, Environmental Protection, 2004.4.
2 *Feasibility Study Report* of the Project.

A.3. Project participants:

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Project participants to the project activity are the following:

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)	Huanghe Hydropower Development Co., Ltd. (Project owner)	No
The Netherlands	Energy Systems International B.V.	No

More detailed contact information on the project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

>>
The People's Republic of China.

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

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Qinghai Province

A.4.1.3. City/Town/Community etc:

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Ge-ermu City of Haixi Mongolian-Tibetan Autonomous Prefecture

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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The Project is sited within the Kunlun Economic Development Zone which is 6 km to the southeast of Ge-ermu City, Haixi Mongolian-Tibetan Autonomous Prefecture, Qinghai Province, P.R.China. Ge-ermu City is located on the Qinghai-Tibet Plateau, in the middle of the south of Qaidam Basin and at the north piedmont of Kunlun Mountains. It is 800 km to the west of Xining City, capital of Qinghai Province, and 540 km to the south of Dunhuang City of Gansu Province. The project site has geographical coordinates with north latitude of 36°22′50″~36°22′56″ and east longitude of 94°28′08″~94°28′14″. Figure 1 is a map showing the location of the Project.

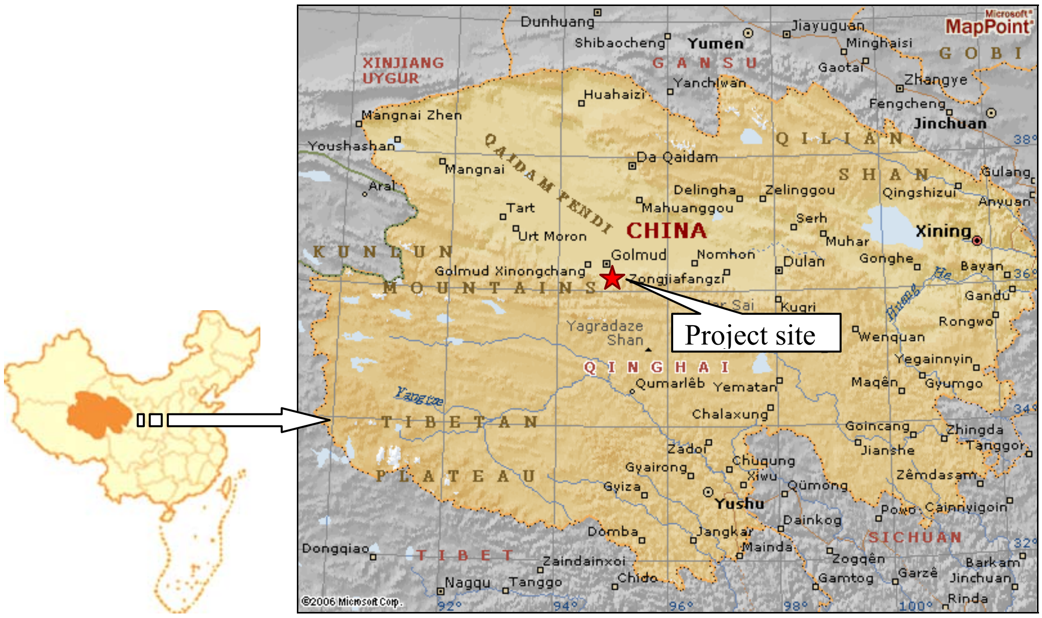

Figure 1. Map showing the location of the Project

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

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This category would fall within sectoral scope 1: energy industries (non-renewable energy).

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

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The Project including installation of two sets of 150 MW level gas-steam combined cycle power generation equipments which use natural gas to generate electricity. Annual consumption of natural gas by the Project is 321,795,500 Nm^3. It is estimated that the feed-in electricity to the Northwest China Grid from the Project is approximately 1559.151 GWh per year via two 110 kV outlet circuits.

The gas turbine manufactured by GE - 9E single gas with Dry Low NO_x Combustion system is used in the Project. Each gas turbine has a starting motor, a 17 stages axial compressor, a combustion system composed by 14 combustion chambers, a 3 stages turbine rotor and auxiliaries. The axial compressor rotor and the turbine rotor are assembled by flange and are supported by 3 bearings. The gas turbine generator is a close-ventilated, air cooled, 3 phases, 2 poles, 3000 rpm, 50 Hz alternating current, synchronous generator with a solid forged rotor.

The implementation of the Project will promote transfer of advanced gas-steam combined cycle power generation technology from abroad. Manufacture and key technical indicators of the key equipments used in the Project are illustrated in Table 1.

Table 1. Manufacture and key technical indicators of the key equipments of the Project

	Equipment	Key Index	Type	Manufacture
1	Gas turbine	123.4 MW	9171E	GE, United States, Nanjing Turbine and Electric Machinery (Group) Co., Ltd.
2	Gas turbine generator	135 MW/MVA	QFR-135-2	Nanjing Turbine and Electric Machinery (Group) Co., Ltd.
3	Steam turbine	46.3853 MW	LZN55-5.60/0.65	Shanghai Electric Group Co., Ltd.
4	Steam turbine generator	75 MVA (60 MW)	QF-60-2	Shanghai Electric Group Co., Ltd.
5	Waste heat recovery boiler	High Pressure：136.1t/h Low Pressure：28.5t/h	Q1505/545-186.1(38.6)-6.3(0.53)/520.3(265.2)	Hangzhou Boiler Plant

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

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Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the project activities will generate emission reductions within the Northwest China Grid for about 292,016 tCO_2e per year over the first 7-year crediting period from 01/08/2008 to 31/07/2015.

Years	Annual estimation of emission reductions in tonnes of CO_2e
Aug. to Dec., 2008	121,673
2009	292,016
2010	292,016
2011	292,016
2012	292,016
2013	292,016
2014	292,016
Jan. to Jul., 2015	170,343
Total estimated reductions (tonnes of CO_2e)	**2,044,112**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**292,016**

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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AM0029.ver 01.1 –Approved baseline methodology AM0029 "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" and approved monitoring methodology AM0029 "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel".

ACM0002.ver 06 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" and "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources".

The *Tool for the Demonstration and Assessment of Additionality* ver 03.

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

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Approved baseline methodology AM0029 "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" and approved monitoring methodology AM0029 "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel" are applicable to the Project for all conditions are satisfied by the Project. Detailed analysis is listed as follows:

• *Condition: The project activity is the construction and operation of a new natural gas fired grid-connected electricity generation plant*[3].
Analysis: The project activity is the construction and operation of a new natural gas fired grid-connected electricity generation plant and no other fuel besides natural gas is used in the Project.

• *Condition: The geographical/ physical boundaries of the baseline grid can be clearly identified and information pertaining to the grid and estimating baseline emissions is publicly available.*
Analysis: Electricity generated by the Project will be supplied to the Northwest China Grid. With reference to the *Notification on Determining Baseline Emission Factor of China's Grid* issued by China DNA on August 9th, 2007 on http://cdm.ccchina.gov.cn, the geographical/physical boundaries of the Northwest China Grid can be clearly identified and information pertaining to the grid and used to estimate baseline emissions is publicly available.

• *Condition: Natural gas is sufficiently available in the region or country, e.g. future natural gas based power capacity additions, comparable in size to the project activity, are not constrained by the use of natural gas in the project activity*[4].

Analysis: Natural gas required by the Project is adequately available at the project site for that natural gas

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3 Natural gas should be the primary fuel. Small amounts of other startup or auxiliary fuels should be used, but can comprise no more than 1% of total fuel use.
4 In some situations, there could be price-inelastic supply constraints (e.g. limited resources without possibility of expansion during the crediting period) that could mean that a project activity displaces natural gas that would otherwise be used elsewhere in an economy, thus leading to possible leakage. Hence, it is important for the project proponent to document that supply limitations will not result in significant leakage as indicated here.

can be sufficiently provided[5]. The Project site (Ge-ermu City) is located in the middle of Qaidam Basin, which has the proved reserves of natural gas of 303.9 billion m^3, [6] adequate for a production scale for an annual output of 6.5 billion m^3 natural gas. The natural gas used by the Project is supplied by Sebei gas field, one of the four gas areas in the continent of China[7], which includes Sebei No.1, Sebei No.2 and Tainan mono-block large-scaled gas fields of the Qaidam Basin of Qinghai Province. Currently, the total transmission capacity of natural gas from Sebei gas field to Ge-ermu City has reached 800 million m^3 per year, while the estimated annual gas consumption of the project is only 321,795,500 Nm^3. So the existing gas transmission can largely satisfy the demand of natural gas by the Project. Natural gas from the Qaidam Basin is supplied mainly to Xining City of Qinghai Province, Lanzhou City of Gansu Province and the surrounding area as well as to the users within the gas field area (Dunhuang City and Ge-ermu City). According to the prediction of production capacity of the Sebei gas field and natural gas demand from Qinghai Province and Gansu Province in the *Feasibility Study Report* of the Project, future capacity additions of natural gas power generation project with a commensurate scale to the Project will not be restricted due to the utilization of natural gas by the Project.

The Project fulfils all the applicable conditions of methodology AM0029, therefore methodology AM0029 is applied to the Project to determine baseline scenario, estimate emission reductions and draft monitoring plan.

According to methodology AM0029, the emission factor of baseline grid electricity displaced by net electricity supply of the Project is calculated as per ACM0002, the additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* ver 03 approved by CDM EB.

Data and information used in the PDD of the Project are mainly from the *Feasibility Study Report* of the Project, methodology AM0029, *Report on the Analysis Data of Component of Natural gas*[8], the *Notification on Determining Baseline Emission Factor of China's Grid*[9], *China Energy Statistical Yearbook*, *China Electric Power Yearbook* and *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

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

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According to methodology AM0029, the spatial extent of the project boundary covers gas turbine, gas turbine generator, steam turbine, steam turbine generator, waste heat recovery boiler, on-site gas transmission pipelines and auxiliary facilities.

Electricity generated by the Project will be delivered to the Qinghai Power Grid. According to the *Notification on Determining Baseline Emission Factor of China's Grid*, Qinghai Power Grid is an integral part of the Northwest China Grid. The Northwest China Grid is defined as the electricity system boundary of the Project. It is composed of Shaanxi Power Grid, Ningxia Power Grid, Gansu Power Grid, Qinghai Power Grid and Xinjiang Power Grid.

The greenhouse gases included in or excluded from the project boundary are shown in Table 2.

5 *Feasibility Study Report* of the Project.
6 Http://www.gxjz.com.cn:8000/guild/Sites/sy/detail.asp?i=HYGLDT&id=7162.
7 Http://www.oilnews.com.cn/gb/vguyb/2005-06/30/content_622182.htm.
8 Provided by the Qinghai Gas Field of PetroChina Company Limited.
9 Issued by China's DNA on August 9th, 2007 on http://cdm.ccchina.gov.cn.

Table 2. Overview of emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Power generation in the Northwest China Grid	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project activity	On-site fuel combustion due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

Figure 2 shows the boundary of the Project.

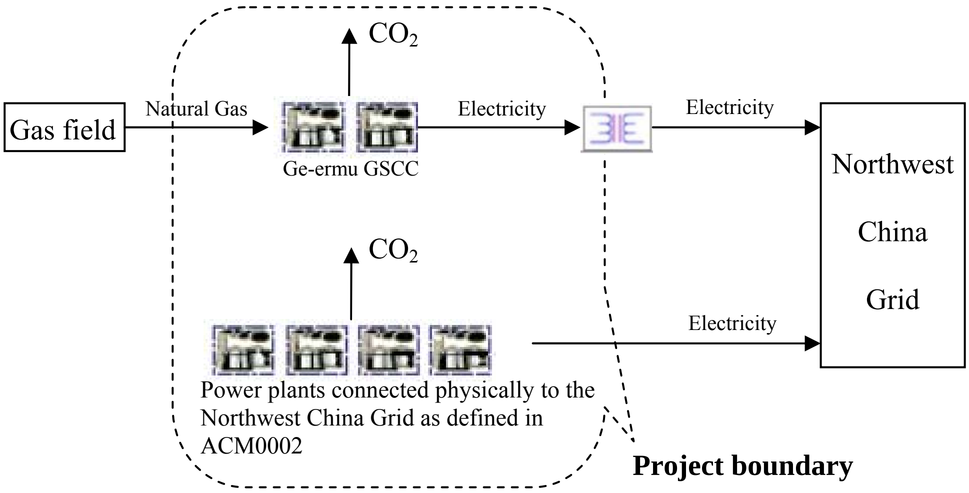

Figure 2. Project boundary

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

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According to methodology AM0029, project participants shall use the following steps to define the baseline scenario:

1. Identify plausible baseline scenarios

The identification of alternative baseline scenarios should include all possible realistic and credible alternatives that provide outputs or services comparable with the proposed CDM project activity (including the Project without CDM benefits), i.e., all types of power plants that could be constructed as alternative to the project activity within the grid boundary (as defined in ACM0002).

Power plant technologies that have recently been constructed or are under construction or are being planned in the Northwest China Grid include coal-fired power plant, oil based power generation technology, gas based power generation technology and renewable energy based power generation technology[10]. As required by methodology AM0029, all relevant power plant technologies that have recently been constructed or are under construction or are being planned in the Northwest China Grid are taken as plausible alternatives.

Alternative a: The project activity not implemented as a CDM project;
Alternative b: Power generation using natural gas, but technologies other than that used by the project activity, including simple cycle gas turbine power plant and single cycle steam turbine power plant;
Alternative c: Power generation technologies using energy sources other than natural gas, including coal-fired power plant, oil based power generation technology and renewable energy based power generation technology;
Alternative d: Import of electricity from the Northwest China Grid, including the possibility of new interconnections.

These alternatives need not consist solely of power plants of the same capacity, load factor and operational characteristics (i.e. several smaller plants, or the share of a larger plant may be a reasonable alternative to the project activity), however they should deliver similar services.

First, analysis on the four alternatives is made from the perspective of resource and technology as following. Baseline scenarios that are not in compliance with all applicable legal and regulatory requirements are excluded as per methodology.

For Alternative a, the project activity not implemented as a CDM project is a plausible baseline scenario regarding resource, technology and mandatory laws and regulations.

For Alternative b, power generation using natural gas, but technologies other than that used by the project activity, including simple cycle gas turbine power plant and single cycle steam turbine power plant is not feasible for the following reasons:

- Since the temperature of exhaust gas is relatively high when single cycle gas turbine power generation technology is adopted, waste heat in exhaust gas is generally recovered by installing waste recovery boiler to produce steam for power generation or heat supply. Furthermore, there is no large-scale single cycle natural gas turbine power generation project operated or under construction in China[11]. Therefore, it is not practical to adopt the natural gas combustion turbine single cycle power generation technology as the baseline.
- The heat efficiency of single cycle natural gas steam turbine power generation technology is relatively low, which is only about 38%, this technology is rarely used now[12]. Therefore, adopting the natural gas steam turbine single cycle power generation technology as the baseline is not practical.

For Alternative c, power generation technologies using energy sources other than natural gas, including coal-fired power plant, oil based power generation technology and renewable energy based power generation technology are partly feasible, detailed analyses are listed as follows:

- According to China's regulations on electricity industry, construction of conventional coal-fired generators with a unit installed capacity less than 300 MW is restricted[13]. Therefore, according to the

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10 Report on power generation in 2004 and electricity supply-demand trend in 2005 in Northwest Region (http://xbj.serc.gov.cn/UploadFiles/2006214162151615.doc), Tenth-five Year Plan for Power Industry (calre.net.cn/ghs/ghsjk/hygh_1/1.pdf), Draft Eleventh-five Year Plan for Power Industry (http://www.chinapower.com.cn/newsarticle/1028/new1028638.asp).
11 Http://www.ntet.net.cn/html/UploadFile/2005620164910134.doc.
12 Http://www.hdrqw.com/news/20060505-31.htm.
13 *Directive Catalog on Industry Structure Adjustment* (2005 edition), Degree No. 40 of NDRC (Dec. of 2005).

generator capacity commonly used in China now, sub critical coal-fuel fired power generation technology with the unit installed capacity of 300 MW or 600 MW, and super critical power generation technology with the unit installed capacity of 600 MW are selected to consider as baseline alternatives.

• Given the similarities between oil-based power project and gas-based power project in terms of peak regulation functions, oil-based combined cycle power generation technology with the same installed capacity as the Project is considered as baseline alternative.

• The Project is a power plant having a yearly peak regulation function, as a result renewable resource power generation technology in Alternative c is applicable only to hydropower projects with a yearly regulation capability. Although Qinghai Province possesses the resources to construct large-sized hydropower plants which have a commensurate scale to the Project and the function of yearly/multi-year regulation, construction of these plants requires huge amount of investment and involves complex engineering[14]. Therefore, renewable resource power generation technology in Alternative c is not feasible.

For Alternative d, limited by capacity of transmission line[15], import of electricity from connected grid is not feasible. The Project is located in the Ge-ermu Grid. As described in the *Feasibility Study Report* of the Project, 330 kV Long-Wu-Ge Transmission Line is the most important transmission line that connected the Ge-ermu Grid to the main Qinghai Power Grid. Since the installed capacity of the Project is 300 MW level, while the capacity of the Long-Wu-Ge Transmission Line is only 88~108 MW, import of electricity from connected grid is not feasible. Consider of new interconnections in the same grid (the Ge-ermu Grid), since new interconnections in the same grid are mainly hydropower plants whose peak regulation is relied on the Project and the total installed capacity of these project is lower than 100 MW, import of electricity from new interconnections is not feasible. Since Alternative d does not have capacity to provide comparable electricity supply as the Project, it is not feasible.

All power plant technologies that have recently been constructed or are under construction or are being planned in the Northwest China Grid are analysed above. To summarize, the possible alternatives that provide outputs or services comparable with the proposed CDM project activity include:
Alternative a: The project activity not implemented as a CDM project;
Alternative c(1): Sub critical coal-fired power plant with a unit capacity of 300 MW or 600 MW;
Alternative c(2): Super critical coal-fired power plant with a unit capacity of 600 MW;
Alternative c(3): Oil based combined cycle power generation technology.

2. Identify the most economically attractive baseline scenario alternative.

According to methodology AM0029, the most economically attractive baseline scenario alternative is identified using investment analysis. Corresponding financial indicators for all alternatives remaining after step 1 should be calculated using the levelized cost of electricity generation in RMB/kWh as financial indicator for investment analysis.

According to the *International Comparisons of Electricity Generation by Types & Costs*[16] written by Nathan Ilten, The formula applied to calculate the levelised electricity generation cost (EGC) is the

14 Http://www.anyuan.net.cn/wen-1.htm.
15 P8, P22~23 of the Feasibility Study Report.
16 Http://people.cs.uchicago.edu/~nilten/docs/
final.pdf#search='International%20Comparisons%20of%20Electricity%20Generation%20by%20Types%20%26%20Costs'. The formula can also be found in Cost Estimation Methodology under Appendix 5 of *Projected Costs of Generating Electricity - 2005 Update* published by NEA, IEA and OECD (*"Projected Costs of Generating Electricity - 2005 Update*, Nuclear Energy Agency (NEA), International Energy Agency (IEA) and Organization for Economic Co-operation and Development (OECD). (Source: http://www.iea.org/textbase/nppdf/free/2005/ElecCost.pdf)).

following:

$$EGC = \frac{\sum_t \left[(I_t + M_t + F_t)((1+r)^{-t}) \right]}{\sum_t \left[E_t (1+r)^{-t} \right]} \quad (1)$$

where,

EGC : Average lifetime levelised electricity generation cost in RMB/kWh.
I_t : Capital expenditure in the year t in RMB.
M_t : Operation and maintenance expenditures in the year t in RMB.
F_t : Fuel expenditure in the year t in RMB.
E_t : Electricity generation in the year t in kWh.
r : Discount rate.

The relevant assumptions and parameters for Alternative a, Alternative c(1), Alternative c(2) and Alternative c(3) are listed in Table 3. And the results of the levelised electricity generation cost (EGC) are listed in Table 4.

Table 3. Parameters for the levelised electricity generation cost (EGC) for each alternative[17]

Item	Unit	Alternative a	Alternative c(1)	Alternative c(2)	Alternative c(3)
Investment expenditure	RMB/kW	3755	3623 (600MW of unit capacity) 3589 (300MW of unit capacity)	4235	3056
Construction period	Years	2	3	3	1
Operation period	Years	20	30	30	20
O&M Expenditure					
Material Expenditure	RMB/MWh	5	7	7.49	5
Other O&M Expenditure	RMB/MWh	12[18]	15	13.59	12[19]
Water Expenditure	RMB/MWh	1	1	0.24	1
Desulfuration Expenditure	RMB/MWh	0	1.5	1.53	0
Employee	Person/MW	0.383	0.38	0.3	0.383
Per capita manpower cost	RMB/year	30000	30000	30000	30000
Rate for overhaul[20]	%	2.5	2.5	2.5	2.5
Energy	-	0.2015 m^3/kWh	320 gCe/kWh (600MW	299 gCe/kWh	180 g/kWh

17 If not specifically indicated otherwise, data are from the *Feasibility Study Report* of the Project, the Natural Gas Purchase Agreement of the Project and Global Climate Change Institute, Tsinghua University, China.
18 Not including overhaul fees, wage and welfare.
19 Not including overhaul fees, wage and welfare.
20 Feasibility Study Report of the Project and, Yang Xuzhong, *Economic Evaluation of Electric Engineering and Tariff* 1st edition, China Electric Publishing House, 2003, P131.

Consumption for power generation[21]			of unit capacity) 330 gCe/kWh (300MW of unit capacity)		
Fuel cost[22]	-	0.773 RMB/m^3 (including VAT)	255 RMB/t	255 RMB/t	2700 RMB/t
Load factor	-	0.63	0.63	0.65	0.63

Table 4. Results of the levelised electricity generation cost (EGC) for each alternative

Item	Unit	Alternative a	Alternative c(1)	Alternative c(2)	Alternative c(3)
EGC	RMB/kWh	0.2307	0.1877 (600MW of unit capacity) 0.1895 (300MW of unit capacity)	0.1907	0.5763

Taking the load factor and fuel cost as the uncertainty factors, sensitivity analysis is made on levelised cost of electricity generation, and the calculation results are listed in Table 5.

Table 5. Sensitivity analysis of the levelised electricity generation cost (EGC) for each alternative (RMB/kWh)

Item	Unit	Alternative a	Alternative c(1)	Alternative c(2)	Alternative c(3)
Load factor	+10%	0.2235	0.1803 (600MW of unit capacity) 0.1821 (300MW of unit capacity)	0.1824	0.5698
Load factor	-10%	0.2395	0.1967 (600MW of unit capacity) 0.1985 (300MW of unit capacity)	0.2009	0.5844
Fuel cost	+10%	0.2440	0.1958 (600MW of unit capacity) 0.1979 (300MW of unit capacity)	0.1984	0.6249
Fuel cost	-10%	0.2174	0.1795 (600MW of unit capacity) 0.1811 (300MW of unit capacity)	0.1831	0.5277

According to methodology AM0029, the baseline alternative with the best financial indicator, i.e. the lowest levelised cost, can be pre selected as the most plausible scenario. It can be drawn from Table 4 and Table 5 that the 600 MW sub critical coal-fired power plant is the most plausible scenario with the lowest levelised cost. The sensitivity analysis in Table 5 confirms and supports that the 600 MW sub critical coal-fired power plant remains the least levelised cost alternative within reasonable variations in the critical assumptions.

21 Http://www.ccchina.gov.cn/source/fa/fa2002082803.html, the research report of *Impact of 2% Appreciation of RMB on Key Electricity Enterprises* supplied by United Securities, http://www.nanfangdaily.com.cn/southnews/sjjj/200609280667.asp.

22 Http://www.cmrn.com.cn/html/24598.htm (near coal mines), http://info.oil.hc360.com/html/001/014/204288.asp (oil price) and the *Natural Gas Purchase Agreement* of the Project.

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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The project owner, Huanghe Hydropower Development Co., Ltd. planned to implement this natural gas fired power generation project in 2004. However, due to the high capital investment and low electricity tariff that such project could get in Qinghai province, the Project was not financially feasible.

World Bank issued a report titled *Clean Development Mechanism in China - Taking a Proactive and Sustainable Approach* in June 2004 and held a dissemination conference in 2004 in Beijing, China. About 300 people from energy sectors, especially the power sector, were invited to attend the conference. The report can be freely downloaded from the website of World Bank[23]. The report studied CDM opportunities in China's power sector and natural gas power generation projects are highly ranked in the pipeline of CDM project activities. The report and the conference have stimulated investors' interest on CDM through out China, including the project owner.

When Kyoto Protocol took effect on 16th Feb. 2005, the project owner realized that it could be a great opportunity to implement the Project with CDM incentive. Based on initial survey of methodology, it was found that new methodologies regarding similar natural gas fired power generation project had been developed[24] at that time. In the directorate conference on 28th Feb. 2005 of Huanghe Hydropower Development Co., Ltd., how to implement the Project was one of the main issues. The Project was decided to carry on mainly because that the CDM assistance could significantly improve the project return.

Afterwards, the project owner spent more than half a year to get necessary approvals from national authorities, including the EIA Approval with document No. HUANSHEN[2005]669 issued by the Ministry of Environmental Protection (former State Environment Protection Agency) in August, 2005 and then, the Approval letter to *Feasibility Study Report* with document No. FGNY[2005]2510 issued by the National Development and Reform Commission. At the same time, the project owner kept tracking the methodology and looking for a CER buyer. On the date of 16/08/2005, the project owner signed a CDM consulting agreement with Electricity Energy (Beijing) Industry Development Co., Ltd. With approvals required and CDM assistance contracted, the project construction company framed the Project Implementation Schedule and got the approval from the supervision entity of the Project on 25/10/2005. After getting this approval, the project owner started construction on 28/10/2005, when actual investment on the Project was initiated.

According to methodology AM0029, the assessment of additionality comprises the following steps:

Step 1: Benchmark investment analysis

According to methodology AM0029, it will be demonstrated that the proposed CDM project activity is unlikely to be financially attractive by applying sub-step 2b (Option III: Apply benchmark analysis), sub-step 2c (Calculation and comparison of financial indicators), and sub-step 2d (Sensitivity Analysis) of the

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23 Http://siteresources.worldbank.org/CHINAEXTN/Resources/318949-1121421890573/cdm-china.pdf.

24 NM0080 (baseline methodology for grid connected electricity generation plants using non-renewable and less GHG intensive fuel) was public available from 17 Nov 04 till 07 Dec 04 and NM0153 (Baseline methodology for grid connected electricity generation plants using Natural Gas (NG) / Liquefied Natural Gas (LNG) fuels) was public available from 16 Feb 06 till 08 Mar 06 on UNFCCC website.

Tool for the Demonstration and Assessment of Additionality ver 03 approved by the CDM EB.

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects,* the financial benchmark rate of return (after tax) adopted by the Project is 8% for the IRR of total investment[25]. On the basis of the above benchmark, calculation and comparison of financial indicators are carried out.

Sub-step 1a. Calculation and comparison of financial indicators

According to the *Feasibility Study Report*[26] and the Natural Gas Purchase Agreement[27], basic parameters for calculation of financial indicators of the Project are listed in Table 6:

Table 6. Basic parameters for calculation of financial indicators of the Project

Item	Value
Power generation (GWh)	1597
Auxiliary electricity consumption rate (%)	2.37
Construction period (year)	2
Operation period (year)	20
Bus-bar tariff (not including VAT) (RMB/kWh)	0.22317
Total investment (10000RMB)	110752
Value of fixed assets (10000RMB)	109034
Fixed assets investment (10000RMB)	106696
Interest during construction (10000RMB)	2338
Fluid capital (10000RMB)	1718.35
Equity of value of fixed assets (%)	20
Equity fluid capital (%)	100
Repayment period (not including 2 year of construction) (year)	16
Interest of long-term loan (%)	5.76
Depreciation period (year)	15
VAT (%)	17
Income tax (%)	33
Urban maintenance and construction tax (%)	5
Surtax for education (%)	3
Natural gas consumption (Nm^3/MWh)	201.5

25 Benchmark reference for retrofit and greenfield power generation projects in China. As highlighted in Section 1.11 of *Interim Rules on Economic Assessment of Electric Power Retrofit Projects*, the benchmark is set for the entire power industry. It has been universally used in the investment analysis section by majority of the registered renewable energy and natural gas fired power generation CDM projects in China.

26 Designed by the Northwest Electric Power Design Institute of State Power Corporation and approved by the National Development and Reform Commission in later 2005 with the document No. FGNY[2005]2510.

27 Signed between the Petro China Qinghai Oilfield Company and the project owner with gas price of 0.661 RMB/m^3 excluding VAT or 0.773 RMB/m^3 including VAT. According to the letter to adjust the natural gas price, the natural gas price including VAT has been increased from RMB 0.773/m^3 (by the end of 2005) to RMB 1.107/m^3.

Natural gas price (not including VAT) (RMB/Nm^3)	0.661[28]
Rate for maintenance fee (%)	1.0
Staff (persons)	115
Salary (10000RMB/year)	3
Rate of employee welfare (%)	52
Water cost (RMB/MWh)	1
Insurance premium rate (%)	0.25
Materials cost (RMB/MWh)	5
Other cost (RMB/MWh)	12

In accordance with the benchmark analysis (Option III), if the financial indicators (such as IRR of total investment) of the Project are lower than the benchmark, the Project is not considered as financially attractive. According to the calculation based on the above data, without CERs sales revenues, the IRR of total investment of the Project is 3.60%, which is far below the benchmark (8%). Thus the Project is not financially attractive.

Sub-step 1b. Sensitivity analysis

For the project, the following financial parameters were taken as uncertainty factors for sensitivity analysis of financial attractiveness:
- Total investment
- Annual O&M cost
- Annual electricity output
- Natural gas price

The impacts of the fluctuation of total investment, annual O&M cost, annual electricity output and natural gas price on IRR of total investment of the Project are analyzed. The results of sensitivity analysis of the four indicators are shown in Table 7 and Figure 3.

Table 7. Sensitivity analysis of financial indicators of the Project (IRR of total investment, without CERs sales revenues)

Parameter \ Range	-10%	0	+10%
Total investment (%)	4.97	3.60	2.45
Annual O&M cost (%)	4.23	3.60	2.98
Annual electricity output (%)	2.25	3.60	4.92
Natural gas price (%)	6.21	3.60	0.63

28 According to the letter to adjust the natural gas price, the natural gas price including VAT has been increased from RMB 0.773/m^3 (by the end of 2005) to RMB 1.107/m^3.

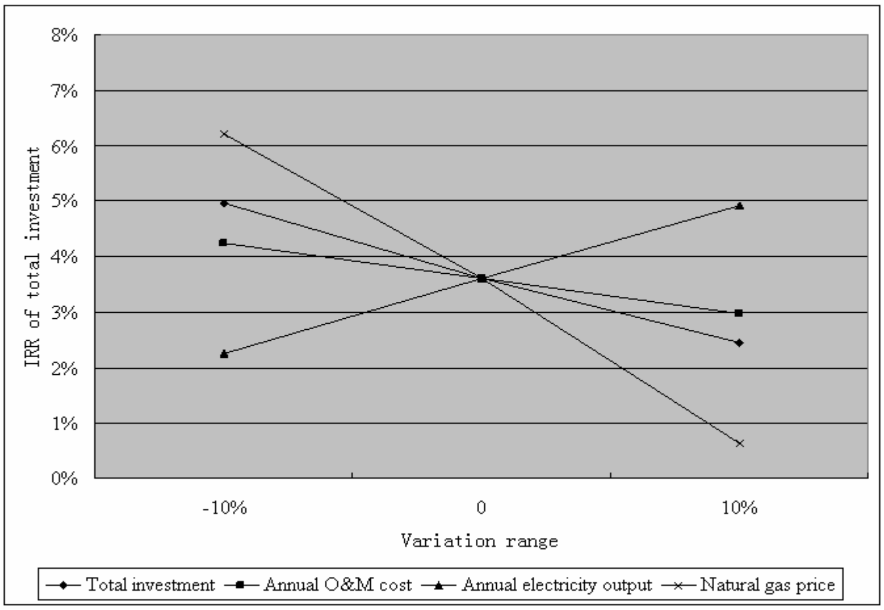

Figure 3. IRR of total investment sensitivity to different financial parameters of the Project (without CERs sales revenues)

As shown in the sensitivity analysis, even the variation range of the uncertainty factors reaches 10%, the IRR of total investment of the Project remains lower than the benchmark and the additionality of the Project would not be influenced. Therefore, the variation of uncertainty factors will not influence the additionality of the Project.

Step 2: Common practice analysis

According to methodology AM0029, this step will demonstrate that the project activity is not a common practice in the relevant country and sector by applying Step 4 (common practice Analysis) of the *Tool for the Demonstration and Assessment of Additionality* ver 03 agreed by the CDM EB.

Sub-step 2a. Analyze other activities similar to the project activity:
No natural gas power generation project with a commensurate scale to the Project which has been constructed and put into operation in Northwest China at present.

Sub-step 2b. Discuss any similar options that are occurring:
After completion of construction, the Project will become the first natural gas based gas steam combined cycle power project in the Northwest China Grid. Therefore, the Project is not a common practice.

Step 3: Impact of CDM registration

According to methodology AM0029, this step will describe the impact of the registration of the project activity.

If the Project can be successfully registered as a CDM project, the following impacts will result:
• Guarantee the loan payback, supplement the bus-bar tariff of the Project and improve the financial indicators of the Project to reach benchmark;
• Be one of the sources to serve as the maintenance fund for gas-steam combined cycle generation units therefore to guarantee the successful implementation of the Project.

Considering of the CERs sales revenues (calculated on the assumption that CERs price is EURO 12/tCO_2e during 20 yrs of operation period)[29], the IRR of total investment of the Project will be significantly improved to reach benchmark, as shown in Table 8.

Table 8. Comparison of IRR of total investment of the Project with and without CERs sales revenues

	Without CERs sales revenues	Consider of CERs sales revenues
IRR of total investment(%)	3.60	8.28

Without CERs sales revenues, the IRR of total investment of the Project is below the benchmark while considering of the CERs sales revenues, the IRR of total investment of the Project will be significantly improved to reach the benchmark. Therefore the Project satisfies the requirement of additionality.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The methodology AM0029 is applied in the context of the Project in the following four steps:

- First, calculate the baseline GHG emissions;
- Second, calculate the project GHG emissions;
- Third, calculate the project leakage;
- Fourth, calculate the emission reductions.

I. Calculate the baseline GHG emissions

Baseline emissions are calculated by multiplying the electricity generated in the project plant ($EG_{PJ,y}$) with a baseline CO_2 emission factor ($EF_{BL,CO2,y}$), as follows:

$$BE_y = EG_{PJ,y} \cdot EF_{BL,CO2,y} \qquad (2)$$

In order to address this uncertainty in a conservative manner, project participants shall use for $EF_{BL,CO2,y}$ the lowest emission factor among the following three options:

Option 1. The build margin, calculated according to ACM0002; and

Option 2. The combined margin, calculated according to ACM0002, using a 50/50 OM/BM weight.

Option 3. The emission factor of the technology (and fuel) identified as the most likely baseline scenario under "Identification of the baseline scenario" above, and calculated as follows:

$$EF_{BL,CO2}(tCO2/MWh) = \frac{COEF_{BL}}{\eta_{BL}} * 3.6GJ/MWh \qquad (3)$$

where,

$COEF_{BL}$: The fuel emission coefficient (tCO_2e/tCe), based on national average fuel data, if available, otherwise IPCC defaults can be used

η_{BL} : The energy efficiency of the technology, as estimated in the baseline scenario analysis above.

Option 1. The build margin, calculated according to ACM0002

29 Calculate based on an exchange rate of EURO 1=10 RMB.

Calculate the Build Margin Emission Factor ($EF_{BM,y}$) according to the consolidated baseline methodology ACM0002 using equation (4):

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

where:

$F_{i,m,y}$ is the amount of fuel i (tCe) consumed by relevant power source m in year(s) y;

$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/tCe), taking into account the carbon content of the fuels used by relevant power source m and the percent oxidation of the fuel in year(s) y; and

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

Option 1, calculate the Build Margin emission factor ($EF_{BM,y}$) ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission was selected for the Project.

According to the consolidated baseline methodology ACM0002, the sample group m consists of either (1) the five power plants that have been built most recently, or (2) the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. It is suggested that the sample group that comprises the larger annual generation should be used.

Because the data can not be obtained in China, CDM EB agrees to use the methodology deviation below:

• Use of capacity additions for estimating the build margin emission factor for grid electricity.

• Use of weights estimated using installed capacity in place of annual electricity generation.

• 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).

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid* issued by China's DNA on August 9th, 2007 on http://cdm.ccchina.gov.cn, the weighted average fuel consumption for power generation of 600 MW coal-fired power generators built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

Based on the latest data as described above, the build margin emission factor ($EF_{BM,y}$) of the Northwest China Grid is calculated as 0.5739 tCO_2e/MWh (see Annex 3 for details).

Option 2. The combined margin, calculated according to ACM0002, using a 50/50 OM/BM weight

The baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$.

According to the consolidated methodology ACM0002, calculate the Operating Margin Emission Factor(s) ($EF_{OM,y}$) based on one of the four following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Each method is analyzed as below.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. Among the total electricity generations of the Northwest China Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 25% in 2001, 23% in 2002, 19% in 2003, 22% in 2004 and 27% in 2005 (see Annex 3 for detail), all less than 50%. Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{OM,y}$) for the Project.

Method (b) Simple adjusted OM

The application of simple adjusted OM method requires annual load duration curve of the grid. The power sector in China is in a transitional period of "separating the plant operation from the grid operation", resulting in the detailed data of dispatch and fuel consumption are often taken as confidential business information by the grid company and the power plants. Therefore those data are not publicly available. In most cases, it is difficult for the CDM projects in China to adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$). Similarly, the Project can not adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$) due to unavailability of the dispatch data of the Northwest China Grid.

Method (c) Dispatch data analysis OM

Dispatch data analysis OM method should be the first choice if the dispatch data are available, because the method can truly reflect the substitutable relationship between the amount of electricity output from power plants of the baseline grid and that from the Project activity and the emission reductions generated. However, Method (c) cannot be adopted for the Project because of unavailability of the dispatch data of the Northwest China Grid, similar reason as method (b).

Method (d) Average OM

Method (d) can only be used when 1) low-cost/must run resources constitute more than 50% of total amount of grid electricity output and 2) detailed data required by applying method (b) and method (c) is unavailable. Among the total electricity generations of the Northwest China Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 25% in 2001, 23% in 2002, 19% in 2003, 22% in 2004 and 27% in 2005, all less than 50%. Therefore method (d) cannot be applied to the Project.

In conclusion, Method (a) Simple OM is the only reasonable and feasible method among the four methods for the calculation of the operating margin emission factor(s) ($EF_{OM,y}$) of the Project. With reference to the *Notification on Determining Baseline Emission Factor of China's Grid*, Method (a)

Simple OM is adopted for the calculation of the operating margin emission factor(s) ($EF_{OM,y}$) of the Project.

In accordance with the consolidated baseline methodology ACM0002, the Simple OM emission factor ($EF_{OM,simple,y}$) is calculated with formula (5)

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (5)$$

where:

$F_{i,j,y}$ is the total amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y,

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by province j and the oxidation rate of the fuel in year(s) y, and

$GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by province j.

The CO_2 emission coefficient $COEF_i$ is then obtained from equation (6) as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (6)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of fuel i,

$OXID_i$ is the oxidation factor of the fuel i, and

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2004 to 2006 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook.*

With reference to the *Notification on Determining Baseline Emission Factor of China's Grid* issued by China's DNA on August 9th, 2007 on http://cdm.ccchina.gov.cn, based on the latest data as described above, the Simple OM emission factor ($EF_{OM,y}$) of the Northwest China Grid is calculated as 1.1256 tCO_2e/MWh (see Annex 3 for details).

As described above, the build margin emission factor ($EF_{BM,y}$) of the Northwest China Grid is calculated as 0.5739 tCO_2e/MWh. Based on the consolidated baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as the weighted average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$), as

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (7)$$

According to the consolidated baseline methodology ACM0002, both the weight w_{OM} and the weight w_{BM}

take 0.50 as default. Therefore the combined baseline emission factor
EF_y=0.5×1.1256+0.5×0.5739=0.8498 (tCO_2e/MWh).

Option 3. The emission factor of the technology (and fuel) identified as the most likely baseline scenario under "Identification of the baseline scenario" above

As described in Section B5, the 600 MW sub critical coal-fired plant has been identified as the most likely baseline, then emission coefficients of coal can be calculated with formula (3) provided above. Based on the reality of the Project, formula (3) can be translated into the following one:

$$EF_{BL,CO2} = COEF_{BL} \times \frac{PGCC_{BL}}{1-e} \qquad (8)$$

where:

$COEF_{BL}$: is the emission coefficient of coal in tCO_2e/tCe, calculated with formula (6).

$PGCC_{BL}$: is the power generation standard coal equivalent consumption of the most likely baseline technology identified in previous step, 600 MW sub critical coal-fired plant in the PDD, in tCe/MWh.

e : is the auxiliary electricity consumption of the 600 MW sub critical coal-fired plant.

The average auxiliary electricity consumption of the coal-fired power plant in Qinghai Power Grid from 2003 to 2005 is calculated as the value of e. The emission factor of the 600 MW sub critical coal-fired plant is calculated ex ante as 0.9332 tCO_2e/MWh.

$$EF_{BL,CO2} = NCV_{coal} \cdot EF_{CO2,coal} \cdot OXID_{coal} \times \frac{PGCC_{BL}}{1-e} = 0.020908/0.7143 \times 94600/1000 \times 100\% \times \frac{0.32}{1\text{-}5.05\%}$$

$$= 0.9332 \ (tCO_2e/MWh)$$

The value of the build margin emission factor ($EF_{BM,y}$) of the Northwest China Grid is the lowest of the three options, therefore the baseline emission factor ($EF_{BL,CO2,y}$) for the Project is 0.5739 tCO_2e/MWh.

II. Calculate the project GHG emissions

According to methodology AM0029, the project activity is on-site combustion of natural gas to generate electricity. Since there is no auxiliary fuel used in the Project besides natural gas, the project GHG emissions are those emissions from on-site combustion of natural gas. The CO_2 emissions from electricity generation (PE_y) are calculated as follows:

$$PE_y = FC_{NG,y} * COEF_{NG,y} \qquad (9)$$

where:

$FC_{NG,y}$: is the total volume of natural gas combusted in the project plant (m^3) in year(s) 'y';

$COEF_{NG,y}$: is the CO_2 emission coefficient (tCO_2/m^3) in year(s) for natural gas and is obtained as:

$$COEF_{NG,y} = NCV_{NG,y} * EF_{CO2,NG,y} * OXID_{NG} \qquad (9a)$$

where:

$NCV_{NG,y}$: is the net calorific value (energy content) per volume unit of natural gas in year 'y' (GJ/m^3) as determined from the fuel supplier, wherever possible;

$EF_{CO2,NG,y}$: is the CO_2 emission factor per unit of energy of natural gas in year 'y' (tCO_2/GJ);

$OXID_{NG}$: is the oxidation factor of fuel.

For the Project, the net calorific value (energy content) per volume unit of natural gas in year 'y' (GJ/m^3) is obtained from the natural gas supplier and other parameters are obtained from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

III. Calculate the project leakage

Natural gas used in the Project is not LNG. According to methodology AM0029, leakage emission (LE_y) sources considered in the Project) includes the fugitive CH_4 emissions ($LE_{CH4,y}$) associated with fuel extraction, processing, transportation and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.

For the purpose of estimating fugitive CH_4 emissions, project participants should multiply the quantity of natural gas consumed by the project in year y with an emission factor for fugitive CH_4 emissions ($EF_{NG,upstream,CH4}$) from natural gas consumption and subtract the emissions occurring from fossil fuels used in the absence of the project activity, as follows:

$$LE_{CH4,y} = \left[FC_y \cdot NCV_y \cdot EF_{NG,upstream,CH4} - EG_{PJ,y} \cdot EF_{BL,upstream,CH4}\right] \cdot GWP_{CH4} \qquad (10)$$

where:

$LE_{CH4,y}$ is the leakage emissions due to fugitive upstream CH_4 emissions in the year y in tCO_2e;

FC_y is the quantity of natural gas combusted in the project plant during the year *y* in m^3;

$NCV_{NG,y}$ is the average net calorific value of the natural gas combusted during the year *y* in GJ/m^3;

$EF_{NG,upstream,CH4}$ is the emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in tCH_4 per GJ fuel supplied to final consumers;

$EG_{PJ,y}$ is the electricity generation in the project plant during the year in MWh;

$EF_{BL,upstream,CH4}$ is the emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH_4 per MWh electricity generation in the project plant;

GWP_{CH4} is the global warming potential of methane valid for the relevant commitment period.

The emission factor for fugitive upstream emissions for natural gas ($EF_{NG,upstream,CH4}$) include fugitive emissions from production, processing, transport and distribution of natural gas, is obtained from Table 2 "other oil exporting countries / rest of world" provided in methodology AM0029.

According to methodology AM0029, the emission factor for upstream fugitive CH_4 emissions occurring in the absence of the project activity ($EF_{NG,upstream,CH4}$) should be calculated consistent with the baseline emission factor ($EF_{BL,CO2,y}$) used above.

Since Option 1 (the build margin, calculated according to ACM0002) is selected for the calculation of the baseline emission factor, relevant emission factor for upstream fugitive CH_4 emissions ($EF_{BL,upstream,CH4}$) is calculated as follows:

$$EF_{BL,upstream,CH4} = \frac{\sum_j FF_{j,k} \cdot EF_{k,upstream,CH4}}{\sum_j EG_j} \quad (11)$$

where:

$EF_{BL,upstream,CH4}$ is the emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH_4 per MWh electricity generation in the project plant;

j is the plants included in the build margin;

$FF_{j,k}$ is the qquantity of fuel type *k* (a coal or oil type) combusted in power plant j included in the build margin;

$EF_{k,upstream,CH4}$ is the emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in tCH_4 per MJ fuel produced;

EG_j is the eelectricity generation in the plant j included in the build margin in MWh;

The emission factor for fugitive upstream emissions for coal ($EF_{k,upstream,CH4}$) include fugitive emissions from underground coal production, is obtained from Table 2 provided in methodology AM0029.

In China, it is very difficult to obtain the data of the plant j. Therefore, according to the deviation in application of methodology AM0005[30] approved by CDM EB, recent 20% capacity additions of the Northwest China Grid during 2003~2005[31] were used for estimating the Build Margin emission factor for grid electricity and the 600 MW sub-critical coal-fired power generator was used as the proxy of efficiency level of the best technology in China[32]. Based on these data, formula (11) can be conservatively converted into formula (12)[33]:

$$EF_{BL,upstream,CH4} = \varphi_{coal} \times PGCC_{coal,best} \times EF_{coal,upstream,CH4} \times \frac{NCV_{coal}}{NCV_{Rawcoal}} \quad (12)$$

where,

φ_{coal} is the share of coal-fired generation in BM generation (0.5984, see Annex 3 for details).

$PGCC_{coal,best}$ is the power generation standard coal equivalent consumption of the 600 MW sub critical coal-fired generation technology within the grid boundary.

NCV_{coal} is the net caloric value of standard coal equivalent in GJ/tCe.

$NCV_{Rawcoal}$ is the net caloric value of raw coal which is used for power generation in GJ/tCe[34].

Since all natural gas used in the Project are from local area and no natural gas imported from other countries is used in the Project, upstream emissions occurring in Annex I countries that have ratified the Kyoto Protocol are not necessary to be excluded.

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30 Http://cdm.unfccc.int/Projects/Deviations.

31 Capacity additions during 2003~2005 are greater than and most close to 20% of the electricity system. See Annex 3 for details.

32 Http://www.ccchina.gov.cn/source/fa/fa2002082803.html.

33 The conservativeness of such switch has been demonstrated in Annex 3.

34 As per the data on P287 of C*hina Energy Statistical Yearbook* (2006 Edition), caloric value of raw coal is 5000 kcal/kg and that of standard coal is 7000 kcal/kg.

Since the total net leakage effects are negative ($LE_y < 0$), project participants assume $LE_y = 0$ for the Project (see Section B.3 for details).

IV. Calculate the emission reductions

To calculate the emission reductions the project participant shall apply the following equation:

$$ER_y = BE_y - PE_y - L_y \quad (13)$$

where:

ER_y is the emissions reductions of the project activity during the year y (tCO_2e),

BE_y is the baseline emissions due to displacement of electricity during the year y (tCO_2e),

PE_y is the project emissions during the year y (tCO_2e),

L_y is the leakage in year y (tCO_2e).

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	mass or volume unit
Description:	Total amount of fuel i consumed by province j in year y
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* is reliable.
Any comment:	-

Data / Parameter:	-
Data unit:	MWh
Description:	Electricity generated by province j in year y
Source of data used:	*China Power Electric Yearbook*
Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Power Electric Yearbook* is reliable.
Any comment:	For calculation of electricity output to the grid by province j in year y.

Data / Parameter:	-
Data unit:	%
Description:	Auxiliary electricity consumption rate of province j in year y
Source of data used:	*China Power Electric Yearbook*

Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Power Electric Yearbook* is reliable.
Any comment:	For calculation of electricity output to the grid by province j in year y.

Data / Parameter:	NCV_i
Data unit:	MJ/t or 1000 m^3
Description:	Net calorific value of fuel i
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* is reliable.
Any comment:	-

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor of the fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* is reliable.
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	$kgCO_2/TJ$
Description:	CO_2 emission factor of the fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* is reliable.
Any comment:	-

Data / Parameter:	-
Data unit:	-
Description:	Fuel consumption per kWh electricity supplied to grid of best technology commercially available in China
Source of data used:	http://cdm.ccchina.gov.cn/
Value applied:	See Annex 3 for detail
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the China's DNA is reliable.
Any comment:	-

Data / Parameter:	-
Data unit:	tCe/t
Description:	Conversion factor from physical unit to standard coal equivalent
Source of data used:	P287 of *China Energy Statistical Yearbook* (2006 edition)
Value applied:	0.7143
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* is reliable.
Any comment:	-

Data / Parameter:	$PGCC_{BL}$
Data unit:	gCe/kWh
Description:	the power generation standard coal equivalent consumption of the most likely baseline technology identified in previous step, 600 MW sub critical coal-fired plant in the PDD
Source of data used:	http://www.ccchina.gov.cn/source/fa/fa2002082803.html
Value applied:	320
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is obtained from official web site of China's DNA. The data source is reliable.
Any comment:	-

Data / Parameter:	e
Data unit:	%
Description:	Baseline scenario: the auxiliary electricity consumption of the 600 MW sub critical coal-fired plant.
Source of data used:	*China Electric Power Yearbook 2004, P670; China Electric Power Yearbook 2005,*

	P472; China Electric Power Yearbook 2006, P560.
Value applied:	5.05%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The average auxiliary electricity consumption of the coal-fired power plant in Qinghai Power Grid from 2003 to 2005 is calculated as the value of e.
Any comment:	=(4.5%+7.96%+2.69%)/3

Data / Parameter:	$EF_{NG,upstream,CH4}$
Data unit:	tCH_4/PJ
Description:	the emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in tCH_4 per GJ fuel supplied to final consumers
Source of data used:	"Other oil exporting countries / rest of world" provided in Table 2 of methodology AM0029.
Value applied:	296
Justification of the choice of data or description of measurement methods and procedures actually applied :	Consider of data availability, use defaults provided by methodology AM0029.
Any comment:	-

Data / Parameter:	$EF_{coal,upstream,CH4}$
Data unit:	tCH_4/kt
Description:	the emission factor for fugitive upstream emissions for coal
Source of data used:	"Underground coal production" provided in Table 2 of methodology AM0029
Value applied:	13.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Consider of data availability, use defaults provided by methodology AM0029.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

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I. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

According to formula (2), the annual baseline emission of the Project is 894,797 tCO_2e as calculated in table below.

Item	$EG_{PJ,y}$ **(MWh)**	$EF_{BL,CO2,y}$ **(tCO_2e/MWh)**	BE_y **(tCO_2e)**
I.D.	A	B	C

Data	1,559,151	0.5739	894,797
Data source or calculation formula	*Feasibility Study Report*	See Annex 3 for detail	C=A×B

II. Estimated project activity emissions:

According to formula (9) and formula (9a), the annual emission of the Project activities is 602,781 tCO_2e as calculated in table below.

Item	$FC_{f,y}$ **(Nm³)**	$NCV_{f,y}$ **(MJ/Nm³)**	$COEF_{f,y}$ **($kgCO_2$/TJ)**	$OXID_f$	PE_y **(tCO_2e)**
I.D.	D	E	F	G	H
Data	321,795,500	33.39	56,100	1	602,781
Data source or calculation formula	*Feasibility Study Report*	Inspection report No.(2006)W178	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*	$H= D×E×F×G/10^9$

III. Estimated project leakage:

According to formula (12), the emission factor for fugitive upstream emissions for the Project is estimated as 0.0040 tCH_4/MWh as shown in table below.

Item	φ_{coal}	$PGCC_{best}$ **(gCe/kWh)**	$EF_{coal,upstream,CH4}$ **(tCH_4/kt)**	$\frac{NCV_{coal}}{NCV_{Rawcoal}}$	$EF_{BL,upstream,CH4}$ **(tCH_4/MWh)**
I.D.	I	J	K	L	M
Data	0.5984	320	13.4	1.4	0.0040
Data source or calculation formula	See Annex 3 for details	China's DNA	AM0029	*China Energy Statistical Yearbook* 2006 edition, P287	$M=I×J×K×L/10^6$

According to formula (10), the annual total net leakage effects for the Project is estimated as -53,686 tCO_2e as shown in table below.

Item	$EF_{NG,upstream,CH4}$ **(tCH_4/PJ)**	**Auxiliary electricity consumption of the Project (%)**	GWP_{CH4} **(tCO_2e/tCH_4)**	$LE_{CH4,y}$ **(tCO_2e)**
I.D.	N	O	P	Q
Data	296	2.37	21	-53,686
Data source or calculation formula	AM0029	*Feasibility Study Report*	IPCC default	$Q=[D×E×N/10^9-A/(1-O)×M]×P$

Since the total net leakage effects are negative ($LE_y < 0$), project participants assume $LE_y = 0$ for the Project.

IV. Estimated emission reductions

According to formula (13), the annual emission reductions of the Project are estimated as 292,016 tCO_2e as shown in table below.

Item	BE_y (tCO_2e)	PE_y (tCO_2e)	$LE_{CH4,y}$ (tCO_2e)	ER_y (tCO_2e)
I.D.	C	H	R	S
Data	894,797	602,781	0	292,016
Data source or calculation formula	C=A×B	H= D×E×F×G/10^9	AM0029	S=C-H-R

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

>>

Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the project activities will generate emission reductions within the Northwest China Grid for about 292,016 tCO_2e per year over the first 7-year crediting period from 01/08/2008 to 31/07/2015.

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Aug. to Dec., 2008	251,159	372,832	0	121,673
2009	602,781	894,797	0	292,016
2010	602,781	894,797	0	292,016
2011	602,781	894,797	0	292,016
2012	602,781	894,797	0	292,016
2013	602,781	894,797	0	292,016
2014	602,781	894,797	0	292,016
Jan. to Jul., 2015	351,622	521,965	0	170,343
Total (tCO_2e)	**4,219,467**	**6,263,579**	**0**	**2,044,112**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	the electricity delivered to the grid by the Project
Source of data to be used:	Data in the PDD is obtained from the *Feasibility Study Report* and real data will be obtained based on measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,559,151
Description of measurement methods and procedures to be applied:	Measured continuously by ammeters installed at the Ge-ermu Substation and recorded monthly by the project owner.
QA/QC procedures to be applied:	Sales receipts/records to the grid are used to ensure the consistency.
Any comment:	Bi-direction ammeters with precision of 0.2s are employed by the Project, whose reading is net electricity delivered to grid, therefore, there is no need to monitor the auxiliary electricity consumption.

Data / Parameter:	$F_{i,m,y}$
Data unit:	mass or volume unit
Description:	total amount of fuel i consumed by province m in year y
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* is reliable. Update the data with the latest public available edition of the *China Energy Statistical Yearbook.*
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	-
Data unit:	MWh
Description:	electricity generated by province m in year y
Source of data used:	*China Power Electric Yearbook*
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Power Electric Yearbook* is reliable. Update the data with the latest public available edition of the *China Power Electric Yearbook.*
QA/QC procedures to	-

be applied:	
Any comment:	For calculation of electricity output to the grid by province m in year y.

Data / Parameter:	-
Data unit:	%
Description:	Auxiliary electricity consumption rate of province m in year y
Source of data used:	*China Power Electric Yearbook*
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Power Electric Yearbook* is reliable. Update the data with the latest public available edition of the *China Power Electric Yearbook.*
QA/QC procedures to be applied:	-
Any comment:	For calculation of electricity output to the grid by province m in year y.

Data / Parameter:	NCV_i
Data unit:	MJ/t or 1000 m^3
Description:	net calorific value of fuel i
Source of data used:	*China Energy Statistical Yearbook*
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* is reliable. Update the data with the latest public available edition of the *China Energy Statistical Yearbook.*
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	oxidation factor of the fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* is reliable. Update the data with the latest public available edition of the *IPCC Guideline for National Greenhouse Gas Inventories.*
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	$kgCO_2/TJ$
Description:	CO_2 emission factor of the fuel i
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* is reliable. Update the data with the latest public available edition of the *IPCC Guideline for National Greenhouse Gas Inventories.*
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	-
Data unit:	-
Description:	Fuel consumption per kWh electricity supplied to grid of best technology commercially available in China
Source of data used:	Data used in the PDD is obtained from http://cdm.ccchina.gov.cn/ and the data will be updated with latest reliable data source.
Value applied:	(see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the China's DNA is reliable. Update the data with data obtained from the latest reliable data source.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$FC_{NG,y}$
Data unit:	Nm^3
Description:	the total volume of natural gas combusted in the project plant in year(s) 'y'
Source of data used:	Data in the PDD is obtained from the *Feasibility Study Report* and real data will be obtained based on measurement.
Value applied:	321,795,500
Justification of the choice of data or description of measurement methods and procedures actually applied :	Daily measured by natural gas flow meters installed at the inlet of gas turbines and recorded by the project owner.
QA/QC procedures to be applied:	The total volume of natural gas combusted in the project plant in year(s) 'y' will be monitored by the vortex flow meter installed at the inlet of gas turbines (project site), and double checked against natural gas metering handover receipt.

	Precision of vortex flow meter used in the Project is 1.0. The flow meter will be maintenance and testing in accordance with stipulation of the meter supplier to ensure accuracy.
Any comment:	-

Data / Parameter:	$NCV_{NG,y}$
Data unit:	GJ/m^3
Description:	the net calorific value per volume unit of natural gas in year 'y'
Source of data used:	Data in the PDD is obtained from Inspection report No.(2006)W178 and real data will be obtained from report provided by the natural gas supplier once per two weeks.
Value applied:	0.03339
Justification of the choice of data or description of measurement methods and procedures actually applied :	Qualified authorities will be selected by the natural gas supplier to measure the net caloric value of natural gas.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$COEF_y$
Data unit:	tCO_2/m^3
Description:	CO_2 emission coefficient of the Project in year 'y'
Source of data used:	Calculated under project activity
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	Annually calculated with $NCV_{f,y}$, $OXID_f$ and $EF_{CO2,f}$.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	PE_y
Data unit:	tCO_2
Description:	CO_2 emission of the Project in year 'y'
Source of data used:	Calculated under project activity
Value applied:	-
Justification of the choice of data or description of measurement methods	Annually calculated with $FC_{f,y}$ and $COEF_y$.

and procedures actually applied :	
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EG_{gen,y}$
Data unit:	MWh
Description:	The amount of electricity generated by the Project during year y
Source of data used:	Data in the PDD is obtained from the *Feasibility Study Report* and real data will be obtained based on measurement.
Value applied:	1,596,980
Justification of the choice of data or description of measurement methods and procedures actually applied :	Electricity generation will be measured by the ammeters at the outlet of generators and recorded per month.
QA/QC procedures to be applied:	Cross-checked with fuel consumption of the Project.
Any comment:	Used to calculate the auxiliary electricity consumption of the Project with the amount of electricity supplied to the grid.

Data / Parameter:	φ_{coal}
Data unit:	-
Description:	the share of coal-fired generation in BM generation
Source of data used:	*China Electric Power Yearbook*
Value applied:	0.5984
Justification of the choice of data or description of measurement methods and procedures actually applied :	Estimate based on data published by *China Electric Power Yearbook*. See Annex 3 for details. Update the data with the latest public available edition of the *China Electric Power Yearbook.*
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

>>

Key content of the monitoring plan for the Project includes monitoring of electricity supplied to the grid, monitoring of baseline emission factor, monitoring of natural gas consumption of the Project, monitoring of net caloric value of natural gas and monitoring of leakage.

1. Management structure

Please refer to Figure 4 for details regarding the management structure of the monitoring plan.

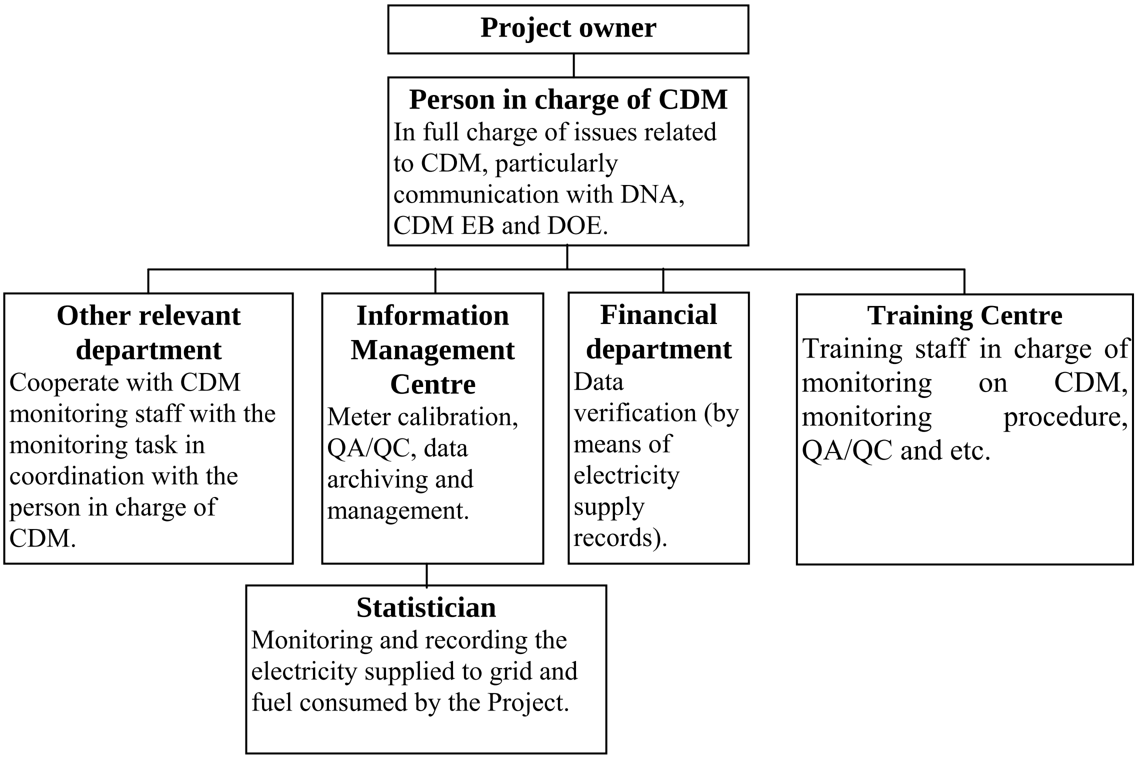

Figure 4. Management Structure of Monitoring Plan

2. Training Plan

The staffs of the Project have been trained by GE in 2006 for several months regarding operation and maintenance of equipments. Prior to the submission of request for registration, the task of training staff in charge of executing the monitoring plan was carried out on October 2006, with the training contents including basic concepts and operation modality of CDM, approaches of data monitoring and archiving for CDM projects, quality control and quality assurance of monitoring, and preparation and improvement of key documents of monitoring and verification. Contents and requirements of the training plan should be supplemented, modified and improved according to DOE's requirements.

3. Methods for monitoring

Electricity delivered to the grid by the Project: Electricity delivered to the grid by the Project will be measured by the ammeters installed at the point connecting the Project to the grid system, and cross-checked by the electricity sales receipts provided by the grid into which the Project is connected. The project owner will ensure that reading records of the ammeters are readily available for DOE's verification.

Baseline emission factors: The latest BM emission factor of the Northwest China Grid calculated based on latest public statistics is adopted as the baseline emission factors of the Project.

Consumption of natural gas by the Project: consumption of natural gas will be daily monitored by natural gas flow meters at the inlet of gas turbine, monthly recorded and cross-checked by the monitoring results of the natural gas flow meter installed by the supplier at the endpoint of the gas transmission pipeline of the Project, natural gas metering handover receipt and natural gas purchase record.

NCV of natural gas: supplier of the natural gas for the Project should provide the project plant with the analysis report of caloric value of natural gas at least once per two weeks.

Leakage: as per China Electric Power Yearbook, the most recent 20% new additions to the Northwest China Grid are calculated according to methodology ACM0002; writers of the monitoring report should be in charge of collecting data and determining the standard coal equivalent consumption for power generation using the most advanced operated technology and providing the authoritative and reliable sources for DOE's verification.

4. Error disposal procedure and review of reported data/results

Error disposal procedure for electricity delivered to the grid and natural gas supply will be executed as per stipulations in Power Purchase Agreement, Parallel Operation Agreement and Natural Gas Purchase Agreement.

Special department will be appointed by the project owner to undertake the responsibility of review of reported data/results.

5. Maintenance and calibration of Meters & Metering

Precision of vortex flow meter used in the Project is 1.0. Precision of ammeters used in the Project is 0.2s. Calibration of Meters & Metering should be implemented according to the Measuring Rules issued by project owner (Document No.: QB/GEM 003-2006). Relevant national and local standards and rules includes Regulation JJG 124-2005, JJG 307, JJG 313, JJG 314 and DL/T 448. As required by the rules, for example, the direct current electric Instruments will be calibrated per year. All the records should be documented and maintained by the project owner for DOE's verification.

6. Quality Assurance and Quality Control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity according to CDM EB rules and real practice. This is an on-going process which will be ensured through the CDM mechanism in terms of the need for verification of the emission reductions on an annual basis according to this PDD.

7. Data Management System

- Specific staff will be appointed by the project owner to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all the data and information of emission reductions for verification.
- Electronic data and documents, including readings from electric meters connected into the computer central control system, will be regularly copied and archived via optical discs and storage tapes, and kept at least two years after the end of the crediting period.
- Written data and documents, including receipts for cross-checking of data, will be copied and archived with an explanation of the department or company where the original copy is kept, and kept at least two years after the end of the crediting period.

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

>>

The application of the baseline study and monitoring methodology of the Project was completed on 20/06/2008 by below parties:

Name/Origination	**Project participate Yes/No**
Dr. Zheng Zhaoning, Ms. Pan Tao	No
Millennium Capital Services 1202 Jinbao Office Building, 89 Jinbao Street, Dongcheng District, Beijing 100005, P.R.China Tel: +86 (10) 8522 1916 Fax: +86 (10) 8522 1906	No

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:

>>
28/10/2005 (Construction starting date[35])

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

>>
20y-0m

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:

>>
01/08/2008

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

35 The date is obtained from the Project Implementation Schedule which was framed by the construction entity of the project and approved on 25/10/2005 by supervision entity of the Project.

SECTION D. Environmental impacts

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

>>

The *Environmental Impact Statement Report* of the Project was completed by the Designing Institute of Environmental Scientific Research of Qinghai Province, and approved by the State Environmental Protection Bureau in August, 2005 (Document No. Huanshen[2005]669).

The environmental impacts arising from the Project are analyzed respectively for the construction phase and the operation phase.

<u>Construction Phase</u>

Ecological impact

Construction activities of the Project may disturb and impact the growth environment of the vegetation around the construction area. The project owner will carry out the planting work for more than 20% of the area planned for production and residential activities, plant greensward on the naked ground surface by means of mixture sowing and cover the temporary pilings in order to control and avoid water loss and soil erosion. The water and soil conservation plan has been approved by the Water Resource Department of Qinghai Province in Sep, 2004(Document No. Qing Shui [2004]350).

Noise

Noises generated during the construction stem mainly from the operation of construction machines and vehicles. As the noise sources during the construction are in the open air, and there exists no acoustic environment objective such as residential area located within 1km to the Project site. Noises generated during the construction will have no impact on local resident and pose no harm to the construction staff.

Dust and waste gas

Construction machines and transportation vehicles will generate dust and waste gas. Since the project site is more than 3 km far from the nearby residential area, dust and waste gas generated by the Project will have only certain impact on the plant area. Volume of earthwork is not large and little dust is generated by the Project, which will satisfy the requirements of the *Ambient Air Quality Standard* (GB3095-1996).

Waste water

Waste water resulting from washing construction machines and vehicles as well as residential waste water will be generated during the construction. Since the Project construction involves no huge amount of work, quantity of construction workers required will not be large. As a result, waste water generated will be small, resulting in little impact on the water quality of Beichuan River into which waste water is discharged, which will satisfy the requirements of the *Integrated Wastewater Discharge Standard* (GB8978-1996).

Solid waste

Waste material, construction garbage and so on generated during construction will be collectively sent to specific places designated by the environmental protection and city construction departments for disposal.

<u>Operation Phase</u>

Ecological impact

Active water and soil conservation measures will be taken by the Project, which may help hold back 90% of additional possible running of sandy soil. Construction and operation of the Project will help optimize the local industrial structure, increase the local tax revenues, and help the local government at the Project site to reinforce ecological protection and construction, thus having positive and profound impacts on improving the environmental and ecological quality.

Noise

There exists no acoustic environment objective such as residential area located within 1km to the Project site; therefore the Project will not impact the nearby residents. The Project owner has taken proper measures, such as giving priority to equipment generating low noises in the process of equipment ordering, installing exhaust mufflers with high efficiency, reinforcing planting efforts, adopting sound insulation, absorption and attenuation measures, to reduce and control the impacts of noises on the surrounding environment. Operation noise of the Project satisfies the requirements of the *Standard of Noise at Boundary of Industrial Enterprises* (GB12348-90).

Waste gas and waste slag

The Project hardly generates SO_2 and paricle emissions. Being take the lead in utilizing dry low-nitrogen burners in China, the Project will emit NO_X resulting in a concentration of 51.25 mg/Nm^3, far lower than the requirement of *Emission Standard of Air Pollutants for Thermal Power Plants* (GB13223-2003) which is 80 mg/Nm^3. Compared with coal-fired power plant which installs desulphurizing equipment and has a commensurate scale to the Project, the Project can reduce emissions of 663 tons of SO_2, 3996 tons of NO_X, 193 tons of CO, 222 tons of TSP and 104 thousand tons of ash, having significant environmental benefits.

Waste water

The Project will use the reclaimed water from Ge-ermu Waste Water Disposal Plant as the industrial water source and reduce consumption of fresh water by means of enhancing efficiency of water usage. Normal waste water (35 m^3/h) discharged by the Project, which can meeting the standards after neutralized treatment or floatation treatment, will be sent together with the clean waste water (185 m^3/h) discharged by the Project to Gelian Oxidation Pond for further treatment. Residential waste water (3 m^3/h) generated during operation of the Project will be recycled after meeting the standards via bio-contact oxidation treatment. Waste water emission of the Project satisfies the requirements of the *Integrated Wastewater Discharge Standard* (GB8978-1996).

Solid waste

Residential garbage generated during the operation of the Project will be piled at regular places and will be delivered to the environmental sanitation department for treatment.

In conclusion, environmental impacts arising from the Project are considered insignificant.

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 Project use clean high efficiency combined cycle power generation technology to generate electricity whose environmental impact comply with relevant national laws and regulations. Environmental impacts arising from this project are considered insignificant.

SECTION E. Stakeholders' comments

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

>>

In April 2005, assisted by the Designing Institute of Environmental Scientific Research of Qinghai Province, the project carried out a survey of the local residents who might be affected by the Project and officials of the Ge-ermu City. The survey was conducted by distributing the questionnaires on a random basis.

Main concern of the questionnaires includes:

• How much do the stakeholders know about the Project?

• What's the attitude of the stakeholders on the construction and operation of the Project?

• What positive impacts will be introduced by the implementation of the Project from the view of stakeholders?

• Do the environmental protection measures feasible from the view of stakeholders?

E.2. Summary of the comments received:

>>

The survey was conducted through distributing and collecting responses to a questionnaire. Totally 64 questionnaires returned out of 67 with 96% response rate. 44 of the respondents (accounting for 69%) are Male and 20 of the respondents (accounting for 31%) are female. The basic structure of the respondents is illustrated in Table 9.

Table 9. Structure of the respondents

Structure of nationality		
Nationality	**Number**	**Percentage (%)**
Tibetan	3	5
Manzu	3	5
Han	57	89
Other	1	1

Structure of educational level		
Educational level	**Number**	**Percentage (%)**
College	20	31
Technical college	26	41
Technical secondary school	4	6
High School	14	22

Structure of age		
Age	**Number**	**Percentage (%)**
20~30	17	27
31~40	35	55
41~50	11	17
Older than 51	1	1

It can be seen that respondents are adequately representative in terms of nationality, gender, age, educational level, etc., and their attitudes towards the impacts of the Project can be a comprehensive reflection of the attitudes of public.

• 69% of the respondents understand and know the Project, surpassing half of the respondents.

• 95% of the respondents support the construction of the Project, 5% of the respondent hold a neutral attitude.

• 92% of the respondents consider that the implementation of the Project may increase employment opportunities, promote local economic development and improved living standards.

• 97% of the respondents consider that measures to control the pollution and impacts resulting from the Project are feasible or basically feasible.

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

>>

The project is constructed on a clearing thus has little impacts on stakeholders. The residents and local government are all very supportive of the Project therefore there has been no need to modify the Project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

To determine the Simple OM emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) for the Project, data and method recommended in the *Notification on Determining Baseline Emission Factor of China's Grid* for the Northwest China Grid are adopted.

The following tables summarise the numerical results from the equations listed in the approved methodology ACM0002 (version 6). The information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Basic statistics of fuel fired power plants of the Northwest China Grid in 2003

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total F=A+B+C+D+E	Emission coefficient ($kgCO_2/TJ$) G	Oxidation Rate (%) H	NCV (MJ/t or $1000m^3$) I	Emission[36] (tCO_2e) J
Raw coal	10^4t	2002.26	1479.62	330.67	682	1065.75	5560.3	94600	100	20908	109,976,996
Other washed coal	10^4t	0.00	0.00	0.00	27	3.64	30.64	94600	100	8363	242,405
Coke oven gas	10^8m^3	0.00	1.54	0.00	0.00	0.00	1.54	44400	100	16726	114,366
Other gas	10^8m^3	0.00	0.12	0.00	0.00	0.00	0.12	44400	100	5227	2,785
Diesel	10^4t	3.12	0.00	0.00	0.04	0.4	3.56	74100	100	42652	112,514
Fuel oil	10^4t	0.00	1.19	0.00	0.00	1.02	2.21	77400	100	41816	71,528
Refinery gas	10^4t	0.00	0.00	0.00	0.00	3.48	3.48	57600	100	46055	92,316
Natural gas	10^8m^3	0.1	0.54	0.00	0.00	5.95	6.59	56100	100	38931	1,439,275
Total emission of the Northwest China Grid (tCO_2e)						112052185					

Data sources: China Energy Statistical Yearbook 2004.

36 If the unit of the fuel is 10^4 t, then $J=F\times G\times H\times I/10^7$; if the unit of the fuel is 10^8 m^3, then $J= F\times G\times H\times I/10^6$. The same about the calculation of J in Table A3 and Table A5.

Table A2. Electricity generation of the Northwest China Grid in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	38144000	6.94	35496806
Gansu	29494000	6.35	27621131
Qinghai	6446000	4.5	6155930
Ningxia	19175000	5.25	18168313
Xinjiang	19834000	8.19	18209595
Total			105651775

Data source: China Electric Power Yearbook 2004.

Table A3. Basic statistics of fuel fired power plants of the Northwest China Grid in 2004

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total F=A+B+C+D+E	Emission coefficient ($kgCO_2/TJ$) G	Oxidation Rate (%) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Raw coal	10^4t	2428.7	1595.9	322.8	1270.1	1240.9	6858.4	94600	100	20908	135,652,074
Other washed coal	10^4t	0.00	0.00	0.00	102.64	10.5	113.14	94600	100	8363	895,096
Coke	10^4t	0.78	0.00	0.00	0.00	0.00	0.78	107000	100	28435	23,732
Coke oven gas	10^8m^3	0.00	0.3	0.00	0.00	0.00	0.3	44400	100	16726	22,279
Other gas	10^8m^3	0.74	1.26	0.00	0.00	0.00	2	44400	100	5227	46,416
Crude oil	10^4t	0.01	0.00	0.00	0.00	0.06	0.07	73300	100	41816	2,146
Gasoline	10^4t	0.02	0.00	0.00	0.00	0.00	0.02	69300	100	43070	597
Diesel	10^4t	2.16	0.36	0.00	0.05	0.41	2.98	74100	100	42652	94,183
Fuel oil	10^4t	0.01	0.69	0.00	0.00	0.3	1	77400	100	41816	32,366
Refinery gas	10^4t	0.00	0.00	0.00	0.00	3.26	3.26	57600	100	46055	86,480
Natural gas	10^8m^3	1.61	0.59	0.00	0.00	6.27	8.47	56100	100	38931	1,849,873
Total emission of the Northwest China Grid (tCO_2e)						138705241					

Data sources: China Energy Statistical Yearbook 2005.

Table A4. Electricity generation of the Northwest China Grid in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	44439000	7.5	41106075
Gansu	33242000	6.21	31177672
Qinghai	6208000	7.96	5713843.2
Ningxia	25298000	5.45	23919259
Xinjiang	22752000	9.07	20688394
Total			122605243

Data source: China Electric Power Yearbook 2005.

Table A5. Basic statistics of fuel fired power plants of the Northwest China Grid in 2005

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total F=A+B+C+D+E	Emission coefficient ($kgCO_2/TJ$) G	Oxidation Rate (%) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Raw coal	10^4t	2461.28	1597	345.1	1467.7	1358.09	7229.17	94600	100	20908	142,985,522
Cleaned coal	10^4t	16.22	0.00	0.00	0.00	0.00	16.22	94600	100	26344	404,225
Other washed coal	10^4t	35.56	0.00	0.00	101.95	10.2	147.71	94600	100	8363	1,168,593
Coke	10^4t	3.23	0.00	0.00	0.00	0.00	3.23	107000	100	28435	98,274
Crude oil	10^4t	0.00	0.00	0.00	0.00	0.18	0.18	73300	100	41816	5,517
Gasoline	10^4t	0.02	0.00	0.00	0.00	0.01	0.03	69300	100	43070	895
Diesel	10^4t	2.24	0.46	0.06	0.00	0.5	3.26	74100	100	42652	103,033
Fuel oil	10^4t	0.01	0.57	0.00	0.00	0.25	0.83	77400	100	41816	26,863
Refinery gas	10^4t	0.00	0.00	0.00	0.00	7.71	7.71	57600	100	46055	204,528
Natural gas	10^8m3	1.46	0.52	1.33	0.00	7.81	11.12	56100	100	38931	2,428,640
Other energy	10^4tCe	8.24	1.3	0.00	0.00	0.00	9.54	0	100	29271.2	0
Total emission of the Northwest China Grid (tCO_2e)						147426092					

Data sources: China Energy Statistical Yearbook 2006.

Table A6. Electricity generation of the Northwest China Grid in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shaanxi	41100000	7.16	38157240
Gansu	33106000	4.23	31705616
Qinghai	5500000	2.69	5352050
Ningxia	27643000	5.73	26059056
Xinjiang	26560000	8.8	24222720
Total			125496682

Data source: China Electric Power Yearbook 2006.

Calculate with data provided in Table A1~A6, the value of Simple OM emission factor ($EF_{OM,y}$) is calculated as (112052185+138705241+147426092)/(105651775+122605243+125496682)=1.1256 tCO_2e/MWh.

Table A7. Data and result of Step a

Energy	Unit	Shaanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Total F=A+B+C+D+E	Emission coefficient ($kgCO_2/TJ$) G	Oxidation Rate (%) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Raw coal	10^4t	2461.28	1597	345.1	1467.7	1358.09	7229.17	94600	100	20908	142,985,522
Cleaned coal	10^4t	16.22					16.22	94600	100	26344	404,225
Other washed coal	10^4t	35.56			101.95	10.2	147.71	94600	100	8363	1,168,593
Coke	10^4t	3.23					3.23	107000	100	28435	98,274
Sub-total											**144,656,614**
Crude oil	10^4t					0.18	0.18	73300	100	41816	5,517
Gasoline	10^4t	0.02				0.01	0.03	69300	100	43070	895
Diesel	10^4t	2.24	0.46	0.06		0.5	3.26	74100	100	42652	103,033
Fuel oil	10^4t	0.01	0.57			0.25	0.83	77400	100	41816	26,863
Sub-total											**136,309**
Refinery gas	10^4t					7.71	7.71	57600	100	46055	204,528
Natural gas	10^8m3	1.46	0.52	1.33		7.81	11.12	56100	100	38931	2,428,640
Sub-total											**2,633,169**
Total											**147,426,092**

Data sources: China Energy Statistical Yearbook 2006.

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel ($kgCO_2/TJ$)	Oxidation Rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/10^6*B*C
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	94600	100%	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	56100	100%	0.4237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	77400	100%	0.5845

Calculate with data provided in Table A7 and formula (4)~(7), the value for λ_{Coal} is 98.12%, the value for λ_{Oil} is 0.09% and the value for λ_{Gas} is 1.79%. Therefore $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9410 tCO_2e/MWh.

Table A9. Installed capacity of the Northwest China Grid in 2005

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	9132.1	5715.0	886.8	4577.0	5051.7	25362.6
Hydro power (MW)	1578.0	4036.2	4825.0	428.5	1352.1	12219.8
Wind power and Other (MW)	46.0	109.1	0.0	112.2	132.2	399.5
Total (MW)	10756.1	9860.3	5711.8	5117.7	6536.0	37981.9

Data source: China Electric Power Yearbook 2006.

Table A10. Installed capacity of the Northwest China Grid in 2004

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	7640.4	4975.6	889.8	3782.0	4959.7	22247.5
Hydro power (MW)	1876.5	3566.1	4053.4	366.2	973.0	10835.2
Wind power and Other (MW)	0.0	138.2	0.0	42.5	95.3	276.0
Total (MW)	9516.9	8679.9	4943.2	4190.7	6028.0	33358.7

Data source: China Electric Power Yearbook 2005.

Table A11. Installed capacity of the Northwest China Grid in 2003

	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power (MW)	7326.4	4745.0	905.8	3102.0	4413.5	20492.7
Hydro power (MW)	1462.3	3280.6	3341.1	308.2	989.8	9382.0
Wind power and Other (MW)	0.0	21.6	0.0	10.0	91.3	122.9
Total (MW)	8788.7	8047.2	4246.9	3420.2	5494.6	29997.6

Data source: China Electric Power Yearbook 2004.

Table A12. Calculation of BM emission factor of the Northwest China Grid

	Installed capacity in 2003 (MW) A	Installed capacity in 2004 (MW) B	Installed capacity in 2005 (MW) C	Capacity additions from 2003 to 2005 (MW) D=C-A	Share in total capacity additions
Thermal power	20492.7	22247.5	25362.6	4869.9	60.99%
Hydro power	9382	10835.2	12219.8	2837.8	35.54%
Wind power and Other	122.9	276	399.5	276.6	3.46%
Total	29997.6	33358.7	37981.9	7984.3	100.00%
Share in total installed capacity of 2004	78.98%	87.83%	100%		

$EF_{BM,y}$ =0.9410×60.99%=0.5739 tCO_2e/MWh.

Table A13. Share of low-cost/must run resources in the Northwest China Grid

	2001	2002	2003	2004	2005
Thermal power (GWh)	81148	93428	113093	131939	133909
Hydro power (GWh)	27446	27427	25899	34813	42801
Wind power and Other (GWh)	234	197	243	2501	7852
Total (GWh)	108828	121052	139235	169253	184562
Share of low-cost/must run resources (%)	25	23	19	22	27

Data source: China Electric Power Yearbook 2002 (P617), 2003 (P585), 2004 (P709), 2005 (P474) and 2006 (568).

Demonstration of the conservativeness of converting formula (11) into formula (12)

According to Methodology AM0029, in the absence of the project activity, emission factor for upstream fugitive CH_4 emissions ($EF_{NG,upstream,CH4}$) should be calculated consistent with the calculation of the baseline emission factor ($EF_{BL,CO2,y}$). Since Option 1 (calculation of the build margin emission factor according to ACM0002) is adopted to calculate the baseline emission factor, relevant calculation of emission factor for upstream fugitive CH_4 emissions ($EF_{BL,upstream,CH4}$) should be consistent with that used by ACM0002 to calculate the build margin emission factor ($EF_{BM,y}$).

According to ACM0002, the formula to calculate the build margin emission factor ($EF_{BM,y}$) is

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (A1)$$

Referring to the *Notification on Determining Baseline Emission Factor of China's Grid*, and as per the deviation approved by CDM EB, formula (A1) is converted to the following formula to calculate the Build Margin emission factor ($EF_{BM,y}$):

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (A2)$$

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad (A3)$$

$$EF_{k,Adv} = PGCC_{k,best} \times EF_k \times \frac{NCV_{coal}}{NCV_k} \qquad (A4)$$

Where:

$PGCC_{k,best}$ is the power generation standard coal consumption of the best technology commercially available for power generation of fuel type k (raw coal, oil or natural gas) fired within the grid boundary(tCe/MWh);

EF_k is the CO2 emission factor of fuel type k (raw coal, oil or natural gas) (tCO_2/t);

NCV_{coal} is the net caloric value of standard coal equivalent (GJ/tce);

NCV_k is the net caloric value of fuel type k (raw coal, oil or natural gas) (GJ/t).

Since calculation of relevant emission factor for upstream fugitive CH_4 emissions ($EF_{BL,upstream,CH4}$) is consistent with that of Build Margin emission factor ($EF_{BM,y}$) based on methodology ACM0002, as per the *Notification on Determining Baseline Emission Factor of China's Grid*, formula to calculate emission factor for upstream fugitive CH4 emissions ($EF_{BL,upstream,CH4}$) is converted from formula (11)

$$EF_{BL,upstream,CH4} = \frac{\sum_j FF_{j,k} \cdot EF_{k,upstream,CH4}}{\sum_j EG_j} \qquad (11)$$

into

$$EF_{BL,upstream,CH4y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,,upstream,CH4} \qquad (A5)$$

$$EF_{Thermal,upstream,CH4} = \lambda_{Coal} \times EF_{Coal,Adv,upstream,CH4} + \lambda_{Oil} \times EF_{Oil,Adv,upstream,CH4} + \lambda_{Gas} \times EF_{Gas,Adv,upstream,CH4} \qquad (A6)$$

$$EF_{k,Adv,upstream,CH4} = PGCC_{k,best} \times EF_{k,upstream,CH4} \times \frac{NCV_{coal}}{NCV_k} \qquad (A7)$$

Where:

$EF_{k,upstream,CH4}$ is the upstream fugitive CH_4 emissions ($EF_{BL,upstream,CH4}$) from power generation by the best technology commercially available for power generation of fuel type k (tCH4/MWh);while definition of other parameters is identical to the above.

Substituting formula (A6) into formula (A5)

$$EF_{BL,upstream,CH4y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times (\lambda_{Coal} \times EF_{Coal,Adv,upstream,CH4} + \lambda_{Oil} \times EF_{Oil,Adv,upstream,CH4} + \lambda_{Gas} \times EF_{Gas,Adv,upstream,CH4})$$

$$> \frac{CAP_{Thermal}}{CAP_{Total}} \times \lambda_{Coal} \times EF_{Coal,Adv,upstream,CH4} \qquad (A8)$$

Substituting formula (A7) into formula (A8)

$$EF_{BL,upstream,CH4y} > \frac{CAP_{Thermal}}{CAP_{Total}} \times \lambda_{Coal} \times PGCC_{coal,best} \times EF_{coal,upstream,CH4} \times \frac{NCV_{coal}}{NCV_{rawcoal}} \qquad (A9)$$

Since the share of coal-fired power generation (φ_{coal})in the recent 20% capacity additions of the grid into which the Project is connected is calculated by the following formula,

$$\varphi_{coal} = \frac{CAP_{Thermal}}{CAP_{Total}} \times \lambda_{Coal} \qquad \text{(A10)}$$

Substituting formula (A10) into formula (A9)

$$EF_{BL,upstream,CH4} > \varphi_{coal} \times PGCC_{coal,best} \times EF_{coal,upstream,CH4} \times \frac{NCV_{coal}}{NCV_{Rawcoal}} \qquad \text{(A11)}$$

The following is formula (12)

$$EF_{BL,upstream,CH4} = \varphi_{coal} \times PGCC_{coal,best} \times EF_{coal,upstream,CH4} \times \frac{NCV_{coal}}{NCV_{Rawcoal}} \qquad \text{(12)}$$

Based on the comparison of formula (A11) and formula (12), it can be seen that calculation by converting formula (11) into formula (12) underestimates the emission factor for upstream fugitive CH_4 emissions and thus the leakage emissions of the baseline scenario. It can be ensured that the result of the emission reduction calculation is conservative.

As per Table A7, λ_{Coal} =98.12%. As per Table A12, $\frac{CAP_{Thermal}}{CAP_{Total}}$ =60.99%. Therefore, $\varphi_{coal} = \frac{CAP_{Thermal}}{CAP_{Total}} \times \lambda_{Coal}$ =60.99%×98.12%=59.84%.

Annex 4

MONITORING INFORMATION

The calibration of meters & metering, the QA/QC procedure and others of the monitoring plan should be carried out with reference to the Power Purchase Agreement of the Project, the Parallel Operation Agreement of the Project, Natural Gas Purchase Agreement, Report on the Analysis Data of Component of Natural gas and the checking and testing standard and the specification of the monitoring equipments and no other additional information.

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