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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Project title: Ningxia Yinchuan No. 1 Natural Gas Cogeneration Project

PDD version: 04

Date: Jan. 13, 2009

Revision History of the PDD

Version	Date	Comments
Version 01	Mar. 28, 08	Completed version of the PDD, prepared for the host country approval and GSP process
Version 02	Dec. 08, 08	Revised according to the validation checklist
Version 03	Dec. 18, 08	Further revision based on validation checklist
Version 04	Jan. 13, 09	Further revision after DOE's Certification Committee, prepared for registration

A.2. Description of the project activity:

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Ningxia Yinchuan No.1 Natural Gas Cogeneration Project (hereinafter referred to as the proposed project) is located in Jinfeng District, Yinchuan City, Ningxia Hui Autonomous Region, People's Republic of China. The project entity is Ningxia HANAS Natural Gas Thermal Power Co., Ltd.. A cogeneration system consisted of a 51MW gas turbine generating unit, a waste heat boiler and a 13MW steam turbine generating unit are proposed to be installed. 64.76 million m^3 natural gas, which is from Shaanxi-Gansu-Ningxia gas field, will be consumed by the proposed project annually.

Electricity generated by the proposed project will be delivered to Northwest Power Grid (NWPG) via Ningxia Power Grid. The annual power delivered to the grid is 307,200MWh. It will take on the task of peak-load regulation. A part of the waste heat will be used for power generation by steam turbine generating unit, while the other part of the waste heat will be used for residential heating. Only the emission reduction by the electric power replacement is claimed.

The proposed project makes use of natural gas, a kind of clean and low-emission energy for power generation. The power generated by the proposed project will substitute a part of power would otherwise

have been generated by NWPG which is dominated by coal-fired power plants and thus reduces GHG emission. The estimated annual emission reductions are 49,041tCO_2e.

The baseline scenario identified is sub critical coal-fired power generation with a unit capacity of 600 MW.

Ningxia is a poverty-stricken and minority-residential region with a total population of 5.95 million in 2005[1]. 357,000 of the total population were living in poverty with an annual income below 944RMB and 75,000 under the absolute poverty line with an annual income below 683RMB. Among the population in poverty and under the absolute poverty line, respectively 74.5% and 77.3% live in Tongxin County, Haiyuan County and Xiji County where minority dominates the population[2].The proposed project will contribute to local sustainable development mainly through the following aspects:

- The proposed project will promote the transfer of advanced technology from overseas;
- The proposed project uses combined-cycle gas turbine (CCGT) technology, which could improve energy efficiency and reduce GHG emission;
- The implementation of the proposed project will reduce other pollutants such as SO_2, NO_x and particulate matter to be produced by conventional power plants;
- The implementation of the proposed project will mitigate the poverty, which is very important to Ningxia, a poverty-stricken region. The proposed project is beneficial to economic promotion of minority residential region. This is in line with the UN Millennium Development Goal (MDG).

A.3. Project participants:

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The project participants are shown in Table A3-1:

Table A3-1 Project participants

Name of Party involved	Private and /or public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participants (Yes/No)
China (host)	Ningxia HANAS Natural Gas Thermal Power Co., Ltd.	No

[1] http://www.stats.gov.cn/tjsj/ndsj/2006/indexch.htm

[2] http://www.nxso.gov.cn/news_display.asp?newsId=1364

http://www.nxso.gov.cn/news_display.asp?newsId=1363

Japan	Marubeni Corporation	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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The People's Republic of China

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

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Ningxia Hui Autonomous Region

A.4.1.3. City/Town/Community etc.:

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Jinfeng District, Yinchuan City

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

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The proposed project is located in Jinfeng District of Yinchuan City, Ningxia, People's Republic of China. The coordinates of the proposed project location are 106°16' east longitude, 38°27' north latitude. Figure A4.1 is the location of Ningxia and Figure A4.2 is the location of the proposed project.

Figure A4.1 Location of Ningxia

Figure A4.2 Location of the proposed project

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

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The proposed project activity category belongs to:

Sectoral Scope 1: Energy industries (non-renewable resources)

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

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The proposed project utilizes natural gas as fuel for power generation, which will reduce the emission of pollutants such as SO_2, NO_x and particulate matter comparing with the conventional coal fired power plants. In addition, the proposed project adopts combined-cycle gas turbine technology, which having higher efficiency.

The proposed project will use a 51MW imported gas turbine generating unit, a waste heat boiler and a 13 MW domestic steam turbine generating unit. Combined cycle power generation is well-known as a popular technology of high-efficiency, so the implementation of the proposed project will promote the advanced technology transfer.

Before the implementation of the proposed project, the equivalent amount of electricity will be provided by the NWPG, which is dominated by the coal-fired power generation. Subcritical coal-fired power generation with a unit capacity of 600 MW has been identified as the baseline scenario of the proposed project.

The flowchart of power generation is shown in Figure A4.3.

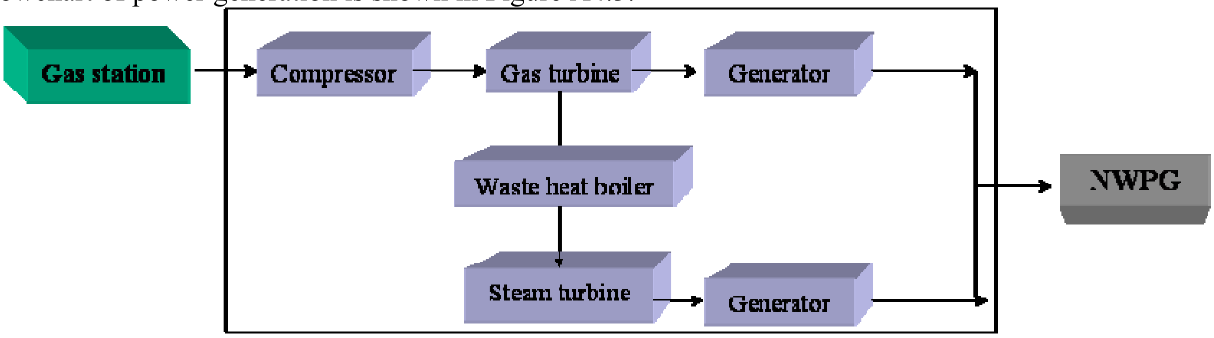

Figure A4.3 Flowchart of power generation

The Key technical parameters are shown in Table A4-1

Table A4-1 Technique parameters of the combined cycle units[3]

1. Gas turbine	
Model	Trent 60 DEL

[3] Feasibility Study Report of the Project, P1-P4 and technical specification of equipments

Manufacturer	Turbomach
Rated power	51MW
Gas volume discharged	543,438kg/h
Temperature of gas discharged	498℃
2. waste heat boiler	
Model	Q382/442-44(13)-3.63(0.4)/430/(201)
Manufacturer	Deltak Power Equipment (China) Co., Ltd
Flow of mid-temperature and mid-pressure steam outlet	43.30t/h
Temperature of mid-temperature and mid-pressure steam outlet	430℃
Pressure of mid-temperature and mid-pressure steam outlet	3.63 MPa
3. Steam turbine	
Type	BN13-3.43/0.35
Manufacturer	Guangzhou Guangzhong Enterprise Group Corporation Ltd.
Rated power	13 MW
Discharged steam pressure	0.048MPa
Discharged steam temperature	80℃

A set of gas metering devices will be installed at the supply line of natural gas measuring the quantity of gas consumed in the proposed project activity.

The electricity meter will be installed connecting to the power system to measure the electricity delivered to the grid and electricity imported from NWPG. After being boosted up, the electricity generated by the project will be transmitted to the substation, and then supplied to Ningxia Power Grid via which the power will be connected to NWPG.

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

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Renewable crediting period (7*3 years) will be used by the proposed project. The estimation of the emission reductions during the first crediting period is presented in Table A4-1.

Table A4-1 The estimation of the emission reductions during the first crediting period

Year	The estimation of annual emission reductions (tCO_2e)
01/04/2009-31/12/2009	36,781
2010	49,041
2011	49,041
2012	49,041
2013	49,041
2014	49,041
2015	49,041
01/01/2016-31/03/2016	12,260
The estimation of total emission reductions in the first crediting period	**343,287**
Total number of the first crediting years	7
The estimation of annual average emission reductions in the first crediting period	49,041

A.4.5. Public funding of the project activity:

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No public funding from the Annex 1 countries is provided to the proposed 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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Methodologies and tools applied to the proposed project are as follows:

Approved baseline methodology AM0029 – "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" (Version 02);

Approved monitoring methodology AM0029 – "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel" (Version 02);

"Tool to calculate the emission factor for an electricity system" (Version 01);

"Tool for demonstration and assessment of additionality" (Version 04).

More details can be referred to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The proposed project activity meets all the applicability conditions defined in the approved methodology AM0029 (Version 02) because of the following reasons:

- The proposed project is the construction and operation of a new natural gas fired grid-connected electricity generation plant.
- The geographical/ physical boundaries of the baseline grid (the NWPG) can be clearly identified and information pertaining to the grid and estimating baseline emissions is publicly available.
- Natural gas is sufficient in Ningxia. The natural gas used by the proposed project is derived from Shaanxi-Gansu-Ningxia gas field. The exploitable reserve of Shaanxi-Gansu-Ningxia gas field exceeds 300 billion m^3 [4] and the design capacity of annual gas transmission is 12 billion m^3[5], while the expected natural gas consumption of the proposed project is about 64.76million m^3/year, accounting for only 0.54% of the total gas transportation capacity. Moreover, the second west-to-east natural gas transmission pipeline was launched on 22 Feb 2008, with a designed gas transmission capacity of 30 billion cubic meters annually, which traversing 14 provinces and autonomous region, including Ningxia Hui Autonomous Region, and expected to be completed by 2011[6]. Obviously, future natural gas based power capacity additions, comparable in size to the proposed project activity, will not constrained by the use of natural gas in the proposed project activity. Therefore, the natural gas is sufficient in Ningxia.

To conclude, the methodology AM0029 (Version 02) is applicable to the proposed project.

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

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Power generated by the project will be connected to NWPG via Ningxia Power Grid. The spatial extent of

[4] Shaanxi-Gansu-Ningxia gas field is the biggest one in the mainland. The exploitable reserve of Shaanxi-Gansu-Ningxia gas field exceeds 300 billion m^3. At present, the natural gas is transmitted through three pipelines to Beijing, Xi'an and Yinchuan respectively and the transmission capacities are: Beijing 660mm*900km, 3 billion m^3/yr (supply for Beijing, Tianjin, Hebei); Xi'an 426mm*480km, 800-900 million m^3/yr; Yinchuan 426mm*300km, 300-400 million m^3/yr. http://news.163.com/06/0123/17/285UJKPD0001126S.html

[5] http://www.cpmec.com.cn/pub/syzbzx/yjdt/t20050922_37062.htm

[6] http://news.rednet.cn/c/2008/02/23/1444924.htm

the project boundary is the proposed project site and other power plants connected physically to the NWPG. According to *"Bulletin of Determination of Baseline Emission Factor of Chinese Power Grid"* published by Chinese DNA[7], the areas covered by NWPG include Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uygur Autonomous Region.

The emission sources and gases included in the project boundary are listed in Table B3-1 and shown in Figure B3-1.

Table B3-1 The emission sources and gases included in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Power generation in NWPG	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.

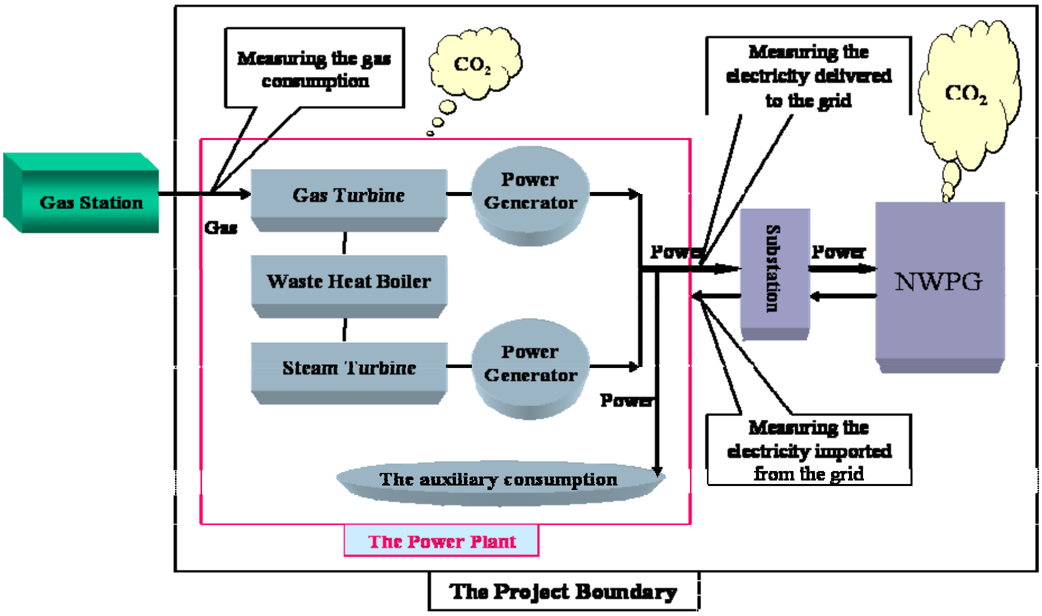

Figure B3-1 The emission sources included within the project boundary

[7] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

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

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According to AM0029 (Version 02), the following steps are used to identify the baseline scenario:

Step 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.

Alternatives to be analyzed should include, inter alia:

- The proposed project activity not implemented as a CDM project;
- Power generation using natural gas, but technologies other than the proposed project activity;
- Power generation technologies using energy sources other than natural gas;
- Import of electricity from connected grids, including the possibility of new interconnections.

Alternatives should meet the following conditions:

a) Outputs or services provided should be comparable with the proposed CDM project activity (e.g. peak-load vs. base-load power);
b) They should include technologies adopted by existing, under-construction and to-be-constructed power plants;
c) They should be in compliance with all applicable legal and regulatory requirements.

Based on the conditions above and the characteristic of the proposed project, the plausible baseline scenarios are identified as follows:

Alternative 1, i.e. the proposed project activity not implemented as a CDM project, is a plausible baseline scenario and in line with current laws and regulations.

As to alternative 2, technologies for power generation using natural gas includes single cycle power generation technology and gas-steam combined cycle power generation technology. The thermal efficiency of single-cycle gas turbine is only 38%~39.5%[8] which is much lower than that of the combined

[8] http://www.chinapower.com.cn/article/1025/art1025680.asp

cycle, i.e. about 55%. Now the single-cycle power generation technology is rarely used now in China[9]. Therefore, single cycle power generation is not a realistic and credible alternative. So, alternative 2 is not feasible.

As to alternative 3, power generation technologies using energy sources other than natural gas are analysed as follows:

There are no hydropower or wind power projects that can undertake the task of peak-load regulation in Ningxia as the proposed project does. Therefore, power generation using water source and wind source are not feasible as baseline scenario.

Nuclear power station can not be operated as peak regulation[10], so it does not provide similar services compared with the project. So it is not a feasible baseline scenario.

"*The Notice on Printing Mid Long Term Specific Plan of Energy-saving*" issued by NDRC (file No. NDRC-Environment and Resource [2004]2505)[11] states that "the new built or extension of oil-fired power unit is prohibited", Therefore, oil-fired power plant is not a feasible baseline scenario.

The technology of providing the peak load regulation using coal fired plants is mature and available in China. Thus, Coal fired plants are considered capable of delivering similar service as the project activity as they are currently used across China to provide peak load regulation service as well as base load generation[12].The notice issued by the State Council Office (decree No.[2002]6) on April 14, 2002[13], strictly prohibits the installation of coal-fired generators with capacity of 135 MW or below. Moreover, according to the *Notice on Requirement of Planning and Construction of Coal Fired Power Plants* issued by National Development and Reform Commission (File No. NDRC-Energy [2004]864)[14], the unit capacity to be selected for power construction should be in principle 600 MW and above. Considering the

[9] http://www.hdrqw.com/news/20060505-31.htm

[10] Safety Management Rules on Nuclear Power Generation, Ministry of Power Industry

[11] http://www.ndrc.gov.cn/hjbh/jnjs/t20050711_45823.htm

[12] http://www.cnaec.com.cn/Info/Show.asp?ID=226054&SortID=

[13] http://www.gov.cn/gongbao/content/2002/content_61480.htm

[14] http://www.chinavalue.net/wiki/showcontent.aspx?titleid=61239

coal fired generation technology commonly used in China now, thus sub-critical or super-critical coal-fired power plant with a unit capacity of 600 MW could be the considered as realistic and credible alternatives of the proposed project.

As to alternative 4, according to the published Bulletin of Determination of Baseline Emission Factor of Chinese Power Grid by Chinese DNA[15], in the past years, the NWPG has no electricity import from connected grids. Therefore, importing electricity from connected grids is unrealistic. So, alternative 4 is not feasible.

To sum up, the possible baseline scenarios include:
Alternative scenario 1: The proposed project activity not implemented as a CDM project;
Alternative scenario 3-1: Subcritical coal-fired power plant with a unit capacity of 600 MW;
Alternative scenario 3-2: Supercritical coal-fired power plant with a unit capacity of 600MW.

Step 2: Identify the economically most attractive baseline scenario alternative

According to AM0029 (Version 02), the economically most attractive baseline scenario alternative is identified from all alternatives remaining after step 1 by using investment analysis. The levelized cost of electricity production should be used as financial indicator for investment analysis.

The levelized cost formula used is as follows[16]:

$$EGC=\frac{\sum[(I_t+M_t+F_t)(1+r)^{-t}]}{\sum[E_t(1+r)^{-t}]} \qquad (1)$$

Where:
EGC=levelized EGC per *kWh*;
I_t=investment in the year *t*;
M_t=Operation and maintenance expenditures in the year *t*;
F_t=Fuel expenditure in the year *t*;
E_t=Electricity generation in the year *t*;

[15] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1888.pdf

[16] Appendix 5: "cost estimation methodology" in 'Project costs of Generating Electricity", Page 174, IEA, 2005 update.

r=Discount rate.

Relevant assumptions and parameters for calculating levelized costs of various generation technologies are listed in Table B4-1:

Table B4-1 Relevant assumptions and parameters of levelized costs of various generation technologies

Generation technology	Alternative scenario 1*	Alternative scenario 3-1***	Alternative scenario 3-2***
Investment (RMB/kW)	4656	3748	3919
Construction Period (year)	2	4	4
Lifetime (year)	20	20	20
Annual operational hours	5500	5000	5000
Discount period (years)	15	15	15
Discount rate	8%	8%	8%
Efficiency****	50.6%	40.32%	41.13%
Material expenditure (RMB/MWh)	12.06	5	5
Other expenditure (RMB/MWh)	13.7	10	10
Water expenditure (RMB/MWh)	2.17	1	1
Desulfuration expenditure (RMB/MWh)	0	1.11	1.09
Employee expenditure (10,000RMB/MW)	1.9	1.65	1.65
Power generation energy consumption	0.203 m^3/kWh	305 gce/kWh**	299 gce/kWh
Fuel expenditure	1.18RMB /Nm^3	430RMB /t	430RMB/t
Levelized cost (RMB/kWh)	0.3846	0.2586	0.2607

*The Feasibility Study Report of the proposed project

** "The Notice on relevant requirements regarding the project planning and construction of coal fired power plants" issued by NDRC of China (file No. NDRC-Energy [2004]864)

*** China Institute of Power Planning and Design, Thermal Power Engineering Design Reference Cost Index", 2005 Edition.

**** In order to provide a clear description of each baseline scenario alternative as required by the methodology, efficiency is just presented here.

Based on the above parameters and levelized cost calculation formula, the levelized EGC and sensitive analysis of the alternatives are listed in Table B4-2.

Table B4-2 Sensitive analysis of levelized cost

Generation technology	Levelized cost (RMB/kWh)	Load factor		Fuel cost	
		+10%	-10%	+10%	-10%
Alternative scenario 1: The proposed project activity	0.3846	0.3740	0.3975	0.4086	0.3606
Alternative scenario 3-1: 600MW subcritical	0.2586	0.2487	0.2706	0.2717	0.2455
Alternative scenario 3-2: 600MW supercritical	0.2607	0.2504	0.2733	0.2736	0.2478

Table B4-1 shows that the 600MW subcritical coal-fired power generation technology has the lowest levelized cost. The sensitive analysis in Table B4-2 confirms and supports that the levelized cost of the 600MW subcritical coal-fired power generation technology remains the least when the critical assumptions fluctuate within reasonable variations. According to AM0029 (Version 02), the baseline alternative with the best financial indicator, i.e. the lowest levelized cost, can be selected as the most plausible scenario. Therefore, without the proposed project activity, the relevant output and service will be provided by 600MW subcritical coal-fired power plants which are being built or to be built.

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 starting date of the project was on May 15 2007, and it is earlier than the date of validation. The following evidence are provided to prove that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. The implementation timeline of the proposed project activity is given in table B5-1.

Table B5-1 timeline of the proposed project activity *

Date	Key Event	Comments	Document / Evidence
April 2004	Under the help of Ministry of Science	Ningxia CDM Service	*Work plan on phase II of*

	and Technology and Department of Science and Technology of Ningxia, the implementation of China-Canada Pilot Project-Local (Ningxia) CDM Capacity Building was conducted.	Centre researched the potential CDM projects of Ningxia, including the project	*China-Canada Pilot Project-Local (Ningxia) CDM Capacity Building*, 2004, website: http://www.nxkjt.gov.cn/999/detail.asp?n_id=1138
09/09/2004	Project owner participated the interim meeting of China-Canada Pilot Project-Local (Ningxia) CDM Capacity Building	Awareness of CDM that can make the project viable.	http://www.kp-cdm.com/Default.aspx?tabid=54&ctl=ArticleShow&mid=375&ArticleID=242
17/11/2005	Ningxia HANAS Natural Gas Thermal Power Co., Ltd submitted a letter to the Department of Science & Technology of Ningxia	Asking for support and instruction on improving the financial feasibility of the Project by using CDM	Letter submitted to Department of Science & Technology of Ningxia by Ningxia HANAS Natural Gas Thermal Power Co., Ltd, Ninghare file[2005] 15
29/11/2005	Reply of the Department of Science & Technology of Ningxia	The Department of Science & Technology of Ningxia provided relevant guidance and suggestions on CDM development	Response Letter from the Department of Science & Technology of Ningxia
Jan. 2006	Ningxia CDM Service Center conducted a research on potential CDM project development, including the project.		"Ningxia CDM Capability Building and Project Development" published in 2006
April 2007	FSR was finished	It states clearly that the support of CDM can alleviate economic pressure because the project is not financially attractive without CDM.	FSR

09/05/2007	Board meeting of Ningxia HANAS Natural Gas Thermal Power Co., Ltd	On acknowledging that CDM is a decisive factor for the smoothly implementation of the project, the board meeting made the final investment decision.	Minute of Board meeting of Ningxia HANAS Natural Gas Thermal Power Co., Ltd
15/05/2007	Purchase contract of Main equipment	Starting date	Purchase contract of Main equipment
10/09/2007	ERPA was signed		ERPA singed between Marubeni Corporation and Ningxia HANAS Natural Gas Thermal Power Co., Ltd
10/09/2007	The Project construction was started formally		Proof of construction start provided by Northwest Power Construction Supervision Co., Ltd.
13/05/2008	Making public available for validation		http://www.jqa.jp/service_list/environment/service/cdm/detail_of_project_ningxia_yinchuan.html
25/06/2008	Got LOA by Chinese DNA		LOA
Feb.2009	Commissioning started		

* In the design process of the project, the capacity had several changes and adjustment. In 2003 the project (Phase I) was designed as cogeneration system consisting of 2*12.5MW gas turbine generating unit with 2*52t/h waste heat boiler. However, due to increase of demand on electricity and heat using, the project owner decided to integrate Phase I project and planned Phase II project in year 2005, thus the system was designed as per 1*50 MW gas turbine generating unit with 1*70t/h waste heat boiler. Subsequently, due to the production of equipment, the capacity of gas turbine of the project had to be adjusted from 50MW to 51MW. Moreover, if only adopting the gas turbine, the portion of discharged gas and steam will be vented into air. Considering the loss of heat and air pollution, the project owner proposed to install a 13MW steam turbine generating unit combing with a 51MW gas turbine generating unit and a waste heat boiler to improve the energy efficiency. Thus, the FSR(2007) based on combined cycle system was finished and approved by local DRC, which is ultimately designed and used as data source for investment analysis below.

All above-mentioned events demonstrate that the incentive of CDM was seriously considered in the decision to proceed with project activity and all the relevant evidences have been provided for validation.

According to AM0029 (Version 02) and "Tool for demonstration and assessment of additionality" (Version 04), the additionality of the proposed project is demonstrated and assessed through the following steps:

Step 1: Benchmark investment analysis

Sub-step 1a. Apply benchmark analysis

The Interim Measures for Economical Assessment of Electrical Technological Transformation Project is the most important reference for power generation project investment assessment in China. According to it, the sectoral benchmark IRR on total investment for power industry is 8% (excluding tax).

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

(1) Basic parameters for calculation of financial indicators

The basic parameters for calculation of financial indicators are shown in the following Table:

Table B5-2: Basic parameters for calculation of financial indicators

No.	Items	Parameters	Data source
1	Installed capacity	64MW	P6 FSR
2	Static total investment	298.01 million RMB	P5 FSR
3	Project lifetime	20 years	P5 FSR
4	Annual operation hours	5,500h	P6 FSR
5	Annual power delivered to the grid	307,200MWh	P11 FSR
6	Prospective on-rid power price (excluding VAT)	0.402RMB/kWh	P5 FSR
	Tax		
7	VAT	17%	P6 FSR
8	Income tax	33%	P6 FSR
9	City Preservation and Development Tax	7%	P6 FSR
10	Education surcharges	3%	P6 FSR

11	Annual average O&M cost	91.23 million RMB	P11 FSR
12	Depreciation period	15 years	P5 FSR
13	Crediting period	7*3 yrs (Renewable)	
14	Expected CERs price	8 Euro/tCO_2e	ERPA

(2) Comparison of the financial indicators of the proposed project and the benchmark *IRR*

Table B5-3: Financial indicators of the proposed project

	IRR (%)
Without CDM income	6.66
With CDM income	8.07

Table B5-3 shows that without CDM income, the *IRR* of total investment is 6.66%, which is lower than the benchmark *IRR*, i.e. 8%. With CDM income (CERs price is 8 Euro/tCO_2e and crediting period is 7*3 yrs), the *IRR* of total investment increases to 8.07%, and thus the financial condition is improved considerably.

Sub-step 1c. Sensitivity analysis

For the proposed project, the following financial parameters are taken as uncertain factors for sensitive analysis of financial attractiveness:

· Static total investment;
· Power delivered to the grid;
· Annual O&M cost.
· Power price

When the above financial parameters fluctuate within the range of -10% to +10%, the IRR of total investment of the proposed project varies to different extent. The impacts on IRR of total investment due to the parameters' fluctuation (not considering CDM income) are shown in Table B5-4 and Figure B5.1:

Table B5-4 Sensitivity analysis of the proposed project IRR (total investment)

Fluctuation range of indicator	-10%	-5%	0	5%	10%
Static total investment	7.99%	7.30%	6.66%	6.07%	5.52%
Power delivered to the grid	5.39%	6.04%	6.66%	7.27%	7.86%

Annual O&M cost	9.42%	8.16%	6.66%	5.04%	3.21%
Power price	1.84%	4.46%	6.66%	8.60%	10.18%

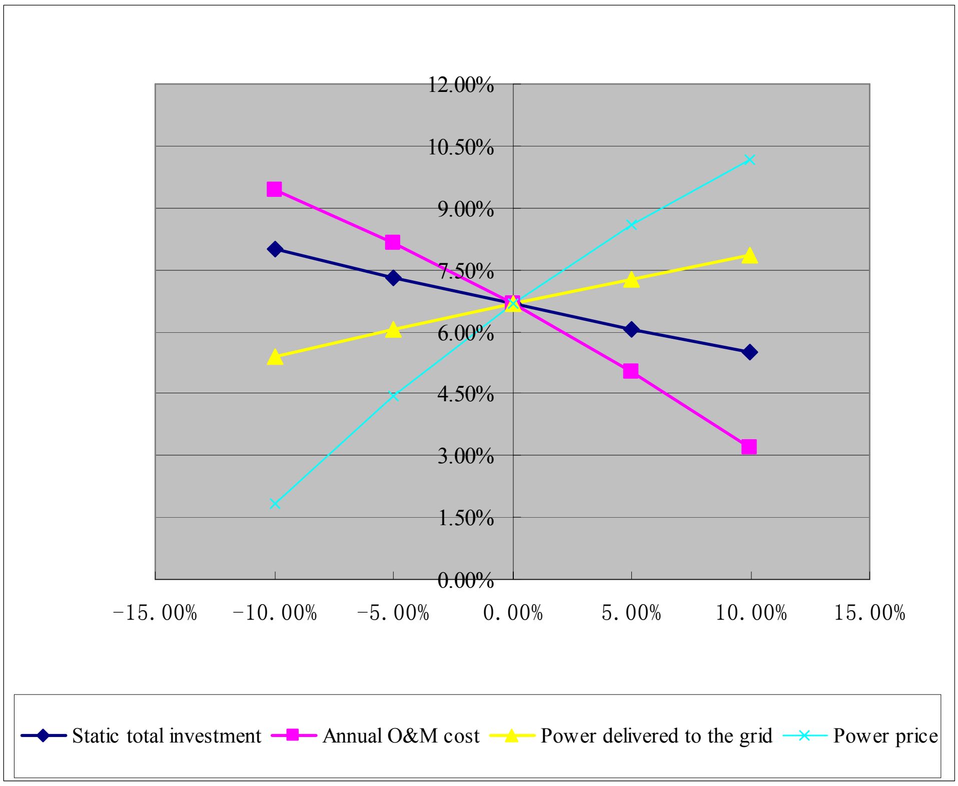

Figure B5.1 The impacts on IRR (total investment) by uncertain factors fluctuation (without CDM income)

When the power delivered to the grid increases by 11.0%, the IRR will reach to the benchmark. Power delivered to the grid is determined by the installed capacity and annual operation hours of the project. The installed capacity of the proposed project has been approved by local government and is fixed. Only the variation of operation hours could influence the power delivered to the grid. As for a power plant, peak-load task undertaking results in frequent start-up and power-off of the generating units, which shortens interval period of maintenance and increases O&M cost. According to the statistic rule on beneficial result and reliability of gas turbine, a cycle of start-up and power-off equals to 10~20 operation hours equivalent. Generally annual frequency of gas turbine generation unit undertaking peak-load task is more than 300 times, which equals to increase 3000~6000 operation hours.[17] The operation hours equivalent of generating unit of the proposed project will reach 8500~11500 as the actual operation hours are 5500, while there are 8760 hours in a year. It is hard to increase the operation hours of the proposed project on the basis of such operation

[17] http://www.chinapower.com.cn/article/1046/art1046081.asp

intensity. Therefore, the power delivered to the grid is unlikely to increase by 11.0%.

When the power price increases by 3.3%, the IRR will reach to the benchmark. However, the increase of the power price is not expected due to the following:

(1) The power price of the proposed project has been approved by the local government, which is consistent with the power price in FSR. In China, once the power price is identified, it will strictly be regulated by the relevant government agencies.

(2) According to a latest control measures announced by the State Council on 14th January 2008 regarding monitoring of the price control and management[18], the price in the certain fields (including power price) is not expected to be increased in the near future.

Since the power price is always strictly monitored and controlled by the central and local government, the power price is considered not likely to increase by 3.3%.

When the annual O&M cost reduces by 4.45%, the IRR will reach to the benchmark. The annual O&M cost composes of the fuel fee, material fee, repairing fee and the payment for the workers etc. All these elements are the basic expenditure for operation and maintain of the project activity. If the fuel fee, which accounted for 83.8% of the annual O&M cost, could be reduced, the annual O&M cost would decreased significantly. However, the natural gas price keeps increasing. Based on "The Notice regarding the issues on adjusting natural gas price" published by NDRC, the natural gas price is raised with increasing of 0.4 RMB/m^3 from 10th of Nov 2007[19]. The document can therefore support the argument that the natural gas price is commonly expected to increase further in future rather than to decrease, which means that the fuel fee of the proposed project is unlikely to be reduced. Meanwhile, the material price in Ningxia has been keeping increasing[20]. Therefore, the annual O&M cost is unlikely to fall by 4.45%.

When the total investment reduces by 10.1%, the IRR will reach to the benchmark. However, the key technical equipment of the proposed project is imported from overseas, which holds a great weight in the total investment. Besides, the construction cost has been keeping increasing due to the increase of industrial material[21]. The construction and operation of the proposed project will be influenced if the total investment is deducted intentionally. Therefore, the total investment is unlikely to fall by 10.1%.

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[18] http://www.gov.cn/ldhd/2008-01/14/content_857704.htm

[19] http://www.egas.cn/Article/hnew/200712/1240.html

[20] http://www.mofcom.gov.cn/aarticle/difang/ningxia/200507/20050700197684.html

[21] http://www.mofcom.gov.cn/aarticle/difang/ningxia/200507/20050700197684.html

Based on the above analysis, without the support of CDM income, the proposed project is not financially attractive.

Step 2: Common practice analysis

Sub-step 2a. Analyze other activities similar to the proposed project activity

Ningxia Power Grid is dominated by fossil-fired power generation. According to Energy Balance Statistics in Ningxia listed in China Energy Statistics Yearbook 2007, there was no power plant using natural gas to generate electricity in Ningxia[22]. Moreover, according to 'Ningxia CDM Capability Building and Project Development'[23], the project is the "first of its kind" in Ningxia. Therefore, natural gas power generation is not common practice in Ningxia Power Grid.

Sub-step 2b. Discuss any similar options that are occurring

After the completion of construction, the proposed project will become the first natural gas based gas-steam combined cycle power project in Ningxia Power Grid. Therefore, the proposed project is not a common practice.

Step 3. Impact of CDM registration[24]

As analysed above, without the revenue of CDM, the IRR of the project is lower than the benchmark, which means that the project is not financially viable.

If the project is registered as a CDM project, it can bring the following benefits:

(1)The CDM revenues has a positive impact on the IRR of total investment of the project, so that the

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[22] China Energy Statistics Yearbook, 2007, P 238-241

[23] Ningxia CDM Capability Building and Project Development, 2006, p38-p39

[24] AM 0029 Version 02 requires three steps in reference to the latest version of "Tool for the demonstration and assessment of additionality". However one of the three steps, i.e. Step 3: "Impact of CDM registration" has been deleted in the Version 4 of the Tool. Here we still keep the step 3 required by the AM0029.

project will be financially viable.

(2)The income from CDM will contribute to the ongoing operation and maintenance of the project.

(3)The successful registration of the project will promote the use of a less carbon intensive power generation technology.

(4) The successful registration of the project will reduce the emissions of the NWPG which is dominated by coal-fired plant.

In conclusion, the project is additional, not (part of) the baseline scenario. CDM is critical for the development of the project, without which, it will not be able to go ahead. The project has strong additionality and can reduce the greenhouse gas emissions. If the project fails to be registered as a CDM project, this portion of emission reduction can not be realized.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Step 1 Calculate Baseline Emission (*BE_y*)

Sub-step 1a Calculate Baseline Emission Factor ($EF_{BL,CO2}$)

Baseline emissions are calculated by multiplying the net electricity delivered to the grid ($EG_{pj,y}$) with a baseline CO_2 emission factor ($EF_{BL,CO2,y}$), as follows:

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

According to AM0029 (Version 02), for the first crediting period, the baseline emission factor should be the lowest of the following three options:

Option 1: The build margin, calculated according to “Tool to calculate emission factor for an electricity system”;

Option 2: The combined margin, calculated according to “Tool to calculate emission factor for an electricity system”, 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:

$$EF_{BL,CO2}(tCO_2/MWh) = \frac{COEF_{BL}}{\eta_{BL}} * 3.6 GJ/MWh \qquad (3)$$

Where:

$COEF_{BL}$: the fuel emission coefficient (tCO_2e/GJ), 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.

This determination will be made once at the validation stage based on an ex ante assessment, once again at the start of each subsequent crediting period. If either option 1 (BM) or option 2 (CM) are selected, they will be estimated ex-post, as described in "Tool to calculate emission factor for an electricity system".

Sub-step 1a.1 Calculate the build margin and the combined margin according to "Tool to calculate the emission factor for an electricity system"

The calculation steps are as follows:

① Identify the relevant electric power system.
② Select an operating margin (OM) method.
③ Calculate the operating margin emission factor according to the selected method.
④ Identify the cohort of power units to be included in the build margin (BM).
⑤ Calculate the build margin emission factor.
⑥ Calculate the combined margin (CM) emissions factor.

The detailed calculated processes are as follows:

① Identify the relevant electric power system.

According to "Tool to calculate the emission factor for an electricity system" and the delineation of electricity system given by Chinese DNA, the proposed project belongs to NWPG. Areas covered by NWPG includes Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

② Select an operating margin (OM) method.

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*.

Method (a) can only be used where low-cost/must run resources[25] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term norms for hydroelectricity production. Among the total electricity generations during 2001-2005 of the NWPG where the proposed project connected, the low-cost/must run resources constitute less than 50% of total amount grid generating output, which is in compliance with the applicability of Method (a). The detailed information could be seen in Table B6-1.

Table B6-1 Annual electricity generation of NWPG during 2001-2005

No.	Year	Electricity generation （10^8kWh）			Proportion of wind power, etc.
		Total generation	Fuel-fired power	Wind power, etc	
1	2001[26]	1,088.28	811.48	276.8	25.43%
2	2002[27]	1210.52	934.28	276.24	22.82%
3	2003[28]	1392.34	1130.93	261.41	18.77%
4	2004[29]	1674.57	1319.39	355.18	21.21%
5	2005[30]	1845.62	1339.09	506.53	27.44%

So, method (a) is selected.

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

The Simple OM emission factor is calculated ex-ante, and it uses the available data in NWPG for the most recent 3 years (2003-2005).

The Simple *OM* emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant/unit (Option A), or

[25] The low-cost/must run resources include hydro power, geothermal sources, wind power, solar sources etc.

[26] China Electric Power Yearbook 2002 p. 617

[27] China Electric Power Yearbook 2003 p. 585

[28] China Electric Power Yearbook 2004 p. 709

[29] China Electric Power Yearbook 2005 p. 474

[30] China Electric Power Yearbook 2006 p. 568

- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. In other cases, option B or option C can be used. For the purpose of calculating the simple OM, Option C should only be used if the necessary data for option A and option B is not available and can only be used if only nuclear and renewable power generation are considered as low-cost / must-run power sources and if the quantity of electricity supplied to the grid by these sources is available.

The data of each power plant /unit in NWPG where the proposed project connected to is not available publicly, thus Option A and Option B is not applicable. The low-cost/must run power resources in NWPG include only nuclear and renewable power generation, and the quantity of electricity supplied to the grid by these sources is available. Therefore, Option C is selected for calculating the Simple *OM* emission factor.

The calculation is as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (4)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$FC_{i,y}$= Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$= Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO2,i,y}$= CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

EG_y= Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y =The three most recent years which data is available

Based on the formula(4), the simple *OM* emission factor of NWPG calculated ex-ante is: $EF_{grid,OM,y}$ = 1.1258 tCO_2/MWh. The detailed calculation process is shown in Annex 3.

④ Identify the cohort of power units to be included in the build margin (BM).

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

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

Sample group that comprises the larger annual generation from these two options should be used. However, it is very difficult to obtain the data of the five power plants built most recently because these data are considered confidential business matter in China. So, option 2 is selected.

The Build Margin emission factor $EF_{BM,y}$ is calculated ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

⑤ Calculate the build margin emission factor.

The Build Margin Emission Factor ($EF_{grid,\ BM,\ y}$) is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (5)$$

Where:

$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ =CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m =Power units included in the build margin

y =Most recent historical year for which power generation data is available

Due to the data's unavailability, the BM calculation in this PDD follows the guidance provided by the EB in the deviation. Calculate first the newly installed capacity and its power generation technology mix, then the weights of different power technologies in the newly installed capacity, and finally the BM emission factor based on the emissions factors of different types of most advanced commercial generation technologies.

Because the capacity of the coal-fired, oil-fired and gas fired power plants can not be separated in the publicly available statistical data, the BM calculation in this PDD adopts the following method. Firstly, use the available data in the energy balance sheets of the most recent year to calculate the proportions of the CO_2 emission from solid, liquid and gaseous fuels in the total CO_2 emissions related to power generation. Secondly, calculate the emissions factor of the fossil fuel-fired power generation in NWPG using the above proportions as the weights and the emission factors of the most advanced commercial generation technologies as the reference. Finally, the BM emission factor is the product of this emission factor of fossil fuel-fired power generation and the proportion of fossil fuel-fired power plants in the newly installed 20% capacity. The detailed steps and the related formulas are as follows:

Sub-step 5a. **Calculating the share of CO_2 emissions of different fuel-fired power plants in the total CO_2 emissions**

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (6)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (7)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (8)$$

Where:

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

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provincial sub-grids j and the percent oxidation of fuel in year y;

*COAL,OIL,*and *GAS* refers to all forms of coal, oil and gas.

Sub-step 5b. **Calculating the Emission Factor of fuel-fired power technology**

$$EF_{Fuel-fired} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \quad (9)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the related Emission Factor of the commercially available most advanced coal, oil and gas fired power technology, please refer to Annex 3 for more details.

Sub-step 5c. **Calculating the $EF_{grid, BM, y}$ of NWPG**

$$EF_{BM} = \frac{CAP_{Fuel-fired}}{CAP_{Total}} * EF_{Fuel-fired} \quad (10)$$

Where:

CAP_{Total} is the newly increment of total installed capacity;

$CAP_{Fuel-fired}$ is the newly increment of fuel-fired installed capacity.

Based on the formula (10), the *BM* emission factor of NWPG calculated ex-ante is: EF_{BM} = 0.5739tCO_2 /MWh. The detailed calculation process is shown in Annex 3.

⑥ Calculate the combined margin (CM) emissions factor.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad (11)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh);
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh);
w_{OM} = Weighting of operating margin emissions factor (%);
w_{BM} = Weighting of build margin emissions factor (%);

According to AM0029 (version 02), $w_{OM} = w_{BM}$ =0.5. Hence:

$$EF_{grid,\ CM,\ y} = 0.5*EF_{grid,\ OM,\ y} + 0.5*EF_{grid,\ BM,\ y}$$
$$= 0.5*1.1258 + 0.5*0.5739$$
$$= 0.8499\ tCO_2/MWh$$

Sub-step 1a2: Calculate the Emission Factor of the Baseline Technology and Fuel

The emission factor of the baseline technology and fuel is calculated as per formula (3) as follows:

$$EF_{BL,CO2}\ (tCO_2/MWh) = \frac{COEF_{BL}}{\eta_{BL}} * 3.6GJ / MWh \qquad (12)$$

Where:

$COEF_{BL}$: is the fuel emission coefficient (tCO_2e/GJ), based on national average fuel data, if available, otherwise IPCC default can be used.

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

The value of $COEF_{BL}$ is 0.0946 tCO_2/GJ(94600kg/TJ)[31], which is determined by IPCC default value

η_{BL} which is estimated in section B.4, is 40.32%

[31] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Chapter 1, Table 1.4

Therefore, the emission factor of the baseline technology and fuel is:
$EF_{BL,CO2}$ = 0.0946*3.6/40.32%=0.8446 tCO_2/MWh

Sub-step 1a3: Choice of Baseline Emission Factor ($EF_{BL,CO2}$)

In summary, the choice of the Baseline Emission Factor ($EF_{BL,CO2}$) is shown in Table B6-2:

Table B6-2 The choice of the Baseline Emission Factor

Options	Emission Factor (tCO_2/MWh)
Option 1：Build Margin *BM*	0.5739
Option 2：Combine Margin *CM*	0.8499
Option 3：Generation technology of the baseline scenario ($EF_{BL,CO2}$)	0.8446

According to AM0029 (Version 02), the baseline emission factor ($EF_{BL,CO2}$) should be the lowest emission factor among the above three options, so the baseline emission factor of the proposed project is identified as:
$EF_{BL,CO2,y}$ =0.5739tCO_2/MWh

According to AM0029 (version 02), since $EF_{grid,BM,y}$ is selected, it will be estimated *ex post.*

Sub-step 1b Calculate Baseline Emission (BE_y)

The baseline emission is calculated as per formula (2) as follows:
$BE_y=EG_{pj,y}\times EF_{BL,CO2,y}$

Then:

$$BE_y = EG_{pj,y}\times EF_{BL,CO2,y}$$
$$=0.5739\, EG_{pj,y}\ (tCO_2) \qquad (13)$$

Step 2 Calculate Project Emission (PE_y)

The project activity is on-site combustion of natural gas to generate electricity. According to AM0029 (Version 02), the CO_2 emissions from electricity generation are calculated as follows:

$PE_y = \sum_f FC_{f,y} \times COEF_{f,y}$ (14)

Where:

$FC_{f,y}$ is the total volume of natural gas or other fuel 'f' combusted in the project plant or other startup fuel (m^3 or similar unit) in year(s) y;

$COEF_{f,y}$ is the CO_2 emission coefficient (tCO_2/m^3 or similar) in year(s) for each fuel and is obtained.

According to AM0029 (version 02), it is obtained as:

$COEF_{f,y} = \sum NCV_y \times EF_{CO2,f,y} \times OXID_f$ (15)

Where:

$NCV_{f,y}$: 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, otherwise from local or national data;

$EF_{CO2,f,y}$: is the CO_2 emission factor per unit of energy of natural gas in year 'y' (tCO_2/GJ), as determined from the fuel supplier, wherever possible, otherwise from local or national data;

$OXID_f$: is the oxidation factor of natural gas.

As the proposed project activity doesn't use other fuel or other startup fuel, so only the CO_2 emission coefficient of natural gas need to be calculated. the NCV of natural gas from the Feasibility Study Report of the proposed project is used in PDD: 0.035028GJ/Nm^3 (46.559GJ/t); the value of $EF_{CO2,NG}$ is 0.0561tCO_2/GJ(56100kg/TJ), calculated as: 0.0153tc/GJ*44CO_2/12C*100%=0.0561tCO_2/GJ,0.0153tc/GJ is determined from Chinese DNA[32]; $OXID_{NG}$ is determined from IPCC 2006 default value, i.e. 100%.[33].

Thus the CO_2 emission coefficient of natural gas is calculated as:

$COEF_{CO2,NG}$ = 0.035028*0.0561*100%=0.001965 tCO_2/m^3

The project emission is:

$PE_y = 0.001965\ FC_y\ tCO_2$ (16)

Where

FC_y is the total volume of natural gas combusted in the project plant (m^3) in year(s) y.

[32] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

[33] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Chapter 1, Table 1.4

Step 3 Calculate Leakage (*LE_y*)

According to AM0029 (Version 02), the following leakage emission sources are considered:

- Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, regasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity;
- In the case LNG is used in the project plant: CO_2 emissions from fuel combustion/electricity consumption associated with the liquefaction, transportation, regasification and compression into a natural gas transmission or distribution system.

As only the natural gas is used in the proposed project activity and LNG is not involved, only the fugitive methane emissions are considered.

Based on AM0029 (Version 02), fugitive methane emissions are calculated as:

$$LE_{CH4,y}=(FC_y \times NCV_{NG} \times EF_{NG,upstream,CH4} - EG_{pj,y} \times EF_{BL,upstream,CH4}) \times GWP_{CH4} \quad (17)$$

Where:

$LE_{CH4,y}$ are leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e;

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

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

$EF_{NG,upstream,CH4}$ is emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in t CH_4/GJ;

$EG_{pj.,y}$ is the annual net power delivered to the grid during the year in MWh;

$EF_{BL,upstream,CH4}$ is emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH_4 per MWh electricity generation in the project plant;

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

Sub step 3a Calculate the upstream fugitive CH_4 emission factor ($EF_{BL,upstream,CH4}$)

According to AM0029 (Version 02), the emission factor for upstream fugitive CH_4 emissions occurring in the absence of the proposed project activity should be calculated consistent with the baseline emission factor ($EF_{BL,CO2}$). As described above, the BM is selected as the baseline emission factor, and then the corresponding upstream fugitive CH_4 emission factor can be calculated as follows:

Option 1: Build Margin

$$EF_{BL,\,upstream,\,CH4} = \frac{\sum_{j} FF_{j,\,k} \cdot EF_{k,\,upstream.CH4}}{\sum_{j} EG_{j}}$$

$$= \frac{FF_{coal} \times EF_{coal,upatream,ch4} + FF_{gas} \times EF_{gas,upatream,ch4} + FF_{oil} \times EF_{oil,upatream,ch4}}{GENy} \quad (18)$$

Where:

$EF_{BL,upstream,CH4}$ =The emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH_4/MWh.

FF_{Coal} =Total quantity of coal combusted (tons coal equivalent) in power plants included in the build margin.

$EF_{Coal,upstream,CH4}$ =Emission factor for upstream fugitive methane emissions from production of coal. AM0029 (Version 02) suggested two default values associated with different source: underground mining and surface mining. Because 95% of the coal production in China are produced by underground mining[34], so the default value for underground mining (13.4 tCH_4/kt coal) is used in this PDD.

FF_{Gas} =Total quantity of gas combusted (GJ) in power plants included in the build margin.

$EF_{Gas,upstream,CH4}$ =Emission factor for upstream fugitive methane emissions from production of gas in tCH_4/GJ. AM0029 (Version 02) suggested several default values associated with different regions. In this PDD, the default value for USA and Canada is adopted, i.e. 160tCH_4/PJ, because the new transmission and distribution network and gas terminal of the proposed project is constructed and operated by advanced technology.

FF_{oil} =Total quantity of oil combusted (GJ) in power plants included in the build margin.

$EF_{Oil,upstream,CH4}$ =Emission factor for upstream fugitive methane emissions from production of oil in tCH_4/GJ. The default value, i.e. 4.1tCH_4/PJ, suggested in AM0029 (Version 02) is used in this PDD.

GEN_y =Electricity generation in the plants included in the build margin in MWh.

As oil-fired and gas-fired power generation in NWPG is little and on the principle of conservativeness, formula (19) is rewritten as:

[34] http://www.china.com.cn/aboutchina/zhuanti/nywt/2007-08/09/content_8653127.htm

$$EF_{Bl,upstream,CH4} = \lambda_{Coal} \times PGCC_{Adv} \times EF_{Coal,\ upstream,CH4} \times \frac{NCV_{Coal}}{NCV_{Rawcoal}} <$$

$$\frac{FF_{coal} \times EF_{coal,upstream,CH4} + FF_{Gas} \times EF_{Gas,upstream,CH4} + FF_{Oil} \times EF_{Oil,upstream,CH4}}{GEN_y} \qquad (19)$$

Where:

λ_{Coal} is the share of coal-fired generation in BM generation. According to the published *Bulletin of Determination of Baseline Emission Factor of Chinese Power Grid* by Chinese DNA, the λ_{Coal} of NWPG is 98.1%[35].

$PGCC_{Adv}$ is the unit coal consumption of power supply of the most advanced coal-fired generation technology within the grid boundary. The value for calculating *BM* emission factor by Chinese DNA is used for the proposed project, i.e.343.33 gce/kWh.

$EF_{Coal,upstream,CH4}$ is the emission factor for upstream fugitive methane emissions from production of coal: 13.4 tCH_4/kt coal.

NCV_{Coal} is the net caloric value of standard coal equivalent, the country-specific value has been adopted, i.e. 29.27GJ/tce.

$NCV_{Rawcoal}$ is the net caloric value of raw coal which is used for power generation, the country-specific value has been adopted, i.e. 20.908GJ/t[36].

The above data will be put into formula (19) and calculated as:

$EF_{Bl,upstream,CH4}$ =98.10%*343.33g/kWh*13.4tCH_4/kt*29.27/20.908 =0.006318tCH_4/MWh

Sub step 3b Calculate Fugitive Methane Emissions ($LE_{CH4,y}$)

As described above, the formula of fugitive methane emissions is as follows:

$$LE_{CH4,y} = (FC_y * NCV_{NG} * EF_{NG,upstream,CH4} - EG_{pj,y} * EF_{BL,\ upstream,CH4}) * GWP_{CH4} \qquad (20)$$

Where:

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH_4 emissions in the year y (tCO_2).

FC_y: Total volume of NG combusted in the project plant (m^3) in year y.

NCV_{NG}: Net calorific value of NG (GJ/ton) combusted by plants, which is determined from the NG

[35] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

[36] China energy statistical yearbook 2005 p.365

supplier, i.e. 0.035028GJ/Nm^3 (46.559GJ/t).
$EF_{Gas,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of gas in tCH_4/GJ. As described above, in this PDD, the default value for USA and Canada is adopted, i.e. 160tCH_4/PJ.
$EG_{pj,y}$: the annual net power delivered to the grid during year y in MWh.
$EF_{BL,upstream,CH4}$: The emission factor determined in sub step 3a for upstream fugitive methane emissions in tCH_4/MWh.
GWP_{CH4}: Global warming potential of methane valid for the relevant commitment period, the IPCC 2006 default value will be used, i.e. 21tCO_2e/tCH_4.

Sub step 3c Calculate Leakage (LE_y)

According to AM0029 (Version 02), the leakage can be calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y} \quad (21)$$

Where:
LE_y: leakage emission during the year y in tCO_2e.
$LE_{CH4,y}$: leakage emission due to fugitive upstream CH_4 emissions in year y in tCO_2e.
$LE_{LNG,CO2,y}$: leakage emission due to fossil fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in tCO_2e.

LNG is not involved in the proposed project activity, so:
$LE_{LNG,CO2,y} = 0$

So the leakage of the proposed project is:

$$LE_y = LE_{CH4,y} \quad (22)$$

Step 4 Calculate Emission Reduction (ER_y)

According to AM0029 (Version 02), the emission reduction of the proposed project can be calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (23)$$

Where:

ER_y: emission reduction in year y in tCO_2e.

BE_y: emission in the baseline scenario in year y in tCO_2e.

PE_y: emission in the project scenario in year y in tCO_2e.

LE_y: emission due to leakage in the year y in tCO_2e.

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

Data / Parameter:	$EG_{i,y}$
Data unit:	MWh
Description:	Power generation in each province of NWPG
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics.
Any comment:	Low uncertainty

Data / Parameter:	$e_{i,y}$
Data unit:	%
Description:	Self- consumption rate of electricity in each province of NWPG
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics.
Any comment:	Low uncertainty

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed capacity in each province of NWPG
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics.
Any comment:	Low uncertainty

Data / Parameter:	$FC_{Adv,\ coal}$
Data unit:	gce/kWh
Description:	The coal consumption of power supply with the best thermal power technology commercially available.
Source of data used:	Bulletin about determining the Emission factors of Chinese Power Grids http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf
Value applied:	343.33
Justification of the choice of data or description of measurement methods and procedures actually applied :	Authoritative government bulletin
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$FC_{Adv,\ Oil}$, $FC_{Adv,\ Gas}$
Data unit:	gce/kWh
Description:	The coal consumption of power supply with the best oil and gas fired power plant technology commercially available.
Source of data used:	Bulletin about determining the Emission factors of Chinese Power Grids http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

Value applied:	258
Justification of the choice of data or description of measurement methods and procedures actually applied :	Authoritative government bulletin
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$FC_{i,y}$ or $F_{i,j,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*
Source of data used:	*China energy statistical yearbook 2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	NCV_i
Data unit:	GJ/tce or m^3
Description:	The net calorific value of the fuel i
Source of data used:	*China energy statistical yearbook*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics.
Any comment:	Low uncertainty

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/tJ
Description:	The Carbon Emission Factor of fuel i
Source of data used:	2006 IPCC Guidelines on National GHG Inventories
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value of IPCC
Any comment:	Low uncertainty

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor of fuel i
Source of data used:	2006 IPCC Guidelines
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value of IPCC
Any comment:	Low uncertainty

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane
Source of data used:	2006 IPCC Guidelines
Value applied:	21
Justification of the choice of data or	IPCC default value

description of measurement methods and procedures actually applied :	
Any comment:	Low uncertainty

Data / Parameter:	$EF_{Coal,upstream,CH4}$
Data unit:	tCH_4/kt coal
Description:	Fugitive CH_4 upstream emission of coal mining
Source of data used:	Default value suggested by the methodology AM0029 (Version 02)
Value applied:	13.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since 95% of the coal production in China are produced by underground mining[37], the default value for underground mining 13.4tCH_4/kt coal is used
Any comment:	Low uncertainty

Data / Parameter:	$EF_{Gas,upstream,CH4}$
Data unit:	tCH_4 /PJ
Description:	Fugitive CH_4 upstream emission of natural gas production
Source of data used:	Default value suggested by the methodology AM0029 (Version 02)
Value applied:	160
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because the new transmission and distribution network and gas terminal of the proposed project is construed and operated by advance technology, the default value for USA and Canada is adopted
Any comment:	Low uncertainty

[37]http://www.china.com.cn/aboutchina/zhuanti/nywt/2007-08/09/content_8653127.htm

Data / Parameter:	$EF_{Coal,\ surfacing\ mining,\ ,upstream.CH4}$
Data unit:	tCH_4/PJ
Description:	Emission factor for upstream fugitive methane emissions from production, transportation, etc. of coal by surfacing mining
Source of data used:	2006 IPCC Guidelines
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	Low uncertainty

B.6.3. Ex-ante calculation of emission reductions:

>>

According to AM0029 (Version 02) and the explanation of methodology choice in section B6.1, the emission reductions can be ex-ante calculated as follows:

Step 1 Calculate baseline emission (BE_y)

According to the calculation of section B.6.1, the baseline emission factor is:

$EF_{BL,CO2}$ = 0.5739 tCO_2/MWh

According to the FSR of the proposed project, the amount of power delivered to the grid is:

$EG_{pj,y} = EG_{ou,yt}$=307,200 MWh

According to formula 13, the baseline emission (BE_y) is calculated as:

$BE_y = EG_y \times EF_{BL,CO2}$

= 307,200MWh*0.5739 tCO_2/MWh

=176,302 tCO_2

Step 2 Calculate project emission (PE_y)

According to the section B.6.1, CO_2 emission coefficient of natural gas is calculated as:
$COEF_{CO2,NG}$ = 0.001965 tCO_2/Nm^3

According to the PDR of the proposed project, annual volume of natural gas combusted by the proposed project activity is:
$FC_{NG,y} = 6476.4*10^4 Nm^3$

According to the formula 16, the project emission (PE_y) is calculated as:
$PE_y = FC_{NG,y} \times COEF_{NG,y}$
$= 6476.4*10^4 Nm^3 *0.001965\ tCO_2/Nm^3$
= 127,261 tCO_2

Step 3 Calculate leakage (*LE_y*)

Sub step 3a: the upstream fugitive CH_4 emission factor is calculated as:
$EF_{Bl,upstream,CH4}=0.006318 tCH_4/MWh$

Sub step 3b: according to the formula 20, the upstream fugitive CH_4 emission is calculated as:
$LE_{CH4,y} = (FC_{NG,y} \times NCV_{NG,y} \times EF_{Gas, upstream,CH4} - EGy \times EF_{BL, upstream,CH4}) \times GWP_{CH4}$
$=(6476.4*10^4 Nm^3*0.035028 GJ/Nm^3*160 tCH_4/PJ-307200 MWh*0.006318 tCH_4/MWh)$
$*21 tCO_2/tCH_4$
$= -33136 tCO_2$

Sub step 3c: according to the formula 22, the amount of leakage is:
$LE_y=LE_{CH4,y}= -33136 tCO_2$

According to the methodology AM0029 (Version 02), since the leakage is negative, the leakage of the proposed project is considered to be zero, i.e. LE_y=0.

Step 4 Calculate Emission Reduction (*ER_y*)

According to the formula 23 of section B.6.1, the emission reduction is calculated as:
$ER_y = BE_y - PE_y - LE_y$
= 176,302-127,261-0
= 49,041 tCO_2

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

>>

Table B6-5 Estimation of emission reductions due to the proposed project activity

No.	Year	Estimation of project emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
1	01/04/2009-31/12/2009	95,446	132,227	0	36,781
3	2010	127,261	176,302	0	49,041
4	2011	127,261	176,302	0	49,041
5	2012	127,261	176,302	0	49,041
6	2013	127,261	176,302	0	49,041
7	2014	127,261	176,302	0	49,041
	2015	127,261	176,302	0	49,041
8	01/01/2016-31/03/2016	31,815	44,075	0	12,260
Total		**890,827**	**1,234,114**	**0**	**343,287**

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

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	$EG_{out,y}$
Data unit:	MWh
Description:	Power delivered to the grid
Source of data to be used:	Direct reading
Value of data applied for the purpose of calculating expected emission reductions in section B.6	307,200
Description of measurement methods and procedures to be	The data will be measured hourly, recorded monthly, and archived in electronic version for crediting period+2yrs.

applied:	
QA/QC procedures to be applied:	According to the national standard, the ammeters will be calibrated periodically. The data will be read together by the project owner and the local Power Grid Company and be cross-checked by the receipt of electricity sale.
Any comment:	Low uncertainty

Data / Parameter:	$FC_{NG,y}$
Data unit:	Nm^3
Description:	Annual quantity of natural gas consumed in proposed project activity
Source of data to be used:	Reading of natural gas flow meter installed by the proposed project or receipt of gas purchase
Value of data applied for the purpose of calculating expected emission reductions in section B.6	64,764,000
Description of measurement methods and procedures to be applied:	The natural gas flow will be monitored by gas supplier continuously. The daily gas consumption amount will be aggregated automatically and recorded.
QA/QC procedures to be applied:	The natural gas flow meter will be checked according to the relevant rules. Besides, the natural gas consumption amount could be monitored both by the gas supplier and project owner for cross-verification.
Any comment:	Uncertainty level of the data is low

Data /parameter：	$E_{in,y}$
Data unit：	MWh
Description：	The electricity consumed by the project which is imported from the NWPG.
Source of data：	Direct reading.
Data used for expected emission reduction calculation in B.6:	0
Description of measurement methods and procedures	The data will be measured hourly, recorded monthly, and archived in electronic version for crediting period+2yrs.

applied:	
QA/QC procedures:	According to the national standard, the meters will be calibrated periodically. The data will be read together by the project owner and the local Power Grid Company and be cross-checked with by the receipt of electricity sale.
Any comments:	Low uncertainty

Data / Parameter:	$OXID_{NG}$
Data unit:	%
Description:	Oxidation factor of natural gas
Source of data to be used:	2006 IPCC Guidelines
Value of data applied for the purpose of calculating expected emission reductions in section B.6	100
Description of measurement methods and procedures to be applied:	Use IPCC current default, and recording annually.
QA/QC procedures:	Official statistics
Any comment:	Low uncertainty

Data/ Parameter:	$EF_{CO2,NG}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor per unit of energy of natural gas
Source of data used for ex-ante calculation:	Chinese DNA (0.0153tc/GJ*44CO_2/12C*100%=0.0561tCO_2/GJ), http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0.0561
Description of the choice of data or	Use supplier-provide data, local data, country-specific value, that order of preference. This data will be recorded annually.

description of measurement methods and procedures actually applied :	
Any comment:	Low uncertainty

Data / Parameter:	$COEF_y$
Data unit:	tCO_2/m^3
Description:	Emission coefficient of fuel
Source of data used:	Calculated
Value applied:	0.001965
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data will be recorded annually.
Any comment:	Low uncertainty

Data / Parameter:	PE_y
Data unit:	tCO_2e
Description:	Project emission during the year y.
Source of data used:	Calculated
Value applied:	127,261
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Low uncertainty

Data /parameter：	NCV_{NG}
Data unit：	GJ/Nm^3
Description：	Net Calorific Value of natural gas consumed by the proposed project. The value will be recorded fortnightly.
Source of data：	Supplied by the gas supplier.
Data used for expected emission reduction calculation in B.6：	0.035028
Description of measurement methods and procedures applied：	Measure Report of Net Calorific Value of natural gas as determined from the gas supplier.
QA/QC procedures:	Qualified authoritative organization or official statistics
Any comments：	Low uncertainty

Data /parameter：	$EF_{grid,BM,y}$
Data unit：	tCO_2e/MWh
Description：	Build margin emission factor of the project electricity system in year y.
Source of data：	The website of Chinese DNA: http://cdm.ccchina.gov.cn/web/index.asp
Data used for expected emission reduction calculation in B.6：	The value issued by Chinese DNA.
Description of measurement methods and procedures applied：	In line with AM0029 (version 02), the calculation is carried out by Chinese DNA, according to the "Tool to calculate the emission factor for an electricity system" approved by EB and statistics of electric power issued by Chinese authority.
QA/QC procedures:	Official statistics
Any comments：	Low uncertainty

Data /parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined margin emission factor of the project electricity system in year y.
Source of data:	The website of Chinese DNA: http://cdm.ccchina.gov.cn/web/index.asp
Data used for expected emission reduction calculation in B.6:	The value issued by Chinese DNA.
Description of measurement methods and procedures applied:	In line with AM0029 (version 02), the calculation is carried out by Chinese DNA, according to the "Tool to calculate the emission factor for an electricity system" approved by EB and statistics of electric power issued by Chinese authority.
QA/QC procedures:	Official statistics
Any comments:	Low uncertainty

B.7.2. Description of the monitoring plan:

>>

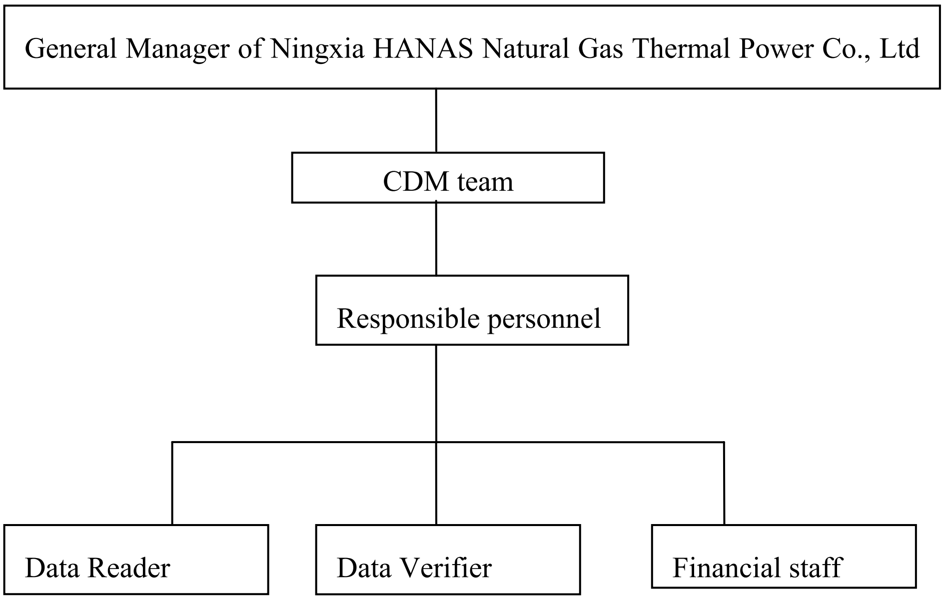
The monitoring plan of the proposed project is made in accordance with ACM0029 and the purpose of the monitoring plan is to ensure the completeness, consistency, accuracy of the monitoring and calculation for the emission reduction. The project owner will be in charge of implementation the monitoring plan.

1. Monitoring objects

The data to be monitored are the electricity delivered to the grid, the electricity consumed by the proposed project which is imported from NWPG, quantity of natural gas consumed in the proposed project activity and its Net Calorific Value, the build margin emission factor and combined margin emission factor of the project electricity system. The Net Calorific Value of natural gas consumed by the proposed project comes from the fuel supplier and will be measured periodically. Meanwhile, the BM and CM are obtained from the data either published officially by the Chinese DNA or resulted from strict calculation without release by Chinese DNA, thus whose uncertainty is low. Thus, the electricity delivered to the grid, the electricity consumed by the proposed project which is imported from the NWPG, quantity of natural gas consumed in the proposed project activity are the key data to be monitored.

2. Monitoring organization

The General Manager of Ningxia Hanas natural gas thermal power co.ltd. is to take charge of the leading and supervision of monitoring organization. One responsible personnel appointed by the General Manager is responsible for the implementation and management of the monitoring plan in order to ensure the completeness, consistency, accuracy of the data.



Data reader will be responsible for reading meters regularly and making records of monitored data, including periodically making record of NCV provided by natural gas supplier.

Data verifier will be responsible for checking the records of data and then sending these records to the responsible personnel.

Financial Staff will be responsible for collecting and archiving the receipts of power sale and gas sale.

In order to ensure the relevant personnel has enough knowledge and capacity to perform the monitoring tasks, the project owner is responsible to provide the personnel with the relevant training. Moreover, the relevant personnel will be trained by CDM project developer regarding CDM knowledge.

3. Monitoring equipment and installation

3.1 The installation of electricity meter

One bidirectional electricity meter will be installed connecting to the power system . The electricity meter

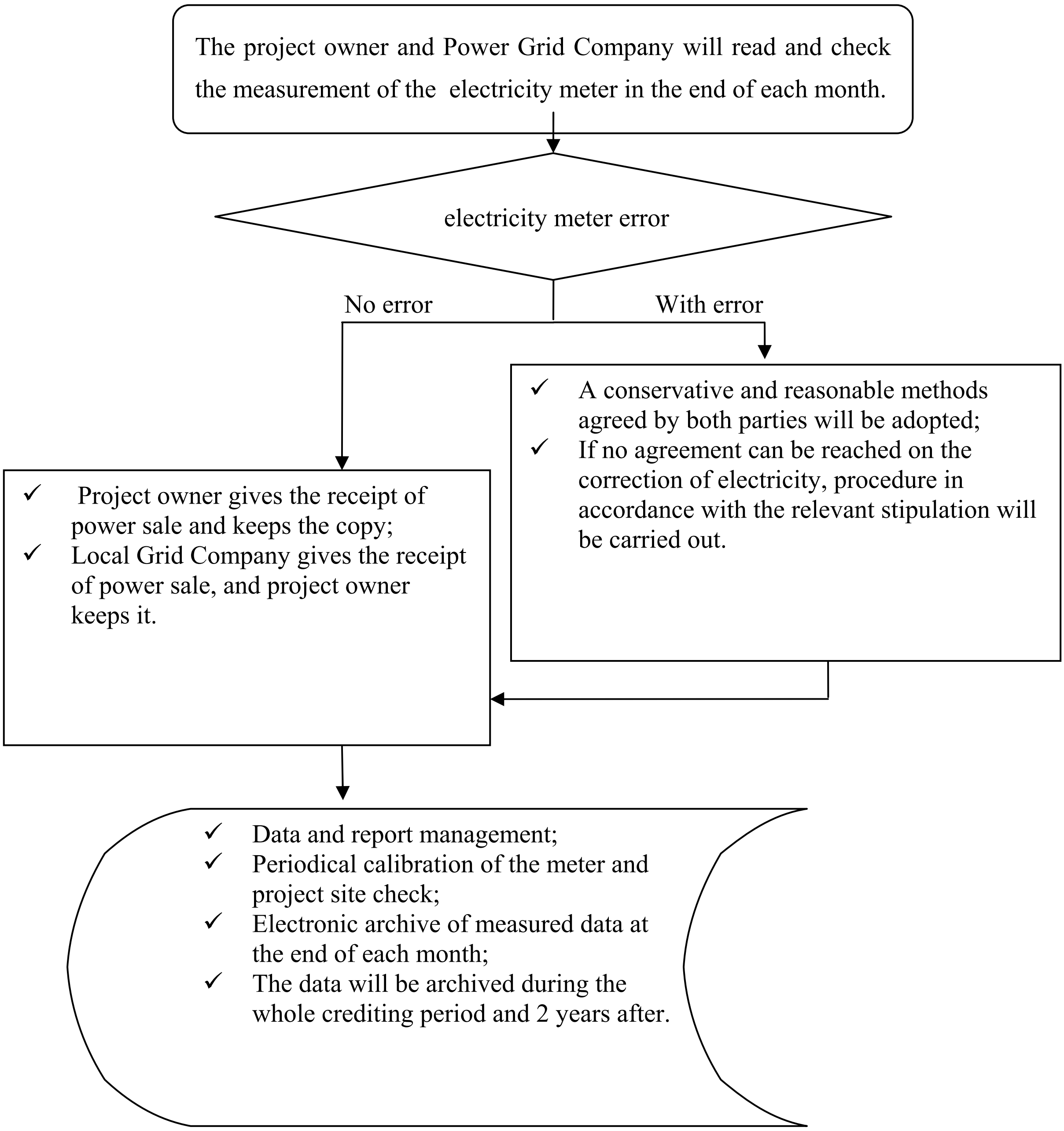
will be properly installed and maintained according to the requirement from relevant administrative code. Forward (positive) active electric power of the electricity meter will be used to measure the electricity delivered to the grid (EG_{out}) and reverse (negative) active electric power of the electricity meter will be used to measure the power, which is imported from NWPG, consumed by the proposed project (EG_{in}). The electricity meter will be checked by the Power Grid Company before installation in accordance with the procedure.

3.2 The installation of gas meter

A set of gas metering devices will be installed at the supply line of natural gas measuring the net quantity of gas consumed in the proposed project activity. The gas metering devices will be jointly checked by the project owner and the gas supplier before installation in accordance with the procedure.

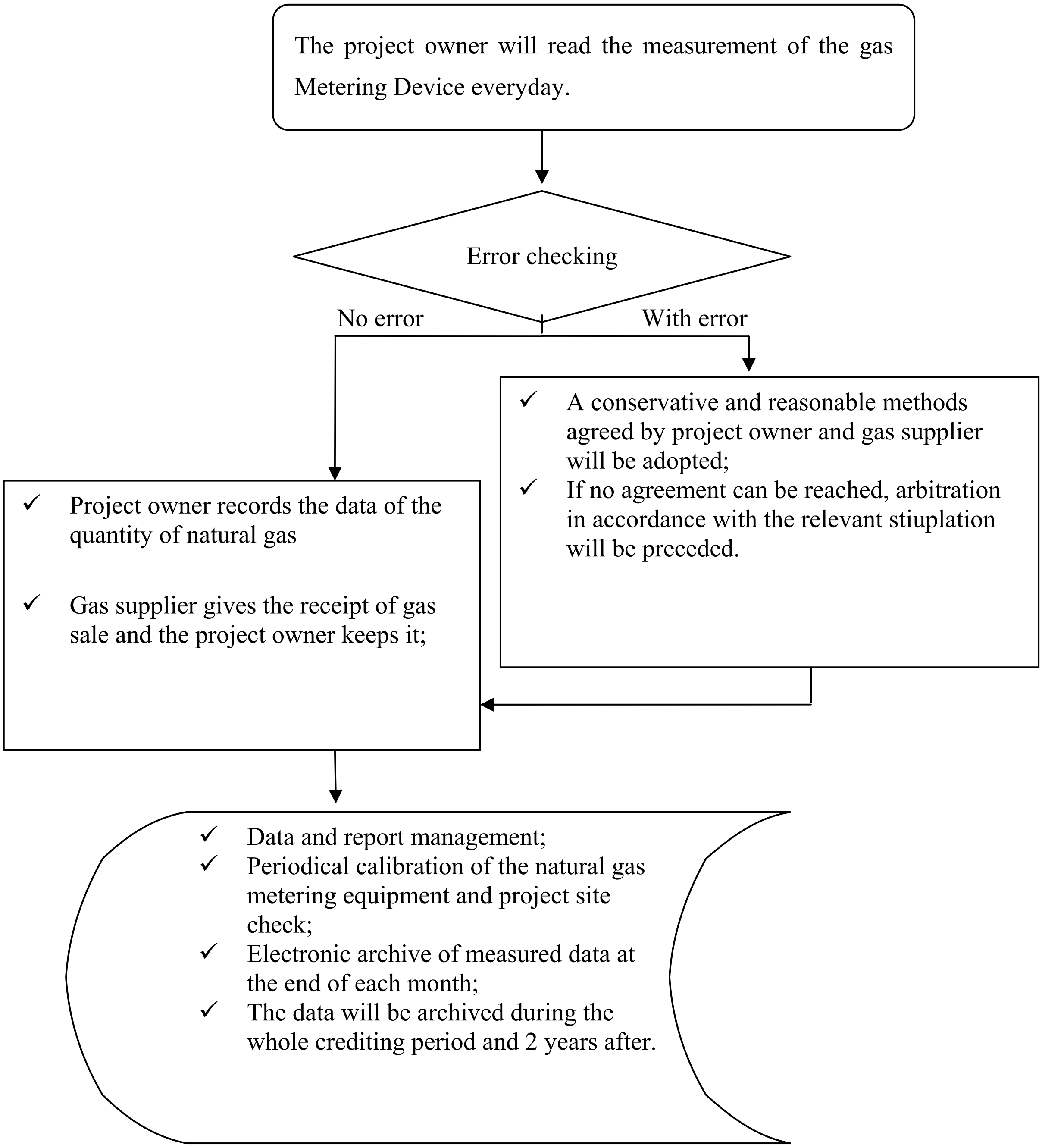
4. Data collection
4.1 Data collection of the electricity meter

The procedure for data collection is as follow:



4.2 Data collection of the gas meter

The procedure for data collection is as follow:



It should be ensured that the auditors can get reliable meter records, calibration and maintenance record.

5. Meters maintenance and calibration

The periodical calibration and maintenance of the electricity meter and gas metering device (hereinafter referred to as meters collectively) should comply with the related standards and regulations of national power sector, so as to ensure the precision of the meters. The meters must be sealed after calibration.

Neither party could unseal or change the meters without the presence of the other party.

After the occurrence of the conditions below, the project owner shall make a claim of maintenance and/or calibration:

a. the error of the meters is out of the permissible limits;
b. the faults of the meters' components.

6. Data management System

The data management system describes how the collected data are recorded and kept, which is also the core of the monitoring plan.

At the end of every month, the monitored data should be archived in the computer and backup in disk, at the same time the paper document should be archived. The project owner should keep the receipt of power sales and gas sales.

The monitoring and data management will be carried out mainly by the CDM team and conducted by the appointed personnel. Documents such as paper map, diagram, Environment Impact Assessment Report and the monitoring plan will be kept collectively. For convenience of auditing, the project owner should provide the index of project document and monitoring report.

The project owner will have a copy of all the paper documents. The monitored data will be kept during the whole crediting period and 2 years after.

7. Corrective action

If error is found, the reason should be analyzed and submitted to responsible personnel in writing by relevant staff in order to ensure the accuracy of data by adopting relevant measures. The corrective action procedure is as follows:

- If error is caused by staff member, he/she will be punished according to relevant regulations;
- If there is a failure in monitoring procedure, CDM team should make proper improvements based on actual situation;
- If the error is caused by fault of the electricity meters or/and natural gas metering device, the relevant electricity meters or/and natural gas metering device must be inspected and calibrated.

8. Periodical Monitoring Sum-up Report

In the end of each monitoring period, the CDM team will prepare a periodical monitoring sum-up report which covers power delivered monitoring and auditing report, gas supply monitoring and auditing report, emission reduction calculation report, meters maintenance and calibration records. It will be an important reference for DOE's verification.

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):

>>

Date of completion of the application of the baseline study and monitoring methodology:
01/03/2008
Name of personnel determining the baseline and monitoring methodology:
Shi Chongqi / Beijing Keji Consulting Ltd. (CDM project developer)
Tel: 010-82253961
Fax: 010-82253952
Email: bjkj2003@vip.163.com

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Ningxia HANAS Natural Gas Thermal Power Co., Ltd. is a project participant, while Beijing Keji Consulting Ltd. is not a participant of the proposed project.

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:

>>

15/05/2007 (the start date of CDM project activity is defined as 'the earliest date at which either the implementation or construction or real action of a project activity begins', as per this definition, the date of

main equipment purchase contract is identified as the start date of the project activity, listed in Table B5-1).

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

>>

The operational lifetime of the proposed project is 20y-0m.

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

C.2.1. Renewable crediting period:

>>

The renewable crediting period (7*3) will be used.

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

>>

01/04/2009 or date of registration (whichever is later)

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:

>>

Not applicable.

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

SECTION D. Environmental impacts

>>

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

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In accordance with relevant environmental law and regulations, an Environmental Impact Assessment of Project Construction has been prepared. The approval for implementation of the proposed project has been issued by Ningxia Environmental Protection Bureau on July 6, 2003. Due to the installed capacity changes of the project during the process of project design, the Environmental Impact Assessment has been conducted again and Ningxia Environmental Protection Bureau has issued the approval based on the ultimate installed capacity on the 23rd of Jan, 2008.

The proposed project is likely to cause the following environmental impacts:

Construction period:

The environmental problem during the construction period is of short duration. During the construction period, atmosphere, soil and vegetation around the construction site may be influenced to some extent, and these impacts will disappear due to the restoration measures when the construction period is over. So, if active restoration measures are taken, negative impact to the environment during and after the construction period will not come into being.

1. Noise

The construction noise pollution mainly comes from various construction machineries. The project entity will control the time of using the machines with loud noise and taking noise reducing measures. The workers working on the site will be equipped with noise reducing facilities.

2. Dust

As the dust caused by the proposed project construction will influence the surrounding environmental quality of construction site, during the construction period, the construction site should be watered in time, and the management of material yards should be strengthened so as to reduce the occurrence of dust pollution.

3. Construction wastes

The construction wastes left in the construction locale should be cleared and transported in time. When the transportation vehicles leave the construction site, the dirt tracked in by the vehicles should be cleared in time and the wastes should be transported to specified place.

4. Waste water
The sewage will be collectively treated in septic tank before discharge, so as to meet the requirement of 'Discharge Standard of Waste Water'(GB8978-1996).

Operation period:

The main environmental pollutants emitted after the proposed project operation are NO_2 and SO_2, basically no particulate matter. The surrounding environment of the proposed project plant could meet the requirement of Grade Ⅱ of *Environmental Atmosphere Quality Standards* (GB3095-1996).

The waste water mainly involves sewage. It will be discharged to sewage pipe network after treated, and won't cause environmental impact.

Another pollutant of the proposed project operation is noise from gas turbine, air compressor of step-up station for cycle water pump etc.. Various measures have been considered when the proposed project is constructed, for example, the muffler is installed at the intake and exhaust ports in the combustion engine, and sound insulation enclosure is adopted in the combustion engine and sound absorption materials are used when the plant is built so as to satisfy Grade Ⅱ of Plant Noise Standards for Industrial Enterprise (GB12348-90).

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:

>>

According to the Environmental Impact Assessment and the approval for implementation of the proposed project issued by Ningxia Environmental Protection Bureau, impacts are considered insignificant.

SECTION E. Stakeholders' comments

>>

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

>>

In order to invite stakeholders' comments, the project owner invited local relevant government department to attend a meeting on 29th of Oct.2007, all attended stakeholders consider that the operation of the project will contribute to local economic development, the improvement of the energy structure in Ningxia and alleviation of air pollution.

Moreover, the project owner released the announcement on asking for the comments of local stakeholders on 8th September 2007. And on 5th October 2007 and 10th November 2007, project owner conducted a survey around the project site by ways of sending questionnaires. Respondents included stakeholders such as residents around, officials, and workers. 65 questionnaires were sent out and all of them were collected back. Table E-1 is the statistics for people who have been invited for the survey.

Table E-1 The detailed respondents' information

Total respondents	65
Gender	Male: 49
	Female: 16
Occupation	Officials: 11
	Workers: 29
	Residents: 16
	Others: 9
Education	Junior College and above: 26
	Senior high school or technical secondary school: 37
	Junior high school and below: 2

E.2. Summary of the comments received:

>>

According to the survey on 65 surrounding stakeholders, all of them support the implementation of the proposed project. Meanwhile, some comments without counterview have be collected and the result is shown as follows:

Table E-2 Summary of the comments received

NO.	Questions	Options	Ratio (%)	Notes
1	How do you feel about the current	Satisfied	63.1	

	environment of the proposed project area?	Unsatisfied	4.6	
		Acceptable	32.3	
2	How do you think about the current local power supply?	Tense	7.7	
		Not tense	16.9	
		OK	75.4	
3	How much do you know about natural gas co-generation project?	A lot	27.7	
		Nothing	10.8	
		A little	61.5	
4	What is your attitude towards the construction of natural gas co-generation project?	Supportive	96.9	
		Not supportive	0	
		Do not care	3.1	
5	What are the impacts of the proposed project construction on your life quality?	Improve	18.5	
		Decline	0	
		No impact	81.5	
6	What are the impacts of the proposed project construction on the current environment?	Significant	1.5	
		Minor	6.2	
		No impact	92.3	
7	What are the impacts of the proposed project construction on the local economic development?	Promote	100	
		Hamper	0	
		No impact	0	
8	Other suggestions and requirements to the project construction:			No other comments

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

>>

In conclusion, the local residents, enterprises and government are supportive to the proposed project. According to the comments received from the stakeholders, it is not necessary now to adjust the design, construction and operation of the proposed project.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from *UNFCCC* Annex 1 countries for the proposed project.

Annex 3

BASELINE INFORMATION

1. Calculation of Operating Margin (*OM*) Emission Factor

Table 3-1 CO_2 Emissions from Fuel-fired Power Plants of NWPG in 2003

Fuel types	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	Emission factor	Oxidation factor	NCV	CO_2 emission (tCO_2e)
								tc/TJ	%	MJ/t,m³	*J=G*H*I*F*44/12/10000 (Mass unit)*
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	*J=G*H*I*F*44/12/1000 (Volume unit)*
Raw coal	*10^4t*	2002.26	1479.62	330.67	682	1065.75	**5560.3**	25.8	100	20908	109976995.8
Cleaned coal	10^4t						**0**	25.8	100	26344	0
Other washed coal	10^4t				27	3.64	**30.64**	25.8	100	8363	242405.2347
Coke	10^4t						**0**	29.2	100	28435	0
Coke oven gas	10^8m^3		1.54				**1.54**	12.1	100	16726	114279.8375
Other coal gas	10^8m^3		0.12				**0.12**	12.1	100	5227	2782.8548
Crude oil	10^4t						**0**	20	100	41816	0
Gasoline	10^4t						**0**	18.9	100	43070	0
Diesel	10^4t	3.12			0.04	0.4	**3.56**	20.2	100	42652	112463.6562
Fuel oil	10^4t		1.19			1.02	**2.21**	21.1	100	41816	71497.13619
LPG	10^4t						**0**	17.2	100	50179	0
Refinery gas	10^4t					3.48	**3.48**	15.7	100	46055	92262.9026
Natural gas	10^8m^3	0.1	0.54			5.95	**6.59**	15.3	100	38931	1439275.177

Other oil products	10^4t						**0**	20	100	38369	0
Other coal chemicals	10^4t						**0**	25.8	100	28435	0
Other energy	10^4tce		5.86			2.3	**8.16**	0	100	0	0
										Subtotal	112051962.6

Data sources: China energy statistical yearbook 2004

Table 3-2 Fuel-fired Electricity Generation in NWPG 2003

Name of the province	Generation	Generation	Rate of electricity used by factory	Power supply
	10^8kWh	MWh	%	MWh
Shaanxi	381.44	38,144,000	6.94	35,496,806
Gansu	294.94	29,494,000	6.35	27,621,131
Qinghai	64.46	6,446,000	4.50	6,155,930
Ningxia	191.75	19,175,000	5.25	18,168,313
Xinjiang	198.34	19,834,000	8.19	18,209,595
Total				105,651,775

Data sources: China Electric Power Yearbook 2004

Table 3-3 Calculation on Simple OM Emission Factor of NWPG in 2003

Total emission amount in NWPG	112,051,963 tCO_2
Total power supply in NWPG	105,651,775.3 MWh
Emission factor in NWPG	1.060578 tCO_2/MWh

Table 3-4 CO_2 Emissions from Fuel-fired Power Plants of NWPG in 2004

Fuel types	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	Emission factor	Oxidation factor	NCV	CO_2 emission (tCO_2e)

								tc/TJ	%	MJ/t,m^3	*J=G*H*I*F*44/12 /10000 (Mass unit)*
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	*J=G*H**F*44/12/ 1000 (Volume unit)*
Raw coal	*10^4t*	*2,428.7*	*1,595.9*	*322.8*	*1,270*	*1,240.9*	*6,858.4*	*25.8*	*100*	*20,908*	*135652074.1*
Cleaned coal	10^4t		*0.91*				*0*	*25.8*	100	*26,344*	*0*
Other washed coal	10^4t				102	10.5	113.14	25.8	100	8,363	895095.5697
Coke	10^4t	0.78					0.78	29.2	100	28,438	23746.6372
Coke oven gas	10^8m^3		0.3				0.3	12.1	100	16,726	22262.306
Other coal gas	10^8m^3	0.74	1.26				2	12.1	100	5,227	46380.91333
Crude oil	10^4t	0.01				0.06	0.07	20	100	41,816	2146.554667
Gasoline	10^4t	0.02					0.02	18.9	100	43,070	596.9502
Diesel	10^4t	2.16	0.36		0.05	0.41	2.98	21.1	100	42,652	94140.92571
Fuel oil	10^4t	0.01	0.69			0.3	1	17.2	100	41,816	32351.64533
LPG	10^4t						0	15.7	100	50,179	0
Refinery gas	10^4t					3.26	3.26	15.3	100	46,055	86430.19037
Natural gas	10^8m^3	1.61	0.59			6.27	8.47	20	100	38,931	1849872.648
Other oil products	10^4t						0	25.8	100	38,369	0
Other coal chemicals	10^4t						0	0	100	28,435	0
Other energy	10^4tce		6.17			3.46	9.63	0	100	0	0
										Total	138705098.5

Data sources: China energy statistical yearbook 2005

Table 3-5 Fuel-fired Electricity Generation of NWPG 2004

Name of the province	Generation	Generation	Rate of electricity used by factory	Power supply
	10^8kWh	MWh	%	MWh
Shaanxi	444.39	44,439,000	7.50	41,106,075
Gansu	332.42	33,242,000	6.21	31,177,672
Qinghai	62.08	6,208,000	7.96	5,713,843.2
Ningxia	252.98	25,298,000	5.45	23,919,259
Xinjiang	227.52	22,752,000	9.07	20,688,394
Total				122,605,243

Data sources: China Electric Power Yearbook 2005

Table 3-6 Calculation on Simple OM Emission Factor of NWPG in 2004

Total emission amount in NWPG	138,705,098 tCO_2
Total power supply in NWPG	122,605,243 MWh
Emission factor in NWPG	1.131315 tCO_2/MWh

Table 3-7 CO_2 Emissions from Fuel-fired Power Plants of NWPG in 2005

Fuel types	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	Emission factor	Oxidation factor	NCV	CO_2 emission (tCO_2e)
								tc/TJ	%	MJ/t,m³	*J=G*H*I*F*44/12/ 10000 (Mass unit)*
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	*J=G*H*I*F*44/12/ 1000 (Volume unit)*
Raw coal	*10⁴t*	*2461.28*	*1597*	*345.1*	*1467.7*	*1358.0 9*	*7229.17*	*25.8*	*100*	*20,908*	*142985522.1*
Cleaned coal	10⁴t	*16.22*					*16.22*	*25.8*	*100*	*26,344*	404225.4973
Other washed coal	10⁴t	35.56			101.2	102.	147.71	25.8	100	8,363	1168592.599
Coke	10⁴t	3.23					3.23	29.2	100	28,438	98335.43353
Coke oven gas	10⁸m³						0	12.1	100	16,726	0
Other coal gas	10⁸m³						0	12.1	100	5,227	0
Crude oil	10⁴t					0.18	0.18	20	100	41,816	5519.712
Gasoline	10⁴t	0.02				0.01	0.03	18.9	100	43070	895.4253
Diesel	10⁴t	2.24	0.46	0.06		0.5	3.26	20.2	100	42,652	102986.3818
Fuel oil	10⁴t	0.01	0.57			0.25	0.83	21.1	100	41,816	26851.86563
LPG	10⁴t						0	17.2	100	50,179	0
Refinery gas	10⁴t					7.71	7.71	15.7	100	46,055	204410.0515
Natural gas	10⁸m³	1.46	0.52	1.33		7.81	11.12	15.3	100	38,931	2428640.359
Other oil products	10⁴t						0	20	100	38,369	0

Other coal chemicals	10^4t						0	25.8	100	28,435	0
Other energy	10^4t ce	8.24	1.3				9.54	0	100	0	0
										Total	147425979.4

Data sources: China energy statistical yearbook 2006

Table 3-8 Fuel-fired Electricity Generation of NWPG 2005

Name of the province	Generation	Generation	Rate of electricity used by factory	Power Supply
	10^8kWh	MWh	%	MWh
Shaanxi	411	41,100,000	7.16	38,157,240
Gansu	331.06	33,106,000	4.23	31,705,616
Qinghai	55	5,500,000	2.69	5,352,050
Ningxia	276.43	27,643,000	5.73	26,059,056
Xinjiang	265.6	26,560,000	8.8	24,222,720
Total				125,496,682

Data sources: China Electric Power Yearbook 2006

Table 3-9 Calculation on Simple OM Emission Factor of NWPG in 2005

Total emission amount in NWPG	147,425,979 tCO_2
Total power supply in NWPG	125,496,682 MWh
Emission factor in NWPG	1.174740 CO_2/MWh

Weighted Average Emission Factor of 3 years: 1. 1258 tCO_2/MWh

2. Calculation of Build Margin (*BM*) Emission Factor

Table 3-10 The proportion of CO_2 emission of solid, liquid and gas in total emission

Fuel types	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	NCV	Emission factor (tc/TJ)	Oxidation factor	CO_2 emission (tCO_2e)
		A	B	C	D	E	F=A+…+E	G	H	I	*J=F*G*H*I*44/12/100*
Raw coal	*10^4t*	2461.28	1597	345.1	1467.7	1358.09	7229.17	20908	25.8	1	142,985,522
Cleaned coal	10^4t	16.22	0	0	0	0	16.22	26344	25.8	1	404,225
Other washed coal	10^4t	35.56	0	0	101.95	10.2	147.71	8363	25.8	1	1,168,593
Coke	10^4t	3.23	0	0	0	0	3.23	28435	29.2	1	98,335
Subtotal											**144,656,675**
Crude oil	10^4t	0	0	0	0	0.18	0.18	41816	20	I	5,520
Gasoline	10^4t	0.02	0	0	0	0.01	0.03	43070	18.9	1	895
Coal oil	10^4t	0	0	0	0	0	0	43070	19.6	1	0
Diesel	10^4t	2.24	0.46	0.06	0	0.5	3.26	42652	20.2	1	102,986
Fuel oil	10^4t	0.01	0.57	0	0	0.25	0.83	41816	21.1	1	26,852
Other oil products	10^4t	0	0	0	0	0	0	38369	20	1	0
Subtotal											**136,253**
Natural gas	10^7m^3	14.6	5.2	13.3	0	78.1	111.2	38931	15.3	I	2,428,640
Coke oven gas	10^7m^3	0	0	0	0	0	0	16726	12.1	1	0
Other coal gas	10^7m^3	0	0	0	0	0	0	5227	12.1	1	0
LPG	10^4t	0	0	0	0	0	0	50179	17.2	1	0
Refinery gas	10^4t	0	0	0	0	7.71	7.71	46055	15.7	1	204,410

Subtotal											**2,633,050**
Total											**147,425,978**

Data sources: China Energy StatisticsYearbook 2006

According to above calculation, λ_{Coal} =98.1%, λ_{Oil} =0.09%, λ_{Gas} =1.81%.

The best efficiencies and emission factors of the coal, oil and gas fired power technology are listed in Table 3-11.

Table 3-11 The Best Efficiencies and Emission Factors of the fuel-fired technologies

Type	Data	Power supply efficiency	$COEF_{Fuel}$ (tc/TJ)	OXID	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power technology	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired power technology	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired power technology	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

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

Table 3-12 Installed capacity of the NWPG 2005

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Fire power	MW	9132.1	5715	886.8	4577	5051.7	25362.6
Hydro power	MW	1578	4036.2	4825	428.5	1352.1	12219.8
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	46	109.1	0	112.2	132.2	399.5
Total	MW	10756.1	9860.3	5711.8	5117.7	6536	37981.9

Data sources: China Electric Power Yearbook 2006

Table 3-13 Installed capacity of the NWPG 2004

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Fire power	MW	7640.4	4975.6	889.8	3782	4959.7	22247.5
Hydro power	MW	1876.5	3566.1	4053.4	366.2	973	10835.2
Nuclear power	MW	0	0	0	0	0	0

Wind power and other	MW	0	138.2	0	42.5	95.3	276
Total	MW	9516.9	8679.9	4943.2	4190.7	6028	33358.7

Data sources: China Electric Power Yearbook 2005

Table 3-14 Installed capacity of the NWPG 2003

Installed capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Fire power	MW	7326.4	4745	905.8	3102	4413.5	20492.7
Hydro power	MW	1462.3	3280.6	3341.1	308.2	989.8	9382
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	0	21.6	0	10	91.3	122.9
Total	MW	8788.7	8047.2	4246.9	3420.2	5494.6	29997.6

Data sources: China Electric Power Yearbook 2004

Table 3-15 *BM* calculation of the NWPG

	Installed capacity 2003	Installed capacity 2004	Installed capacity 2005	New added installed capacity 2003-2005	The fraction of newly added installed capacity
	A	B	C	D=C-A	
Fire power	20,492.7	22,247.5	25,362.6	4,869.9	60.99%
Hydro power	9,382	10,835.2	12,219.8	2,837.8	35.54%
Nuclear power	0	0	0	0	0.00%
Wind power	122.9	276	399.5	276.6	3.46%
Total	29,997.6	33,358.7	37,981.9	7,984.3	100.00%
The fraction of installed capacity 2005	78.98%	87.83%	100%		

Thus: $EF_{BM,y}$=0.9409*60.99% ＝0.5739 tCO_2/MWh

Annex 4

MONITORING INFORMATION

There is no additional information.