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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Baotou Iron & Steel Coke Dry Quenching #3 and Waste Heat Utilization for Electricity Generation Project
Version: 04
Date: 05/09/2008

PDD Revision History:
Version 1.0, 18/05/2007, GSP version
Version 2.0, 01/10/2007, updated following DOE site visit
Version 3.0, 29/01/2008, revised according to DOE CAR & CR list and comments from DOE
Version 4.0, 05/09/2008, revised after taking into account the review for request by the CDM EB.

A.2. Description of the project activity:

Baotou Iron & Steel Group Co., Ltd.(BISCO) intends to build one set of coke dry quenching (CDQ) system on coke ovens numbers 9 and 10 and install a set of coke wet quenching process (CWQ) system.The CWQ would be constructed as a backup. The CDQ unit will recover waste heat from red-hot coke and utilize the sensible heat for electricity generation. The electricity will be used to meet the company's power demand, displacing the electricity mainly purchased by BISCO from the North China Power Grid. Since there is currently no relevant regulation obliging iron and steel companies in China to mandate installation of CDQ system, without the project, BISCO would most likely choose CWQ systems and the sensible heat could not be recovered and utilized to generate electricity.

CDQ No.	Coke oven No.	Coke oven scale	Coke oven capacity	CDQ capacity	Waste heat boiler	Turbine Generator
3	9	2×50room, height 6m	117.3t/h	125t/h	70t/h	15MW
	10					
CDQ No.	**Coke oven No.**	**Coke oven starting date of construction**	**Considering CDM date**	**CDQ starting date of construction**	**CDQ starting date of commissioning**	
3	9	2006-3-23	2005-4-17	2007-3	2007-11	
	10	2006-3-23				

The proposed project will adopt Japan Nippon Steel Corporation CDQ technology, which uses inert gas to reclaim sensible heat from the coke quenching process. In the steam-water heat exchanging process, steam will be produced in the CDQ boilers, then enter the turbine for electricity generation. The project is expected to generate net electricity supply of 83.35 GWh annually, which will replace the equivalent amount of electricity from the North China Power Grid, and reduce the GHG emissions from the coal-dominated North China Power Grid. The expected annual emission reductions from this project are estimated at 84,278 tCO_2e per year for ten years.

The project, which recovers waste heat from red-hot coke and then uses the heat for electricity generation, has significant environmental and social benefits. It will contribute to sustainable development as follows.

- The project will reduce the waste of energy resources and promote energy conservation.
- Electricity generated by this project will displace coal-fired power generation in the North China Power Grid, reducing the environmental pollution generated from burning coal.
- The project will significantly reduce dust from the existing CWQ facility.
- The project will create 44 employment opportunities for the local community during the construction and operation of the project.

The project will be located in the coke plant of Baotou Iron & Steel Group Co., Ltd. in Baotou City, Inner Mongolia Autonomous Region, China.

A.3. Project participants:

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China	Baotou Iron & Steel Group Co. Ltd. is the project's owner and operator	No
Denmark	Danish Ministry of Climate and Energy	Yes
Denmark	DONG Naturgas A/S	Yes
Denmark	Aalborg Portland A/S	Yes
Denmark	Mærsk Olie og Gas A/S	Yes
Denmark	Nordjysk Elhandel A/S	Yes
Denmark	International Bank for Reconstruction and Development (IBRD) as the trustee of the Danish Carbon Fund	Yes

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time that registration is requested, the approval by the Party(ies) involved is required.

For detailed contact information of the project participants, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Inner Mongolia Autonomous Region

A.4.1.3. City/Town/Community etc:

Baotou City

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

The project will be located in the coke plant of Baotou Iron & Steel Group Co., Ltd. (BISCO), at 109°44′36″E, 40°51′58″N. BISCO is in the western Kundulun River Industry Park, with Bao-Lan Railroad to the south, Bao-Bai Railroad to the west, Bao-Lan Road to the north, and Song-Zhao Road to the east. The geographic location of the project is shown below.


Baotou City
China
International boundary
Province-level boundary
National capital
Province-level capital
Railroad
Road
500 Kilometers
500 Miles
RUSSIA
MONGOLIA
KAZAKSTAN
XINJIANG
QINGHAI
XIZANG
SICHUAN
NEI MONGOL
INDIA
NEPAL
BHUTAN
BANGLADESH
BURMA
LAOS
THAILAND
VIETNAM
CAMBODIA
PHILIPPINES
South China Sea
East China Sea
Yellow Sea
Beijing
Baotou
Hohhot
Base 802437 (545114) 2-96

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

Sectoral scope 1: Energy industries

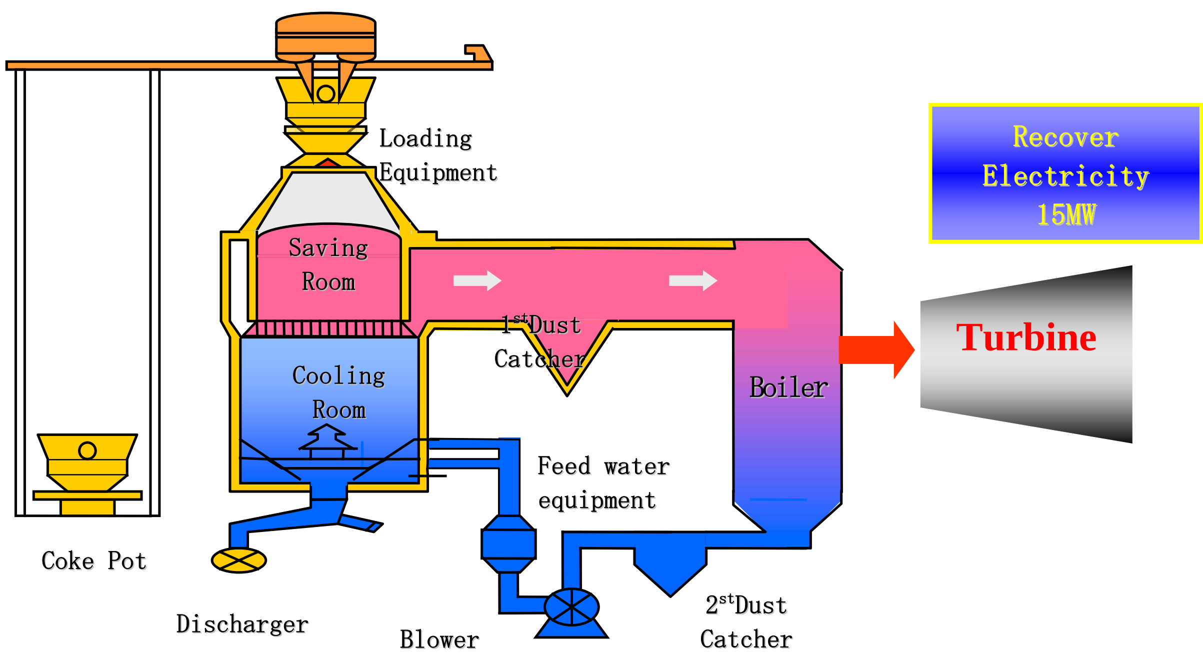
A.4.3. Technology to be employed by the project activity:

This project will use CDQ technology from Japan Nippon Steel Corporation. CDQ is a process by which red-hot coke is cooled with low temperature inert gas in a shaft-like cooling unit called a cooling chamber. The detailed process is described below.

A coke-bucket transfer car loaded with red-hot coke will be pulled by locomotive to the bottom of a derrick. An elevator will then send the coke bucket to the top of the CDQ oven. The hot coke will be unloaded into the CDQ oven by the coke charging unit. After the heat exchange takes place between the hot coke and inert, cold gaseous nitrogen in the oven, the hot coke will be further cooled to below 200℃ and the cooled coke will be discharged to a conveyer belt and sent to the coke screening system.

The inert gas used to cool the hot coke is blown into the CDQ chamber by a circulating fan from the bottom of the unit that supplies the gas. After the heat exchange with the red-hot coke, the gaseous nitrogen reaches a temperature of 900℃. This gaseous nitrogen's temperature varies as the red-hot coke's temperature changes. Normally, it would stay around 980℃ if the temperature of red-hot coke were steadily kept at 1050℃. After being cleaned by the first dust collector, the hot gaseous nitrogen enters the CDQ boiler to complete the heat exchange with water, whereupon its temperature will drop below 170℃. The inert gas will then be cleaned again by a second dust collector. As the circulating fan increases pressure on the inert gas through a feedwater preheater, the inert gas continues to cool to below 130℃. The cold gas is then recycled into the CDQ chamber to quench the next shift of hot coke.

Details of the CDQ process flow is illustrated in the figure below.



Main components of the CDQ system include:

- Circulating water pump station
- CDQ dust collecting system
- CDQ central control unit

- CDQ coke transfer system
- CDQ locomotive car and coke-bucket check station
- Waste heat boiler with capacity of 70t/h
- Turbine power generator with capacity of 15MW
- Power, automation, communications system

The main technology/equipment will be imported. Details are listed in the following table:

Technology/ Equipment Name:	Supplied by:
Coke bucket	Japan
Coke pot transfer car	Japan
CDQ main body	Japan
Circulating fan	Germany
Electromagnetic vibrating input device	Japan
Revolving airtight valve	Japan

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

The project activity is expected to generate estimated annual emission reductions of 84,278 tCO_2e, or 842,779 tCO_2e, over the ten-year project crediting period.

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emission reductions shall be indicated using the following tabular format.	
Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2008 (May-Dec)	56,185
2009	84,278
2010	84,278
2011	84,278
2012	84,278
2013	84,278
2014	84,278
2015	84,278
2016	84,278
2017	84,278
2018 (Jan- April)	28,093
Total estimated reductions (tonnes of CO_2e)	842,779
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	84,278

A.4.5. Public funding of the project activity:

No public funding from 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:

Approved consolidated baseline methodology ACM0004 (Consolidated baseline methodology for waste gas and /or heat and /or pressure for power generation, version 02, valid from 03 Mar 06 to 05 Jul 07) and ACM0002 (Consolidated baseline methodology for grid connected electricity generation from renewable sources, version 06, valid from 19 May 06 onwards) are applied to this project activity.

As required by methodology ACM0004, ACM0002 is used to calculate the emission factor of electricity supply, and Tool for the Demonstration and Assessment of Additionality (Version 03) is used to demonstrate and assess the project's additionality.

For more information regarding ACM0004, ACM0002 and Tool for the Demonstration and Assessment of Additionality refer 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:

The approved consolidated baseline methodology ACM0004 applies to project activities:

- that generate electricity from waste heat or the combustion of waste gases in industrial facilities;
- that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels;
- where no fuel switch is done in the process where the waste heat or the waste gas is produced after the implementation of the project activity.

This project meets all of the above application criteria:

- ✧ This project recovers waste heat from red-hot coke quenching process for electricity generation
- ✧ The electricity generated by the project will displace the power from the North China Power Grid. The installed capacity of coal-fired power plants accounts for over 95 percent of the total installed capacity of the North China Power Grid
- ✧ The implementation of the project activity will not lead to fuel switch.

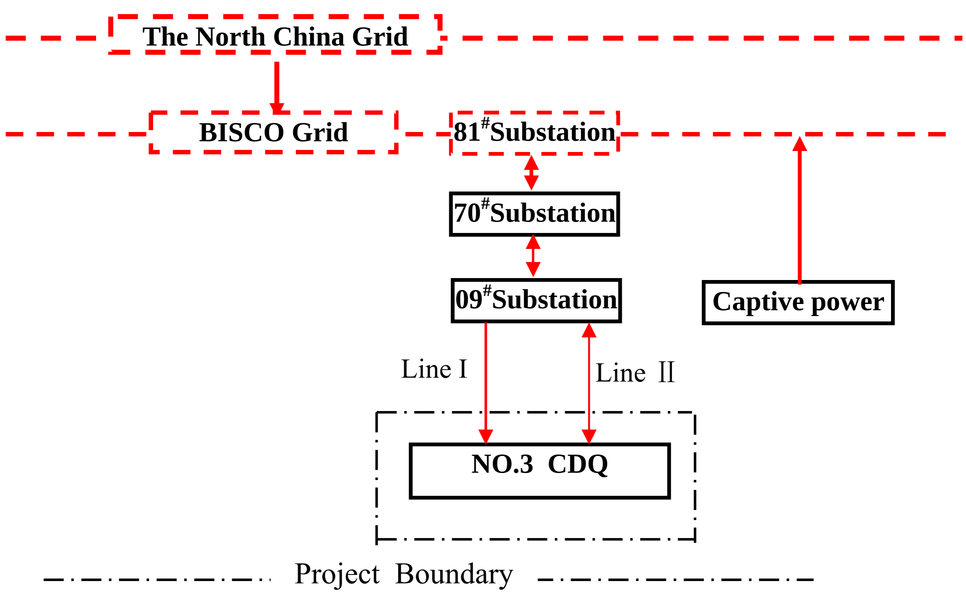
Accordingly, it is appropriate to use the consolidated baseline methodology ACM0004 for this project.

According to ACM0004, as the electricity generated by this project displaces that from the power grid, the emissions factors of the displaced electricity should be the emissions factor of the grid power, which will be calculated as described in ACM0002.

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

For the purpose of determining both project and baseline emissions, the table below illustrates which emission sources and GHG are included in the project boundary:

	Source	Gas	Included?	Justification / Explanation
Baseline	The North China Power Grid	CO_2	Y	Main emission source
		CH_4	N	Excluded for simplification. This is conservative
		N_2O	N	Excluded for simplification. This is conservative
	Captive Power Plants	CO_2	N	Not captive electricity will be involved in the baseline scenario
		CH_4	N	Not captive electricity will be involved in the baseline scenario
		N_2O	N	Not captive electricity will be involved in the baseline scenario
Project Activity	Fuel consumption to produce steam for CDQ startup	CO_2	Y	Main emission source
		CH_4	N	Excluded for simplification
		N_2O	N	Excluded for simplification
	Coke gas firing for CDQ startup	CO_2	Y	Main emission source
		CH_4	N	Excluded for simplification
		N_2O	N	Excluded for simplification



The project boundary is the proposed activity, and the spatial extent of the baseline boundary comprises the waste heat sources, CDQ waste heat recovery for electricity generation plant, the equipments used to provide auxiliary heat to the waste heat recovery process, and the power plants connected physically to the electricity grid that the proposed project activity will affect.

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

According to ACM0004, the possible alternative scenarios in absence of the CDM project activity are:

(a) The proposed project activity not undertaken as a CDM project activity;

(b) Import of electricity from the grid;

(c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;

(d) A mix of options (b) and (c), in which case the mix of grid and captive power should be specified

(e) Other uses of the waste heat and waste gas

(f) The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the options above).

Alternative (a), the proposed project activity not undertaken as a CDM project activity. This option meets all current legal requirement in China and is therefore a possible baseline scenario. However, this alternative is financially unattractive and face significant technological barrier, therefore can not be baseline scenario. The analysis will be further elaborated in the following section B.5.

Alternative (b), import of electricity from the grid - This option meets all current legal requirements in China and is therefore a possible baseline scenario.

Alternative (c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc; As the marginal cost of supplying electricity from the captive power plant is lower than the tariff of the electricity import from the grid, electricity generated from the proposed project will not likely affect the captive power plant, the existing captive power plant is not the plausible alternative to this project. The annual average electricity consumption of BISCO from 2002-2005 is 3392.324Gwh,. only 18% of which are supplied by the existing captive power plant. The marginal cost of supplying electricity from the existing captive power plant is lower than the tariff of the electricity import from the grid means that existing captive power plant is must-run and will be fully dispatched to meet BISCO's electricity need. Therefore the electricity supplied from the proposed CDQ project will unlikely replace electricity generated by the existing captive power plant.

Construction of new captive power plant is not a plausible alternative as the Chinese regulation prohibits any power plant less than 135MW to be constructed.[1]

Alternative (d) a mix of options (b) and (c), since alternative (c) is not a possible scenario, this is not a possible baseline scenario.

Alternative (e), other uses of the waste heat. The main energy demand in the iron and steel industry is related to processing. Since the blast furnace gas and converter gas are abundant and there is an extensive pipe network recovering all the gases needed to meet the process heat demand, it is unnecessary to invest

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

in recovering waste heat from the red-hot coke to meet the plants' downstream processing heat needs, which are already met. Therefore alternative (e) can not be the baseline scenario.

Alternative (f), continuation of the current situation, is the mixture of electricity imported from the grid and the electricity generated by the captive power plant. This is already included in alternative (d), therefore will not be discussed separately.

Consequently, the baseline scenario of this project is (b), import of electricity from the grid.

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):

According to the consolidated baseline methodology ACM0004, the project must demonstrate additionality according to the most recent version (version 3) of the "*Tool for the demonstration and assessment of additionality.*" The Tool consists of the following steps:

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

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

As identified in the section B.4. The possible alternative scenarios in the absence of the CDM project activity would be as follows:

(a) The proposed project activity not undertaken as a CDM project activity;

(b) Import of electricity from the grid;

(c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;

(d) A mix of options (b) and (c), in which case the mix of grid and captive power should be specified

(e) Other uses of the waste heat and waste gas

(f) The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the options above).

Alternative (a), the proposed project activity not undertaken as a CDM project activity. This option meets all current legal requirements in China and is therefore a possible baseline scenario.

Alternative (b), import of electricity from the grid - This option meets all current legal requirements in China and is therefore a possible baseline scenario.

Alternative (c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc; As the marginal cost of supplying electricity from the existing captive power plant is lower than that of grid, electricity generated from the proposed project will not likely affect the captive power plant, the existing captive power plant is not the plausible alternative to this project. The annual electricity consumption of BISCO from 2002-2005 is 3392.324Gwh,. only 18% of which are supplied by the existing captive power plant. The marginal cost of supplying electricity from the existing captive power plant is lower than the tariff of the electricity import from the grid means that existing captive power plant is must-run and will be fully dispatched to meet BISCO's electricity need. Therefore the electricity supplied from the proposed CDQ project will unlikely replace electricity generated by the existing captive power plant.

Construction of new captive power plant is not a plausible alternative as the Chinese regulation prohibits any power plant less than 135MW to be constructed.

Alternative (d) a mix of options (b) and (c), since alternative (c) is not a possible scenario, this is not a possible baseline scenario.

Alternative (e), other uses of the waste heat. The main energy demand in the iron and steel industry is from processing. Since the blast furnace gas and converter gas are abundant and there is an extensive pipe network recovering all the gases needed to meet the process heat demand, it is unnecessary to invest in recovering waste heat from the red-hot coke to meet the plants' downstream processing heat needs, which are already met. Therefore alternative (e) can not be the baseline scenario.

Alternative (f), continuation of the current situation, is the mixture of electricity imported from the grid and the electricity generated by the captive power plant. This is already included in alternative (d), therefore will not be discussed separately.

Consequently, the baseline scenario of this project is (b), import of electricity from the grid.

Sub step 1b. Enforcement of applicable laws and regulations

Applicable laws and regulations in China are:
"Law of the People's Republic of China on environment protection"
"Law of the People's Republic of China on Prevention and Control of Air Pollution"
"Law of the People's Republic of China on Prevention and Control of Water Pollution"
"Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise "
"Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste "
Directive on prohibiting the installation of coal-fired power plants with capacity of 135MW or below, issued by the General Office of the State Council.

The alternatives that are consistent with current laws and regulations are alternatives (a) and (b) are considered feasible baseline scenarios.

<u>Step 2． Investment analysis</u>

In the absence of CDM, the IRR under alternative (a) is less than the benchmark IRR and is therefore considered to be less plausible. The construction of the proposed CDQ project requires a large investment and the annual maintenance cost is high. Further information on the financial analysis and sensitivity analysis is provided below.

Sub-step 2a. Determine appropriate analysis method

According to the *Tool for the demonstration and assessment of additionality*, the project may employ a simple cost analysis, investment comparison analysis, or benchmark analysis.

The CWQ system will be installed along with the CDQ system and serve as a standby equipment to back up the CDQ ovens during repair and maintenance. The project can generate revenue from electricity savings, so the simple cost analysis is not applicable. As there is more than one alternative baseline scenario, option 2 is not applicable. Therefore, the project will undertake a benchmark analysis, identifying the Equity internal rate of return (EIRR) as the indicator to judge whether the proposed project is financially attractive.

Sub-step 2b. Apply benchmark analysis

According to *The economic analysis method and parameters for project construction (version 3)2*, the Equity Internal Rate of Return (EIRR) for an investment project in the iron and steel industry is 13%. As this project will be 100% financed by BISCO's own equity, this benchmark is justified.

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

Table: major parameters of the #3 CDQ unit for financial analysis

Item	Unit	Value	Source
Total investment	1,000,000 RMB	180.28	Feasibility Study
Rated power capacity	kW	15000	Feasibility study
Expected forced outages and de-rating	%	15%	Feasibility Study
Operation & Maintenance Cost	Million RMB	7.48	Feasibility Study
Annual Gross Generation	GWh/yr	105.57	Feasibility study
Annual electricity consumed by auxiliary equipment	GWh/yr	22.22	Feasibility study
Expected annual grid electricity	GWh/yr	105.57-22.22 =83.35	Feasibility study
On-grid power price including tax as of 2006	RMB/kWh	0.3697	Feasibility study

2 Issued by the National Development and Reform Commission and the Ministry of Construction, published by China Planning Publishing House

Extended benefit on coke powder and steel quality	Million RMB	11.88	Feasibility study
Value-added tax rate	%	17	Feasibility study
Urban Construction tax and Education Surcharge (as % of VAT)	%	10	Feasibility Study
Income tax rate	%	33	Feasibility study
Expected price of CERs	$/tCO_2$	13	The project company's estimate
Lifetime of project	yr	20	Feasibility study
Crediting period of emission reductions	yr	10	PDD

1. Main conclusions of the comparison of financial parameter:

In the absence of CER revenue, the project IRR is only 10.6%, significantly lower than the benchmark, making the proposed project financially unattractive. Including the CER revenue, the Equity IRR of this project is higher than the benchmark of EIRR for the iron and steel industry.

Table: Financial indicator comparison: With and Without CER revenue

Item	Unit	Without income from CERs	Benchmark parameter	With income from CERs
Project IRR	%	10.6	13	13.5

Sub-step 2d. Sensitivity analysis

Sensitivity analysis will include the economic impact of the following four parameters:

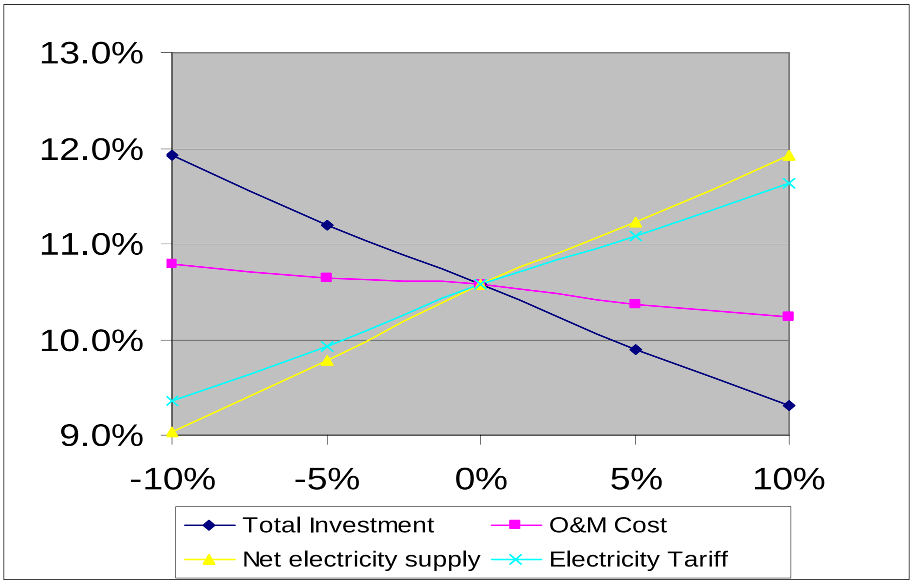
1) Total project investment;
2) O & M cost;
3) Net electricity supply
4) Electricity tariff

When the parameters vary in the range of -10% to +10%, the project IRR (without CER revenue) will change accordingly. Variations in project IRR are shown in the following table.

Changes to project IRR

Change of Sensitivity factor	-10%	-5%	0%	5%	10%
Total Investment	11.9%	11.2%	10.6%	9.9%	9.3%
O&M Cost	10.8%	10.6%	10.6%	10.4%	10.2%

Net electricity supply	9.0%	9.8%	10.6%	11.2%	11.9%
Electricity Tariff	9.4%	9.9%	10.6%	11.1%	11.6%



IRR change curves of the project activity

The above curves show that the IRR is most sensitive to the net electricity supply, while it is least affected by O&M cost. The project IRR is maintained to be less than the benchmark of 13% while the four parameters fluctuate in the range of -10% to +10%. With the general trend of rising raw material price, the actual investment cost is expected to go up. It shows that the electricity tariff has to increase by 25% to make the IRR of total investment equal to the 13% benchmark. However, the level of the on-grid electricity tariff in the feasibility study is regulated by National Development and Reform Committee, which is unlikely to increase so dramatically in the project lifetime taking into account the average grid-connected tariff. The electricity generation from waste heat recovery is subject to many uncertainties such as coking time, temperature and quantity of hot-red coke, and air entering the CDQ boilers and thus can vary considerably. The current projection of electricity generation is based on the assumption that the expected forced outages and de-rating is 15%. The experience commonly accepted in the iron and steel industry is that the expected forced outages and de-rating is between 15% and 25%. At the time this PDD was finalized, the operational record from registered BISCO CDQ #1-2 project indicated that the average available generation capacity is only 10MW, more than 30% lower than the installed capacity of 15 MW. As a result, the projection of electricity generation when the investment decision was made is already a very optimistic estimate and make further improvement of the IRR highly unlikely.

In brief, since the project is not economically attractive without CER revenue, the project owner will not invest in the CDQ systems unless the project is developed under the CDM. This demonstrates one aspect of the project's additionality.

Step 3. Barrier analysis

In addition to the investment barriers analyzed in step 2, the proposed project activity also faces the following significant barriers:

1. Technology risk

CDQ technology has not been widely taken up in China. Projects with relatively large CDQ capacity (100 t/h) started operating only one year ago[3] thus the operating reliability has not been validated. There is no large-scale operating experience in the CDQ sector, which constitutes a significant risk to BISCO investing in the proposed project. In addition, the project activity will adopt five advanced technologies: whirl coking retort, continuous coke extracting, bell style distributing device, feed water pre-heater, and self-circulating boiler, all of which further increase the technological risks.

2. Lack of CDQ expertise and operational experience by BISCO operators

Due to the very brief experience with operating large-scale CDQ projects in China, no experienced operating staff are available to the BISCO. Operators must be extensively trained before gaining competence with the complexity of the large CDQ electromechanical system. No professional training organization is available in China, potentially driving up the preparation and installation expenses in the construction phase and O&M cost in the operating phase.

In summary, when decision of investing on this CDQ is made, the BISCO had no experience and proven successful track record of operating CDQ equipment. With high risk of operating the highly automated CDQ system and special need for extensively trained staff, BISCO faces substantial barriers to implementing this project. Without the CDM incentive, BISCO would most likely continue its current practice of wet quenching the hot coke. The above barriers will not prevent the project entity from importing electricity from the grid continually, which is the alternative (c) identified in B4.

Step 4． Common practice analysis

CDQ technology was first introduced into China in the 1980s. Located in eastern China, the Baosteel Group was the first company to import a whole set of CDQ facilities from Japan in May 1985. After consecutively implementing the imported CDQ system three times, in December 1997 Baosteel Group built 12 sets of CDQ equipment, each with capacity of 75t/h. Baosteel Group is viewed as one of the industry leaders in China in terms of introducing and operating advanced technologies. However, the significant variance of the management capacity of Chinese steel companies indicates that Baosteel Group's successful operation of CDQ with capacity of less than 100 t/h is not representative of the sector situation on penetration of CDQ technology of over 100t/h capacity.

In March 1993, two sets of CDQ facilities (with capacity of 70t/h) were put into production by Ji'nan Iron & Steel Group as a national energy-saving demonstration project. In 2001, Capital Steel Group completed the construction of a CDQ system sponsored by the Japanese Green Aid Plan.

In North China where the proposed project is located, there are altogether 1311 registered iron and steel enterprises[4]. Only two of them, Ji'nan Iron & Steel Group and Capital Steel Group, possessed CDQ facilities as of September 2005. Jigang's CDQ project was supported by the central government as a

3 Wugang coke company No.1 CDQ with capacity of 140t/h was built in 2004.
4 China Steel Yearbook, 2005

national energy saving demonstration project. Capital Steel Group's CDQ project benefited from the Japanese Green Aid Plan.

Unlike the two CDQ cases above, BISCO's CDQ project is not financially supported by either government subsidy or international development assistance, same as the two set of CDQ systems which the BISCO is applying for CDM support. With unattractive financial returns compared with the industry benchmark and faced with overwhelming barriers to implement this project, BISCO needs the critical support from the CDM to improve the project's financial return and to mitigate the risk of implementing this project which its staff has no CDQ operational experience.

With serious concerns of unattractive financial returns and technological barriers, the management team of BISCO decided to pursue support from CDM and subsequently signed a contract with a consulting firm in April 2005 to develop PDD for this project before the project construction started. The document of seeking CDM support and the contract with the consulting firm are available for the DOE's check.

B.6. Emission Reductions:

B.6.1. Explanation of methodological choices:

Project emissions are determined according to Methodology ACM0004:

Project emissions are only applicable if auxiliary fuels are fired for generation startup, or in emergencies to provide additional heat before entering the Waste Heat Recovery Boiler. The steam and coke oven gas are required for CDQ startup.

According to ACM0004, steam and coke oven gas are defined as project emissions, which are given as:

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \qquad (1)$$

Where:

PE_y: Project emissions in year y (tCO_2);

Q_i: Mass or volume unit of fuel *i* consumed (t or m^3);

NCV_i: Net calorific value per mass or volume unit of fuel *i* (TJ/t or m^3);

EF_i: Carbon emissions factor per unit of energy of the fuel *i* (tC/TJ);

$OXID_i$: Oxidation factor of the fuel *i* (%)

Baseline Emissions

Baseline emissions are given as:

$$BE_{electricity,y} = EG_y \times EF_{electricity,y} \qquad (2)$$

Where:

EG_y: Net quantity of electricity supplied to the manufacturing facility by the project during the year *y* (MWh),
$EF_{electricity,y}$ CO_2 baseline emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2/MWh)

When the baseline scenario is import of electricity from the grid, Emission factors of electricity displacing the electricity from the North China Power Grid should be calculated as per the consolidated baseline methodology ACM0002. The baseline emission factors of the operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) are determined *ex ante*, and the emission factors are fixed during crediting periods.

The baseline emission factor ($EF_{grid,y}$) is calculated as a combined margin (CM), consisting of the equally weighted average of the operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$):

Step 1：calculate the operating margin emission factor *（$EF_{OM,y}$） based on one of the four following methods:*

(a) Simple OM

The simple OM method can only be used where low-cost/must run resources constitute less than 50% of total amount of grid generating output.

(b) Simple Adjusted OM

The simple adjusted OM is a variation of method (a) and can be used where low-cost/must-run power plants are not included in the baseline. It requires data that is prohibitively difficult to obtain in China.

(c) Dispatch Data Analysis OM.

(d) Average OM.

According to Methodology ACM0002, dispatch data analysis (c) should be the first methodological choice if grid dispatching data are available. However, detailed dispatching data of the Chinese power grid is considered confidential information in China and it is publicly unavailable. Method (c) cannot be applied to calculate $EF_{OM,y}$.

From 2001 to 2005, the proportions of electricity generated by low-cost/must run resources in the total output of the North China Power Grid are0.85% in 2001, 0.90% in 2002, 0.87% in 2003, 1.06% in 2004 and 0.75% in 2005[5], respectively, which are all far below 50%. Method (d), which can only be used where low-cost/must run resources constitute over 50% of total grid generation and data to apply option (b) is not available, is not applicable. Method (a), "Simple OM," is the appropriate method to calculate the operation margin emission factor (EFOM，y) of the project.

According to the simple OM method, the operation margin emission factor is calculated using the following formula:

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5 China Electric Power Yearbook, 2001-2005

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (4)$$

Where:

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

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

$COEF_{i,j}$ 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 power sources j and the percent oxidation of the fuel in year(s) y; and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*, i.e. electricity supply;

And $COEF_{i,j}$ can be obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (5)$$

Where:

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

$OXID_i$ is the oxidation factor of the fuel, (%)

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.（tCO_2/GJ）。

As the specific value of $OXID_i$ is not available for the plants connected to the North China Power Grid, the project adopts the IPCC default values, solid fuel as 98%, liquid fuel as 99%, and gas fuel as 99.5%. The NCV_i value is from China Energy Statistical Yearbook[6], and the $EF_{CO2,i}$ is the IPCC default value.

The Operating Margin Emission Factor could calculated according to the publicly available data of the North China Power Grid in 2003~2005.

The OM emission factor is 1. 12025tCO_2/MWh.

Step 2 Calculate the Build Margin Emission Factor（$EF_{BM,y}$）

There are two options to calculate $\boldsymbol{EF_{BM,y}}$:

Option 1. Calculate the Build Margin emission factor $\boldsymbol{EF_{BM,y}}$ ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission. The sample group m consists of either:

- ✧ the five power plants that have been built most recently, or
- ✧ the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

6 China Energy Statistical Yearbook, [YEAR2005], page 365

Project participants should use from these two options the sample group that comprises the larger annual generation.

Option 2. For the first crediting period, the Build Margin emission factor (***$EF_{BM,y}$***) must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, ***$EF_{BM,y}$*** should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consists of either:

✧ the five power plants that have been built most recently, or

✧ the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently,

Project participants should use the sample group that comprises the larger annual generation.

For this project, option 1 is used. The $EF_{BM,y}$ can be obtained using the following formula:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (7)$$

Where:

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

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

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

The project chooses the EF_{BM} value released by Chinese DNA, which is determined *ex ante* and is fixed during the crediting period.

The BM emission factor is 0.9397 tCO_2/MWh.

Step 3 Calculate the Baseline Emission Factor（$EF_{grid,y}$）

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

$$EF_{grid,y} = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \qquad (8)$$

Where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$).

The baseline emission factor is 1.0300 tCO_2/MWh.

Leakage

No leakage is considered, according to ACM0004

Emission Reduction

The emission reduction ER_y by the project activity during a given year *y* is the difference between the baseline emissions though substitution of electricity generation with fossil fuels ($BE_{electricity,y}$) and project emissions (PE_y), as follows:

$$ER_y = BE_{electricity,y} - PE_y \quad (9)$$

Where:

ERy , is the emissions reductions of the project activity during the year *y* (tCO_2);

$BE_{electricity,y}$ is the baseline emissions due to displacement of electricity during the year *y* (tCO_2);

PEy are the project emissions during the year *y* (tCO_2);

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

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin Emission Factor
Source of data used:	*The affiche regarding determining the emission factors of China's regional power grids,* released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee, update on August 9 2007
Value applied:	1. 12025
Justification of the choice of data or description of measurement methods and procedures actually applied :	Released by the government
Any comment:	

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Margin Emission Factor
Source of data used:	*The affiche regarding determining the emission factors of China's regional power grids,* released by Office of National Coordination Committee on Climate Change, National Development and Reform Committee, update on August 9 2007
Value applied:	0.9397
Justification of the choice of data or description of measurement methods and procedures actually applied :	Released by the government
Any comment:	

Data / Parameter:	$OXID_{coke\ oven\ gas}$
Data unit:	%
Description:	Oxidation factor of coke oven gas
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter1, Page 1.23, Table 1.4
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	$OXID_{BF\ gas}$
Data unit:	%
Description:	Oxidation factor of blast furnace gas
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter1, Page 1.23, Table 1.4
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	η_{boiler}
Data unit:	%
Description:	The minimum heat efficiency of the boiler
Source of data used:	The National Standard for Boiler Efficiency (GB-T17954) published by National Standardization Bureau
Value applied:	70
Justification of the choice of data or description of measurement methods and procedures actually applied :	The National Standard for Boiler Efficiency (GB-T17954) stipulated that fossil fuel-burning boiler with capacity of over 2.8MW has minimum heat efficiency of 70% (GB-T17954 National Standard for Boiler Efficiency. Table 1, minimum thermal efficiency of boilers). BISCO's boilers have capacity of 130t/hour and 90MWe. 70% is very conservative estimate of the actual boiler efficiency. According to the national standard, the boiler

	efficiency should be at least 83%. The boiler efficiency is measured periodically by the Energy Measure and Test Centre of BISCO, which is authorized by Inner –Mongolia Autonomous Region Quality Technology Supervise Bureau.
Any comment:	

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

I. Calculate the project emissions (PE_y)

The project emissions could result from using steam and burning coke oven gas to dry CDQ oven However, after the CDQ system start up, whether the drying process is required each time after annual maintenance depends on the temperature of the CDQ oven. Heating the CDQ oven is not necessarily required if the temperature of the CDQ oven is very high. However, the ex-ante calculation assumes heating of CDQ oven takes place after regular maintenance of the CDQ system for conservative purpose. The ex-post monitoring will be based on the actual maintenance situation each year.

Step 1. Calculate the project emissions from the steam used for CDQ startup:

The steam used for CDQ drying is under the pressure of 0.78MPa, saturated temperature (about 175℃), with a flow 8t/h, for 8 consecutive days. Thus the total steam amount for CDQ is about 1,536t. The amount of emission generated from using steam for CDQ startup depends on the enthalpy of steam. The enthalpy of steam under 0.78MPa and saturated temperature is 2,768 kJ/kg, so the total enthalpy lead by steam is : 1,536t× 2,768 kJ/kg /1000 = 4,251.65 GJ.

In the power plant, coal, blast furnace gas and coke oven gas are the fuel sources. In order to make the most conservative calculation in ER, blast furnace gas is assumed to be the only fuel source for steam production after comparing the CO_2 emission factors of different fuel type indicated by the 2006 IPCC.

	Coal	BF gas	Coke oven gas
Effective CO_2 emission factor/Default value(kg/TJ)	94600	260000	44400

So the project emission from the steam can be estimated as following table,

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times OXID_i$$

Energy of steam for CDQ startup (GJ)	1,536t×2,768kJ/kg/1000 =4,251.65
η_{boiler}	70%
Energyof Blast Furnace gas to produce the steam (GJ)	4,251.65 /70%=4886.95
$EF_{BF\ gas}$(kg/TJ)	260,000

$OXID_{BF\ gas}$ (%)	100
CO_2 emission (tCO_2)	4886.95×260,000×100%/1000000=1270.6

So the project emission from the steam used for CDQ startup is 1270.6 tCO_2.

Step 2. Calculate the project emissions from the coke oven gas used for CDQ startup:

The flow of the coke oven gas used for drying the CDQ oven for 8 consecutive days is estimated to be 600~2000m^3/h. Thus the total gas amount for CDQ oven is: 2000×24×8＝384,000m^3. This is conservative.

Let i=coke gas , $Q_{coke\ gas}$=384,000 m^3

So,

$$PE_{cokegas} = \sum_i Q_{cokegas} \times NCV_{cokegas} \times EF_{cokegas} \times OXID_{cokegas}$$

＝384,000 m^3×17590MJ/ m^3×44,400 tC/TJ×100%

＝299.9 tCO_2

Step3. Calculate the project emissions (PEy)

$PE_y = PE_{steam,y} + PE_{coke\ gas,y}$

＝1270.6 +299.9

= 1,570.5 tCO_2

Please note the steam consumption is only an estimate. The actual consumption of the steam and the coke oven gas utilized in the drying process will be monitored according to the monitoring plan.

II. Calculate the baseline emission BE_y

The baseline emission calculation consists of two parts, the first is the emission from the electricity imported from the North China Power Grid that will be displaced by the electricity generated by CDQ project. The second is the baseline emission associated with CWQ system displaced by the proposed project. For this project, only the first part is included so as to simplify the baseline emission calculation. This is conservative.

Step 1 Determine the emission factor of the North China Grid ($EF_{grid,y}$)

According to the document, *The affiche regarding determining the emission factor of China's regional power grids,* issued by the National Development and Reform Commission, the emission factor of the North China Power Grid is:

$EF_{OM,y}$=1. 12025 tCO_2/MWh;

$EF_{BM,y}$ =0.9397 tCO_2/MWh.

For the project, the weights w_{OM} and w_{BM}, by default, are 50%, with the values of $EF_{OM,y}$ and $EF_{BM,y}$ derived from the above steps. The $EF_{grid,y}$ can be given as:

$EF_{grid,y} = EF_{OM,y}/2 + EF_{BM,y}/2$ = 1.0300tCO_2/MWh。

Step24 Calculate the baseline emission BE_y

BE_y=83.35 × 10^3MWh×1.0300 tCO_2/MWh=85,848.4 tCO_2e

III. Leakage

According to ACM0004, no leakage is considered, i.e. L_y= 0 tCO_2.

IV. Emission Reduction

The emissions reductions of the project activity is:

$ER_y=BE_y-PE_y-L_y$= 85,848.4 tCO_2-1,570.5 tCO_2 = 84,278 tCO_2.

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008 (Mar-	1,570.50	64,386.31	0	62,816
2009	1,570.50	85,848.42	0	84,278
2010	1,570.50	85,848.40	0	84,278
2011	1,570.50	85,848.40	0	84,278
2012	1,570.50	85,848.40	0	84,278
2013	1,570.50	85,848.40	0	84,278
2014	1,570.50	85,848.40	0	84,278
2015	1,570.50	85,848.40	0	84,278
2016	1,570.50	85,848.40	0	84,278
2017	1,570.50	85,848.40	0	84,278
2018 (Jan-Mar)	0.00	21,462.10		21,462
Total (tonnes of CO_2e)	15,705	858,484	0	842,779

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

B.7.1. Data and parameters monitored:

Data / Parameter:	$EF_{coke\ oven\ gas}$
Data unit:	kg/TJ
Description:	Carbon emissions factor per unit of energy of coke oven gas
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume

	2 Energy, Chapter1, Page 1.23, Table 1.4
Value of data applied for the purpose of calculating expected emission reductions in section B.5	44,400
Description of measurement methods and procedures to be applied:	The data will be updated according to the IPCC.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	Calorific Value of coke oven gas
Data unit:	MJ/m^3
Description:	Net calorific value per standardized m^3 of coke oven gas
Source of data used:	Feasibility study report
Value of data applied for the purpose of calculating expected emission reductions in section B.5	17590
Description of measurement methods and procedures to be applied:	Project specific value, changing in a very narrow range. It could be considered as a fixed conservative value.
QA/QC procedures to be applied:	The data will be updated according to published China Energy Yearbook annually.
Any comment:	

Data / Parameter:	E
Data unit:	GWh/yr
Description:	The net electricity supplied by the proposed project
Source of data to be used:	Monitored by the project owner
Value of data applied for the purpose of calculating expected emission reductions in section B.5	83.35
Description of measurement methods and procedures to be applied:	Use one ammeter; personnel are responsible for periodic adjustment of the ammeter.
QA/QC procedures to be applied:	The ammeter is periodically adjusted by a qualified service company to ensure that it meets the national standard.
Any comment:	

Data / Parameter:	G
Data unit:	m^3/yr

Description:	The amount of coke oven gas for starting up the #3 CDQ
Source of data to be used:	An estimate value, the actual consumption will be monitored according to the monitoring plan, G1
Value of data applied for the purpose of calculating expected emission reductions in section B.5	384,000 m^3/yr
Description of measurement methods and procedures to be applied:	Use flow meters G1; there are personnel responsible for making periodic adjustments as needed.
QA/QC procedures to be applied:	The flow meter is periodically adjusted by a qualified monitoring service to ensure precision that meets the national standard.
Any comment:	

Data / Parameter:	S
Data unit:	t/yr
Description:	The amount of steam for starting up the #3 CDQ
Source of data to be used:	Monitored by the project owner during the startup,S1
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	1,536t/yr
Description of measurement methods and procedures to be applied:	Use flow meters; there are personnel responsible for making periodic adjustments as needed.
QA/QC procedures to be applied:	The flow meter is periodically adjusted by a qualified monitoring service to ensure precision that meets the national standard.
Any comment:	

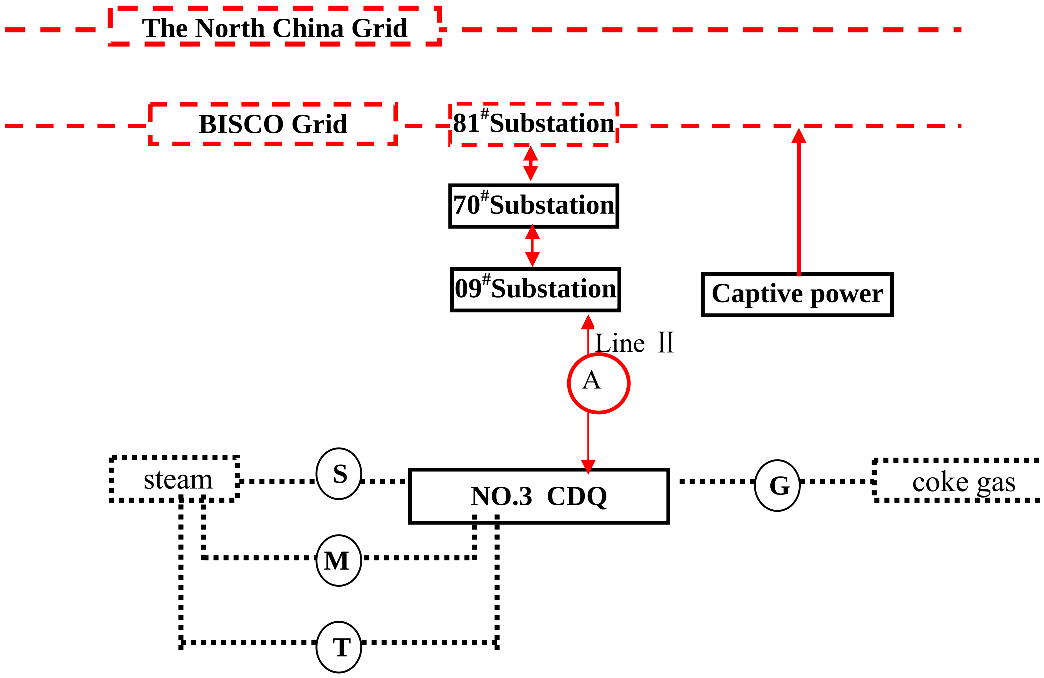
Data / Parameter:	Ir
Data unit:	kJ/kg
Description:	Enthalpy of the steam at 0.78MPa, saturated temperature (about 175℃)
Source of data used:	Pyrology manual
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	2,768
Description of measurement methods and procedures to be applied:	The steam pressure and temperature will be monitored by the project owner. Accuracy level of steam meter is 0.5
QA/QC procedures to be applied:	The thermometer and manometer are periodically adjusted by a qualified monitoring service provider to ensure precision that meets the national standard.
Any comment:	

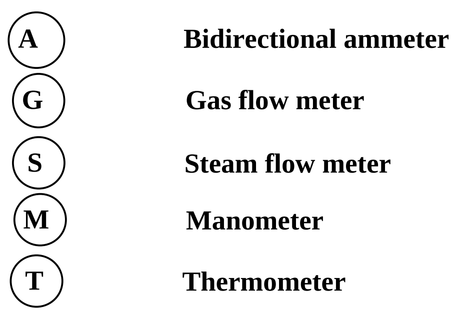
The details about monitoring plan please refer to Annex 4.

B.7.2. Description of the monitoring plan:

1 General project activity and monitoring Information
The monitoring plan is carried out by the Production Department of BISCO. Those in charge of monitoring quality must be satisfied.

To calculate the emission reductions, the project owner will monitor the amount of steam and coke oven gas consumed, as well as the electricity generated and consumed by the #3 CDQ. The steam and coke oven gas are needed to start the CDQ process. The data of consumed steam and coke oven gas could be monitored by installing flow meters on the steam and gas pipes. The electricity generated and consumed by the #3 CDQ could be monitored by installing ammeters in the transformer substation. The monitoring work will be carried out by the Energy Measure and Test Centre of BISCO , which is authorized by Inner –Mongolia Autonomous Region Quality Technology Supervise Bureau. Please refer to the following.





2 Key monitoring activities

The electricity consumed by CDQ is partly provided by Line I. Line И not only provides power to CDQ, but also export the power generated by CDQ to transformer substation and then transmitted to the BISCO Grid. In order to measure the power generated and consumed by CDQ, a bidirectional ammeter will be installed on Line И(ammeter A) to measure electricity consumed and generated by CDQ.

So, the monitoring plan design is based on the approved methodology ACM0004. The project owner, BISCO Group, must carefully implement the monitoring plan throughout the crediting period in order to obtain the certified emission reductions.

Key data of CDQ used in the monitoring plan are:

- ✧ The amount of steam for CDQ startup, ***S***;
- ✧ The pressure of steam for CDQ startup, ***M;***
- ✧ The temperature of steam for CDQ startup, ***T;***
- ✧ The amount of coke oven gas for CDQ startup, ***G***;

- ✧ Net electricity supply of the CDQ system, ***E***;

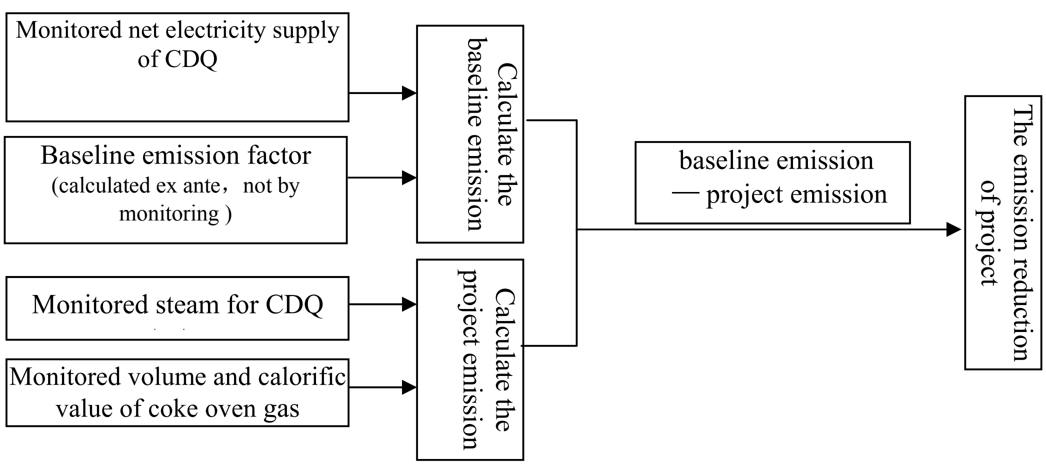
3 Quality assurance and quality control measures
The flow meters measuring the steam and coke oven gas will be read by BISCO Gas-Supply Plant, and the electricity ammeter is read by the Power Supply Plant.

The precision of all the meters used in the monitoring activity meet the national standard, and the accuracy level of the coke oven gas flow meter is 0.2, and the accuracy level of electricity ammeter is 0.5. Reading and cross-checking of the meters should follow the relevant national rules and standards to ensure data accuracy.

All meters need to be checked periodically. The flow meters measuring the steam and coke oven gas must be checked once every year, and the ammeters measuring the electricity consumed and generated by CDQ must be checked once every year. BISCO's Measuring Department is responsible for the meters cross-checking . The Measuring Department is authorized by Inner Mongolia Autonomous Region Quality Technology Supervise Bureau.

4 Calculation of GHG emission reductions
The proposed project activity will recover waste heat from the CDQ process to generate electricity, which will be used to displace electricity purchased from the North China Power Grid. In this way the project will reduce GHG emissions from grid-connected, coal-fired power plants.

The following figure shows the steps in calculating the emission reductions:



5 Saving monitoring data

Among the monitoring data, E1, E2', E2'' will be recorded by the Power Supply Plant of BISCO, and S, G, will be recorded by the Gas Supply Plant of BISCO. A paper copy of the data shall be filed as well.

The data will be made available for verification purposes on annual basis and as well as required by the CDM EB.

The monitoring data shall be saved for two years after the end of the crediting period or the last issuance of certified emission reductions.

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 methodology application: 20 December, 2007

Responsible entity:

Carbon Finance Unit
The World Bank
1818 H. Street, NW
Washington, DC 20433
USA
Email: IBRD-carbonfinance@worldbank.org

CERI eco Technology Co., Ltd
Tel: 8610-83587698
Fax: 8610-63520875
E-mail: wangyongmin@ceri.com.cn

CERI eco Technology Co., LTD is not project participant.

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:

The construction of the proposed project started from 01/03/2007.

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

20 years

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

Not applicable

C.2.1. Renewable crediting period

Not applicable

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

10 years

C.2.2.1. Starting date:

05/05/2008 or the date of registration whichever come later.

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

The project activity consists of the construction of one CDQ facility. The EIA has been approved by the Environmental Protection Agency in Baotou City and the Environmental Protection Agency in Inner Mongolia Autonomous Region. The project is under the BISCO's environmental management/improvement program, which will achieve significant environmental benefits.

1) Waste gas: in order to prevent air pollution (mainly dust) caused by the CDQ project, the project company will install dust-catching equipment at the following places: the loading inlet of the CDQ stove, the red-hot coke transmission network, the coke discharging system of the CDQ stove, the coke dropping point and transition point of the conveyer belt, the gas discharging outlet, gas circulating decompression outlet and dust loading place, etc. By these measures, emissions of dust and other harmful particles will be significantly reduced compared with the amount emitted from CWQ, which greatly improves the local air quality. Key data are listed in the following table.

Comparison of air pollution from CDQ and CWQ [7] (mg/m^3)

Equipment	hydroxybenzene	cyanide	sulfide	ammonia	Coke dust	CO
CWQ	33	4.2	7.0	14.0	13.4	21.0
CDQ	--	--	--	--	7.0	22.3

2)Waste water: Compared to CWQ, this project with CDQ will reduce water usage by 0.5t/t-coke. The CDQ purified circulating water system is composed of a water circulating system for electricity generation and a circulating system for the CDQ main body. The water can be reused continuously if supplemented with more water, if it does not become polluted.

7 ***The actuality and expectation of the CDQ technology in China and abroad, Metal Management,*** **Wangsiwei，May 2006，pages 46-49**

3)Solid waste: a spatula-transporter and lift equipment are adopted as part of the project activity. Dust caught by the CDQ dust-catcher will be transported to a dust storage tank, ready for further utilization.

4)Noise from the project activity is within the range permitted by the national standard, and no contamination of soils occurs.

The CDQ project is regarded as an Integrated Resource Utilization project with substantial environmental benefits. The project's emissions meet national emission standards. Thus, it can be seen that the CDQ system will significantly improve the environmental quality in the area around the project activity.

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:

As stated in the D.1., the project is regarded as an Integrated Resource Utilization project with substantial environmental benefits. The project's emissions meet national emission standards. The approval document is available to support the conclusion above.

SECTION E. Stakeholders' comments

>>

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

The proposed project is located within the BISCO plant. As an environmental improvement project with significant pollution reduction benefit, it has little impact on residents outside of the plant area. To determine public attitude towards the proposed project, the project entity announced the project news on BISCO's website for ten days, then distributed questionnaires soliciting public input in November 2006. The questionnaire gives a brief introduction of the proposed project, its environmental impacts, and ways to alleviate the impacts. The content of the questionnaire is shown below:

<table>
<tr><td>Name</td><td></td><td>Gender</td><td>□male □female</td><td rowspan="3">Age</td><td>□18~30 years old</td></tr>
<tr><td>Occupation</td><td colspan="3">□Farmer □Worker □Businessman □Teacher □Official □Others</td><td>□31~55 years old</td></tr>
<tr><td>Educational level</td><td colspan="3">□ Primary school
□ Junior/high school
□ Bachelor's degree or above</td><td>□above 56 years old</td></tr>
<tr><td colspan="6">(The brief of the proposed project introduction is omitted)
Attention For the purpose of environmental protection, the project should carry out public consultation in accordance with relevant national laws. Please mark the item with which you agree, and thank you for your opinion and advice.</td></tr>
<tr><td colspan="6">1 What do you think of the local environment？
□Satisfying □Comparatively satisfying □Dissatisfying □Very dissatisfying</td></tr>
</table>

2 By what means have you heard about the proposed project? □Newspaper □TV/broadcast □Internet □Friends
3 Do you know about the CDQ and TRT technology? □Yes □No
4 What do you think of the main pollution from the CWQ system? (more than one may be chosen) □Waste gas □Waste water □Noise □Solid waste
5 What do you think about the pollution from the CWQ? □Heavy □Average □Light
6 How much do you think the CDQ will improve the local environment? □Greatly improve □Modestly improve □ Can not improve
7 In what aspects do you think the CDQ will improve the local environment? □Waste gas □Waste water □Noise □Solid waste
8 What do you think of the main pollution from the existing TRT of the BF? (more than one may be chosen) □Waste gas □Waste water □Noise □Solid waste
9 What do you think about regarding the environmental impacts from TRT reconstruction? □Impacts during construction □Impacts during operation □Impacts will be few
10 In what aspects do you think the dry-type TRT will improve the local environment? (more than one may be chosen) □Waste gas □Waste water □Noise □Solid waste
11 To whom will you report when encountering environmental problems? □Environment Protect Agency □Government. □Residential committee □BISCO Group
12 Do you support the proposed project? □Yes □No
If you have any other advice or requirement for environmental protection, please explain here: ____

The majority of survey respondents are local residents and enterprises near the BISCO Group. The questionnaire was distributed randomly to respondents in different organizations and of different ages. It was carried out as an on-site paper interview. At the same time, public comments not included as written responses to the questionnaire were carefully recorded.

E.2. Summary of the comments received:

Comments from the questionnaire are summarized up by CERI eco Technology Co., LTD.
In total, 21 copies of the questionnaire were collected with a return rate of 100% . The structure of the respondents is illustrated in the following table.

Table of the profile of the respondents (%)								
	Gender		Age			Level of Education		
	male	female	18-30 years old	31-55 years old	Above 56 years old	Primary school	Middle school	Junior college or above
Number	12	9	2	17	2	1	7	13
%	57	43	10	80	10	5	33	62

The contents from the questionnaire are summarized as follows:

No.	Content	Alternatives	Amount	Share
1	What do you think of the local environment?	Satisfying	2	9.5
		Comparatively satisfying	6	28.6
		Dissatisfied	9	42.9
		Very dissatisfied	4	19.0
2	By what means have you heard about the proposed project	Newspaper	4	19.0
		TV or broadcast	1	4.8
		Internet	7	33.3
		Friends	9	42.9
3	Do you know about the CDQ and TRT technology?	Yes	12	57.1
		No	9	42.9
4	What do you think of the main pollution from the CWQ system?	Waste gas	21	100
		Waste water	19	90.5
		Noise	9	42.9
		Solid waste	9	42.9
5	What do you think of the pollution from the CWQ system?	Heavy	19	90.5
		Average	2	9.5

		Light	0	0
6	How much do you think the CDQ will improve the local environment?	Greatly improve	5	23.8
		Modestly improve	16	76.2
		Can not improve	0	0
7	In what aspects do you think the CDQ will improve the local environment?	Waste gas	21	100
		Waste water	21	100
		Noise	9	42.9
		Solid waste	6	28.6
11	To whom will you report to when encountering environmental problems	Environmental Protect Agency	6	28.6
		Government	7	33.3
		Residential committee	0	0
		BISCO Group	8	38.1
12	Do you support the proposed project?	Yes	21	100
		No	0	0

The questions 8-10 were designed for the public consultation for the BISCO's another energy efficiency project (dry-type TRT technology) that is also in the process of applying for CDM status, its statistics is not relevant to this CDQ project and will be compiled and analyzed separately.

The results show that 13 out of 21 respondents (accounting for 61.9%) are not satisfied with the current local environmental situation, among which 4 people consider it very bad; 19 out of 21 respondents (accounting for 90.5%) consider that the environmental impacts from the CWQ are heavy; all respondents consider that the CDQ project can improve the local environment, of which 5 people (accounting for 23.8%) think the improvement will be great; all of the respondents support the proposed project.

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

All survey respondents, the Environmental Protection Agency of Baotou City, and a nearby school and hospital support the CDQ project. No modification of the project is needed. At the same time, the project owner is happy about the survey results indicating that 8 respondents (38.1%) would directly report pollution problems to BISCO group and say BISCO values stakeholders' opinions. Meanwhile, BISCO will strictly implement measures required by the EIA so as to achieve the project's environmental, social and economic benefits.

In addition, the project company will maintain regular communication with the stakeholders during the construction and operating periods.

Annex 1

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<u>**Annex 2**</u>

INFORMATION REGARDING PUBLIC FUNDING

The proposed project receives no public funding from Annex 1 countries. The funding is from the Danish Carbon Fund, operated by the World Bank. It is a special fund established by Danish Government to purchase emission reductions. The Fund and its projects do not result in a diversion of official development assistance.

Annex 3

BASELINE INFORMATION

1. OM calculation

Table A3-1 Electricity Generation from Fossil Fuels of North China Grid in 2001

Province	Total Electricity Generation （MWh)	Electricity Generation from Fossil Fuels （MWh)	Fossil Fuels Stations Service Power Consumption Rate （%）	Electricity Supply from Fossil Fuels （MWh)
Beijing	17665000	17391000	8.18	15968416
Tianjin	22175000	22166000	7.72	20454785
Hebei	93194000	92865000	6.85	86503748
Shanxi	71100000	69419000	8.16	63754410
Inner Mongolia	46550000	45821000	8.18	42072842
Shandong	110435000	110404000	6.67	103068986
Total	361119000	358066000		331823187

Data source：China Electric Power Yearbook 2002

Table A3-2 Electricity Generation from Fossil Fuels of North China Grid in 2002

Province	Total Electricity Generation （MWh)	Electricity Generation from Fossil Fuels （MWh)	Fossil Fuels Stations Service Power Consumption Rate （%）	Electricity Supply from Fossil Fuels （MWh)
Beijing	18352000	17886000	7.95	16464063
Tianjin	27275000	27263000	7.08	25332780
Hebei	101416000	100970000	6.72	94184816
Shanxi	84134000	82256000	7.98	75691971
Inner Mongolia	52191000	51382000	7.93	47307407
Shandong	124177000	124162000	6.79	115731400

Total	407545000	403919000		374712437

Data source：China Electric Power Yearbook 2003.

Table A3-3 Electricity Generation from Fossil Fuels of North China Grid in 2003

Province	Total Electricity Generation （MWh)	Electricity Generation from Fossil Fuels （MWh)	Fossil Fuels Stations Service Power Consumption Rate （%）	Electricity Supply from Fossil Fuels （MWh)
Beijing	19287000	18608000	7.52	17208678
Tianjin	32200000	32191000	6.79	30005231
Hebei	108802000	108261000	6.5	101224035
Shanxi	95852000	93962000	7.69	86736322
Inner Mongolia	65947000	65106000	7.66	60118880
Shandong	139565000	139500047	6.79	130071759
Total	461653000	457628047		425364906

Data source：China Electric Power Yearbook 2004

Table A3-4 Electricity Generation from Fossil Fuels of North China Grid in 2004

Province	Total Electricity Generation （MWh)	Electricity Generation from Fossil Fuels （MWh)	Fossil Fuels Stations Service Power Consumption Rate （%）	Electricity Supply from Fossil Fuels （MWh)
Beijing	20549000	18579000	7.94	17103827
Tianjin	33952000	33952000	6.35	31796048
Hebei	125535000	124970000	6.5	116846950
Shanxi	106948000	104926000	7.7	96846698
Inner Mongolia	81794000	80778000	7.17	74660384

Shandong	163997000	163918000	7.32	151919202
Total	532775000	527123000		489173110

Data source：China Electric Power Yearbook 2005

Table A3-5 Electricity Generation from Fossil Fuels of North China Grid in 2005

Province	**Total Electricity Generation** **（MWh)**	**Electricity Generation from Fossil Fuels** **（MWh)**	**Fossil Fuels Stations Service Power Consumption Rate** **（%）**	**Electricity Supply from Fossil Fuels** **（MWh)**
Beijing	21481000	20880000	7.73	19,265,976
Tianjin	37000000	36993000	6.63	34,540,364
Hebei	134683000	134348000	6.57	125,521,336
Shanxi	130935000	128785000	7.42	119,229,153
Inner Mongolia	93683000	92345000	7.01	85,871,616
Shandong	190000000	189880000	7.14	176,322,568
Total	607782000	603231000		560,751,013

Data source：China Electric Power Yearbook 2006

Table A3-6 Calculation of simple OM emission factor of North China Grid in 2003

		Beijing	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	**A**	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	K=G*H*J*I*44/12/10000(mass unit) K=G*H*J*I*44/12/1000(volume unit)
Raw coal	10000 t	714.73	1052.74	5482.64	4528.5	3949.3	6808	**22535.94**	25.8	100	20908	445737636.11
Cleaned coal	10000 t						9.41	**9.41**	25.8	100	26344	234510.60
Other washed coal	10000 t	6.31		67.28	208.21		450.9	**732.7**	25.8	100	8363	5796681.31
Coke	10000 t					2.8		**2.8**	29.2	100	28435	85244.34
Coke oven gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	**3.08**	12.1	100	16726	228559.67
Other gas	10^8m^3	16.92		10.63		10.32	1.56	**39.43**	12.1	100	5227	914399.71
Crude oil	10000 t						29.68	**29.68**	20	100	41816	910139.18
Gasoline	10000 t						0.01	**0.01**	18.9	100	43070	298.48
Diesel oil	10000 t	0.29	1.35	4		2.91	5.4	**13.95**	20.2	100	42652	440693.26
Fuel oil	10000 t	13.95	0.02	1.11		0.65	10.07	**25.8**	21.1	100	41816	834672.45
LPG	10000 t							**0**	17.2	100	50179	0.00
Refinery gas	10000 t			0.27			0.83	**1.1**	15.7	100	46055	29163.56
Natural gas	10^8m^3		0.5				1.08	**1.58**	15.3	100	38931	345076.60
Other petroleum products	10000 t							**0**	20	100	38369	0.00
Other coking products	10000 t							**0**	25.8	100	28435	0.00
Other energy	10000 tce	9.83					39.21	**49.04**	0	100	0	0.00
											Total	455557075.27

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories. China Energy Statistical Yearbook 2004.

Table A3-7 Calculation of simple OM emission factor of North China Grid in 2004

		Beijing	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	**A**	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	K=G*H*J*I*44/12/10000(mass unit) K=G*H*J*I*44/12/1000(volume unit)
Raw coal	10000 t	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	100	20908	538547476.6
Cleaned coal	10000 t						40	**40**	25.8	100	26344	996856.96
Other washed coal	10000 t	6.48		101.04	354.17		284.22	**745.91**	25.8	100	8363	5901190.882
Coke	10000 t					0.22		**0.22**	29.2	100	28435	6697.769467
Coke oven gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	100	16726	1153187.451
Other gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	100	5227	1578574.385
Crude oil	10000 t							**0**	20	100	41816	0
Gasoline	10000 t								18.9	100	43070	0
Diesel oil	10000 t	0.39	0.84	4.66				**5.89**	20.2	100	42652	186070.4874
Fuel oil	10000 t	14.66		0.16				**14.82**	21.1	100	41816	479451.3838
LPG	10000 t							**0**	17.2	100	50179	0
Refinery gas	10000 t		0.55	1.42				**1.97**	15.7	100	46055	52229.28682
Natural gas	10^8m^3		0.37		0.19			**0.56**	15.3	100	38931	122305.6296
Other petroleum products	10000 t							**0**	20	100	38369	0
Other coking products	10000 t							**0**	25.8	100	28435	0
Other energy	10000 tce	9.41		34.64	109.73	4.48		**158.26**	0	100	0	0
											Total	549024040.8

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories. China Energy Statistical Yearbook 2005.

Table A3-8 Calculation of simple OM emission factor of North China Grid in 2005

		Beijing	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Fuel	Unit	**A**	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	K=G*H*J*I*44/12/10000(mass unit) K=G*H*J*I*44/12/1000(volume unit)
Raw coal	10000 t	897.75	1675.2	6726.5	6176.5	6277.2	10405.4	**32158.53**	25.8	100	20908	636062535.8
Cleaned coal	10000 t						42.18	**42.18**	25.8	100	26344	1051185.664
Other washed coal	10000 t	6.57		167.45	373.65		108.69	**656.36**	25.8	100	8363	5192725.191
Coke	10000 t					0.21	0.11	**0.32**	29.2	100	28435	9742.210133
Coke oven gas	$10^8 m^3$	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	100	16726	1742396.483
Other gas	$10^8 m^3$	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	100	5227	2111027.27
Crude oil	10000 t					0.73		**0.73**	20	100	41816	22385.49867
Gasoline	10000 t			0.01				**0.01**	18.9	100	43070	298.4751
Diesel oil	10000 t	0.48		3.54		0.12		**4.14**	20.2	100	42652	130786.3867
Fuel oil	10000 t	12.25		0.23		0.06		**12.54**	21.1	100	41816	405689.6325
LPG	10000 t							**0**	17.2	100	50179	0
Refinery gas	10000 t			9.02				**9.02**	15.7	100	46055	239141.2016
Natural gas	$10^8 m^3$	0.28	0.08		2.76			**3.12**	15.3	100	38931	681417.0792
Other petroleum products	10000 t							**0**	20	100	38369	0
Other coking products	10000 t							**0**	25.8	100	28435	0
Other energy	10000 tce	8.58		32.35	69.31	7.27	118.9	**236.41**	0	100	0	0
											Total	647649330.9

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories; China Energy Statistical Yearbook 2006

Table A3-9 Calculation of simple OM emission factor of Northeast China Grid in 2003

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
		A	B	C	**D=A+B+C**	**E**	**F**	**G**	H=D*E*F*G* 44/12/10000(mass unit) H=D*E*F*G* 44/12/1000(volume unit)
Raw coal	10000 t	3556.51	2006.66	2763.62	**8326.79**	25.8	100	20908	164695313
Cleaned coal	10000 t	70.83		3	**73.83**	25.8	100	26344	1839948.734
Other washed coal	10000 t	617.04	15.9	53.41	**686.35**	25.8	100	8363	5429988.017
Coke	10000 t				**0**	29.2	100	28435	0
Coke oven gas	10^8m^3	1.66			**1.66**	12.1	100	16726	123184.7599
Other gas	10^8m^3	5.31			**5.31**	12.1	100	5227	123141.3249
Crude oil	10000 t	3.39			**3.39**	20	100	41816	103954.576
Gasoline	10000 t					18.9	100	43070	0
Diesel oil	10000 t	0.32	0.34		**0.66**	20.2	100	42652	20850.00368
Fuel oil	10000 t	14.87	0.7	4.32	**19.89**	21.1	100	41816	643474.2257
LPG	10000 t	1.55			**1.55**	17.2	100	50179	49051.64513
Refinery gas	10000 t	4.03		0.46	**4.49**	15.7	100	46055	119040.3542
Natural gas	10^8m^3		0.04	4.47	**4.51**	15.3	100	38931	984997.1241
Other petroleum products	10000 t				**0**	20	100	38369	0
Other coking products	10000 t				**0**	25.8	100	28435	0
Other energy	10000 tce	29.38			**29.38**	0	100	0	0
Total									174132943.7

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories. China Energy Statistical Yearbook 2004.

Table A3-10 Calculation of simple OM emission factor of Northeast China Grid in 2004

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
		A	B	C	**D=A+B+C**	**E**	**F**	**G**	H=D*E*F*G* 44/12/10000(mass unit) H=D*E*F*G* 44/12/1000(volume unit)
Raw coal	Unit	4144.2	2310.9	3084.8	**9539.9**	25.8	100	20908	188689376.8
Cleaned coal	10000 t	84.75	1.09	4.88	**90.72**	25.8	100	26344	2260871.585
Other washed coal	10000 t	577.67	14.26	61	**652.93**	25.8	100	8363	5165589.096
Coke	10000 t				**0**	29.2	100	28435	0
Coke oven gas	10000 t	4.83	2.91		**7.74**	12.1	100	16726	574367.4948
Other gas	10^8m^3	57.33	4.19		**61.52**	12.1	100	5227	1426676.894
Crude oil	10^8m^3				**0**	20	100	41816	0
Gasoline	10000 t					18.9	100	43070	0
Diesel oil	10000 t	2.04	1.16	0.24	**3.44**	20.2	100	42652	108672.7465
Fuel oil	10000 t	12.81	1.78	2.86	**17.45**	21.1	100	41816	564536.2111
LPG	10000 t	2.19			**2.19**	17.2	100	50179	69305.22764
Refinery gas	10000 t	9.79		1.14	**10.93**	15.7	100	46055	289779.7487
Natural gas	10000 t		0.03	2.53	**2.56**	15.3	100	38931	559111.4496
Other petroleum products	10^8m^3				**0**	20	100	38369	0
Other coking products	10000 t				**0**	25.8	100	28435	0
Other energy	10000 tce	26.97	5.07		**32.04**	0	100	0	0
Total									199708287.3

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories. China Energy Statistical Yearbook 2005

Table A3-11 Calculation of simple OM emission factor of Northeast China Grid in 2005

Fuel	Unit	**Liaoning**	**Jilin**	**Heilongjiang**	**Total**	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
		A	B	C	**D=A+B+C**	**E**	**F**	**G**	H=D*E*F*G* 44/12/10000(mass unit) H=D*E*F*G* 44/12/1000(volume unit)
Raw coal	10000 t	4305.41	2446.13	3383.21	**10134.75**	25.8	100	20908	200454895.9
Cleaned coal	10000 t				**0**	25.8	100	26344	0
Other washed coal	10000 t	524.74	19.26	24.16	**568.16**	25.8	100	8363	4494939.888
Coke	10000 t				**0**	29.2	100	28435	0
Coke oven gas	10^8m^3	1.03	3.57	0.68	**5.28**	12.1	100	16726	391816.5856
Other gas	10^8m^3	12.62	8.37		**20.99**	12.1	100	5227	486767.6854
Crude oil	10000 t	1.16			**1.16**	20	100	41816	35571.47733
Gasoline	10000 t				**0**	18.9	100	43070	0
Diesel oil	10000 t	1.18	1.48	0.57	**3.23**	20.2	100	42652	102038.6544
Fuel oil	10000 t	9.32	2.46	1.55	**13.33**	21.1	100	41816	431247.4323
LPG	10000 t	0.12			**0.12**	17.2	100	50179	3797.54672
Refinery gas	10000 t	5.48		1.32	**6.8**	15.7	100	46055	180283.8327
Natural gas	10^8m^3		0.84	2.24	**3.08**	15.3	100	38931	672680.9628
Other petroleum products	10000 t				**0**	20	100	38369	0
Other coking products	10000 t				**0**	25.8	100	28435	0
Other energy	10000 tce	16.18			**16.18**	0	100	0	0
Total									207254040

Date source：2006 IPCC Guidelines for National Greenhouse Gas Inventories. China Energy Statistical Yearbook 2006

Table **A3-12** OM of the North China Power Grid in 2003

Emissions of North China Power Grid (tCO_2e) A	455557075	455551793
Supply from Northeast China Power Grid (MWh) B	4244380	4244380
average emission factor of Northeast China Power Grid in 2003 C	1.136435	1.136559
Total electricity supply (MWh) D	429609286	429609286
Total Emissions of North China Power Grid (tCO_2e) E=A+C*B	460380537	460375781
$EF_{OM,2002}$ (tCO_2e/ MWh) F=D/E	1.071626	1.071615

Table **A3-13** OM of the North China Power Grid in 2004

Emissions of North China Power Grid (tCO_2e) A	549024040.8	549031577.7
Supply from Northeast China Power Grid (MWh) B	4514550	4514550
average emission factor of Northeast China Power Grid in 2003 C	1.17383707	1.1741083
Total electricity supply (MWh) D	493687660	493687660
Total Emissions of North China Power Grid (tCO_2e) E=A+C*B	554323387	554332148
$EF_{OM,2002}$ (tCO_2e/ MWh) F=D/E	1.122822	1.122840

Table **A3-14** OM of the North China Power Grid in 2005

Emissions of North China Power Grid (tCO_2e) A	647649330.9	647686276.3
Supply from Northeast China Power Grid (MWh) B	3939000	23423000
average emission factor of Northeast China Power Grid in 2003 C	1.157639633	1.1578
Total electricity supply (MWh) D	564690013	584174013
Total Emissions of North China Power Grid (tCO_2e) E=A+C*B	652209273	674805425
$EF_{OM,2002}$ (tCO_2e/ MWh) F=D/E	1.154986	1.155145

The Operating Margin emission factor of NCG is calculated as the weighted average of $EF_{OM,2003}$, $EF_{OM,2004}$ and $EF_{OM,2005}$

EF_{OM}=1.12025 tCO_2e/MWh。

2.Calculate BM

Table A3-15 Emissions Factors of Most Advanced Commercial Power Technologies

	Variable	Power Generation Efficiency	Emissions Factor (tc/TJ)	Oxidation rate	Emissions Factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

(1) Calculate the proportions of the corresponding CO_2 emissions of the solid fuel, liquid fuel and gas fuel to the total emission.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

From the formula above and Table A3-15, the proportions of the corresponding CO_2 emissions of the solid fuel, liquid fuel and gas fuel to the total emission could be calculated as follows:

λCoal=99.17%，λOil=0.88%，λGas=0.74%。

(2) Calculate the fuel-fired emission factors ($EF_{Thermal}$) of the grids based on the emissions of the best technology commercially as follows:

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9465 tCO_2e/MWh$。

(3) Calculate EF_{BM} of the ECG

Table A3-16 Installed capacity in North China Power Grid 2005

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydro	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear	MW	0	0	0	0	0	0	0
Wind and others	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.2	37413.4	114620.5

Data source: China Electric Power Yearbook 2006.

Table A3-17 Installed capacity in North China Power Grid 2004

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3485.5	6008.5	19932.7	17693.3	13641.5	32860.4	93954.9
Hydro	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear	MW	0	0	0	0	0	0	0
Wind and others	MW	0	0	13.5	0	111.7	12.3	137.5
Total	MW	4514.4	6013.5	20730	18480.6	14321.2	32923.5	96983.2

Data source: China Electric Power Yearbook 2005.

Table A3-18 Installed capacity in North China Power Grid 2003

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
Hydro	MW	1058.1	5	764.3	795.7	592.1	50.8	3266
Nuclear	MW	0	0	0	0	0	0	0
Wind and others	MW	0	0	13.5	0	76.6	0	90.1
Total	MW	4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	87362.7

Data source: China Electric Power Yearbook 2004.

Table A3-19 Calculation of BM emission factor for North China Power Grid

Installed Capacity	2003	2004	2005	2003-2005	Ratio of the Increased Installed capacity
	A	B	C	D=C-A	
Fossil fuel-fired（MW）	84006.6	93594.9	111068.7	27062.1	99.28%
Hydro（MW）	3266.0	3250.7	3216.2	-49.8	-0.18%
Nuclear（MW）	0	0	0	0	0.00%
Wind（MW）	90.1	137.5	335.5	245.4	0.90%
total（MW）	**87362.7**	**96983.1**	**114620.4**	**27257.7**	**100.00%**
Ratio of the Installed capacity in 2004	76.22%	84.61%	100%		
BM (tCO_2/MWh)	0.9397				

EF_{BM}=0.9465tCO_2e/MWh×99.28%＝0.9397tCO_2e/MWh.

Annex 4

MONITORING INFORMATION

Details please refer to section B7.2

Monitoring Data Record

ID Number	Data Type	Monitoring Meter	Data Unit	Measured(m) Caculated(c) or estimated (e)	Recording Frequency	Cross-checking Frequency	How will the data be archived	For how long is archived data kept?	Comment
E1	Electricity	A1	$\times 10^4$kwh	m	Hourly reading	Yearly	Paper	During the crediting period and two years after	
S	The amount of steam for No.3 CDQ unit start up	S	T	m	When the CDQ startup needed	Yearly	Paper	During the crediting period and two years after	
G	The amount of coke oven gas for No. 3 CDQ unit start up	G	m^3	m	When the CDQ startup needed	Yearly	Paper	During the crediting period and two years after	
enthalpy	The pressure of steam for No.3 CDQ unit start up	M	MPa	m	When the CDQ startup needed	Yearly	Paper	During the crediting period and two years after	
	The temperature of steam for No.3 CDQ unit start up	T	℃	m	When the CDQ startup needed	Yearly	Paper	During the crediting period and two years after	

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