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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: 24MW Power Generation from Coking Waste Heat Generated in the Clean-type Heat-recovery Coke Ovens at Shanxi Sinochem Wonder Industries Co. Ltd.

Version: 04

Date: 18/02/2008

A.2. Description of the project activity:

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The proposed project involves the utilisation of waste heat from coke production at Sinochem Wonder Industries Coking Facility in Shanxi Province to generate electricity. The purpose of the project is to generate electricity using waste heat and to sell the electricity to the North China Power Grid (NCPG) on the basis of a Power Purchase Agreement (PPA).

The proposed project will install five waste heat boilers (5*30t/h) and four steam turbines coupled to four generators (4*6MW). This will provide a total installed electricity generation capacity of 24MW and an estimated annual gross electricity production of 144GWh. The total net electricity generated is estimated as 134.2GWh per annum. All of the net electricity produced by the proposed project will be supplied to the Shanxi Power Grid which is a constituent of the North China Power Grid.

The proposed project activity will achieve greenhouse gas (GHG) emission reductions by displacing fossil fuel generated electricity from the North China Grid which would have resulted in CO_2 emissions. Annual emission reductions of this project are estimated to be 138,266 tCO2e.

The project will improve air quality and local livelihoods and promote sustainable energy industry development. The specific benefits of the project to the host country's sustainable development include:

- Promoting efficient and comprehensive resource utilisation
- Reducing the use of fossil fuel for electricity generation thus reducing GHG emissions
- Reducing other pollutants resulting from the power generation industry, compared to a business-as-usual approach, such as SOx, NOx and TSP. These pollutants cause lung disease, acid rain and smog amongst other impacts and therefore their reduction could lead to wide ranging benefits for the local economy, environment and population.
- Project will create 144 employment opportunities for local people.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Part involved wishes to be considered as project participant (Yes/No)
P.R. China(host)	Shanxi Sinochem Wonder Industries Co.Ltd China.	No
UK	Trading Emissions PLC	No

The detailed information of participants is included in Annex 1.

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):

P.R. China

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

Shanxi Province

A.4.1.3. City/Town/Community etc:

Dali Village, Zhangcun Town, Houma City

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

The proposed project is sited within the premises of the Huanda coke plant. The ring road of the local village is located to the north of the site. The Nantonpu line railway is next to the site on the west. The site is approximately 10km northeast to down town Houma City, southwest of Shanxi Province. The geographical coordinates are east longitude 111°21′ and north latitude 35°37′. Figure 1 shows the location of the proposed project.

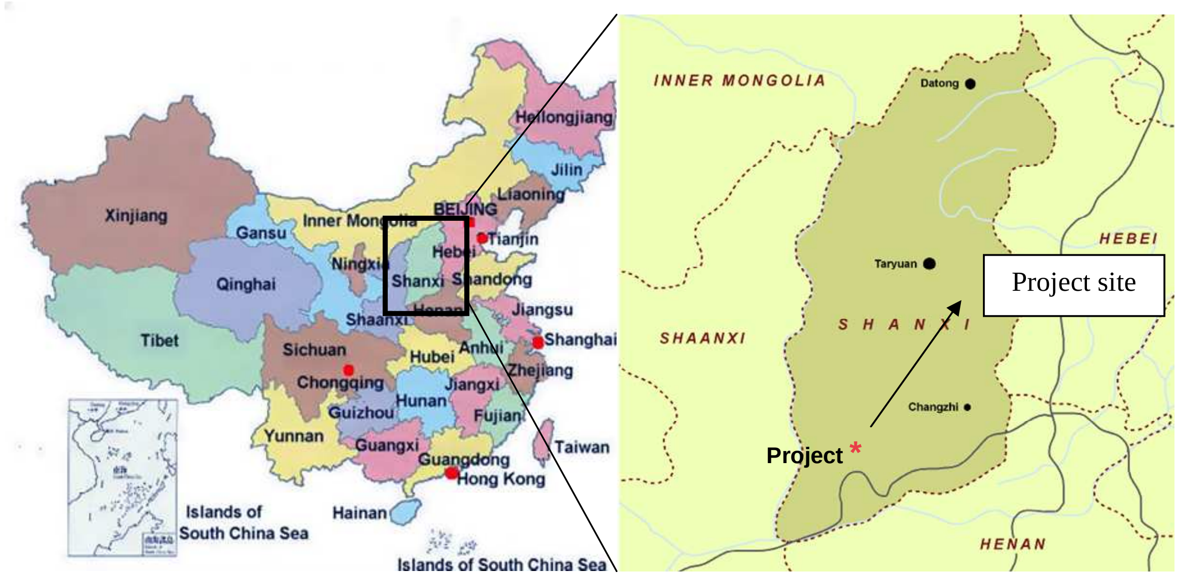

Figure 1 Location map

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

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Category 1: Energy Industries (renewable/non-renewable sources)

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

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The project activity will employ waste heat recovery boilers and steam cycle power generation technology to produce electricity. The project activity is to be located at a clean type *non-chemical-recovery* type coke production facility.

Coke is produced by the pyrolysis of coal in coking ovens. This involves the heating of prepared coal at high temperatures in the absence of oxygen. Most coke is produced in *by-product* coke ovens. As the coal is heated volatiles are driven off forming coke oven gas. In a traditional *by-product* coke oven this gas is used to produce a range of chemicals. In a clean type *non-chemical-recovery* system such as at the site of the project activity, the coke oven gas and other volatiles driven off the coal are combusted inside the coke ovens.

The coking plant consists of a battery of coke ovens. Each oven has two doors, one for charging the coal and the other for removing the coke. The ovens themselves remain hot between batches and this heat is sufficient to commence the coking process. No external heat energy source is required. As the gases come off the coal they are combusted in the air space above the coal and in downcomers down the side of the ovens and also under the floor of the ovens. This combustion ensures even spread of thermal energy around the coal. The hot combustion gases leave the ovens and are carried along a pipe running the length of the battery to the stack where they are currently emitted directly to the atmosphere.

The waste heat boiler to be installed by the project activity will be installed at the point where the combustion gases reach the stack. At this point the gases are still at a high temperature but are no longer contributing thermal energy to the process. As the waste heat boiler is being installed at the end of the coking process and as the process requires no additional thermal energy input it is clear that the waste heat is not of use on the site without the installation of the project activity. As the combustion gases pass through the waste heat boiler they will produce steam which will be used to power a steam turbine and generator.

The coke production facility has been operational since 2003. The coking plant's energy demand prior to the implementation of the project activity has been met through the coal used directly in the coking process and through electricity from the grid. There has not been/ will not have any captive power plant on site. After the project implementation, the energy sources of the coking plant will not be changed. The project activity will not impact the amount of coal required for coking and its electricity will be exported to the grid and not used on site other than for equipment directly linked to power production. Therefore there is no fuel switching after implementation of the project activity.

The main characteristics of the waste heat are as follows:

- Average temperature: 1,066.3℃;
- Minimum temperature: 1,040℃;
- Pressure: -200pa ~ -400pa;
- Density of SO_2: 310 ~ 527.0mg/Nm^3;

- the efficient caloric enthalpy supplied by the waste gas: 640 ~ 857kJ/m^3.

Table 1 The types of the waste heat boilers and the generators

Waste heat boiler	Steam turbine	Generator
YR30/1050-3.82/450	N6-35-1	TQC
	N6-35	TQC5466-2
	N6-35	QF-6-2
	N6-3.43	QF-6-2

The electricity generated by the proposed project will be sold to Shanxi Power Grid which is part of North China Power Grid. The voltage of the generators adopted by the proposed project is 6kV and the power will be stepped up to 35kV by way of an on-site substation so as to connect to the grid.

The equipment to be used are domestic Chinese equipment.

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

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It is expected that the proposed project activities will generate annual emission reductions 138,266 tCO_2e. A renewable crediting period (7×3 years) has been chosen. In the first crediting period (from 2008 to 2014), the total emission reductions generated by the proposed project is expected to be 967,862tCO_2e.

Years	Estimation of emission reductions (tCO_2e)
2008 (15/05/08 to 31/12/08)[1]	86,416
2009	138,266
2010	138,266
2011	138,266
2012	138,266
2013	138,266
2014	138,266
2015 (01/01/15 to 14/05/15)	51,850
Total estimated reductions (tCO_2e)	967,862
Total number of crediting years	7
Annual average over the crediting period of estimated reductions(tCO_2e)	138,266

A.4.5. Public funding of the project activity:

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No official development assistance (ODA) from Annex I countries is being 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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The following approved methodologies have been applied to the proposed project activity:

- ACM0004: Consolidated baseline/monitoring methodology for waste gas and/or heat and/or pressure for power generation (version 02)
- ACM0002: Consolidated baseline/monitoring methodology for grid-connected electricity generation from renewable sources (version 06)
- Tools for the Demonstration and Assessment of Additionality (version 04)

More information about the methodologies and the tool can be found on the website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

[1] 15th May 2008 is assumed to be the CDM registration date. The CER generation will only start when the actual crediting period starts.

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 applies the approved methodology of ACM0004 because the proposed project will generate electricity from waste heat in the coke production that:

- displace electricity generated by fossil fuels in the electricity grid;

The proposed project will generate electricity from the waste heat from the coke production. The electricity will be exported to the grid.

- there is no fuel switch undertaken in the process after the implementation of the project activity

Prior to the project

As described in Section A.4.3, the ovens themselves remain hot between batches and this heat is sufficient to commence the coking process. No external heat energy source is required. As the gases come off the coal they are combusted in the air space above the coal and in downcomers down the side of the ovens and also under the floor of the ovens. This combustion ensures even spread of thermal energy around the coal. The hot combustion gases leave the ovens and are carried along a pipe running the length of the battery to the stack where they are currently emitted directly to the atmosphere. The collecting of combustion gases would not be feasible until the installation of a waste heat boiler which is the project activity. The waste heat has not been utilised. There has not been any captive power plant on site.

After the project implementation

The energy sources of the coking plant will not be changed. The project activity will not impact the amount of coal required for coking and its electricity will be exported to the grid and not used on site other than for equipment directly linked to power production. There will not have any captive power plant on site.

There is no fuel switching after implementation of the project activity.

Therefore ACM0004 is applicable for the proposed project activity.

The proposed project activity also applies the approved methodology of ACM0002 because the electricity generated from utilizing the waste heat will be exported to North China Power Grid, displacing electricity generated by other power plants connected to the electricity grid. The emission factor for the North China Power Grid will be calculated as per ACM0002.

Tools for the Demonstration and Assessment of Additionality version 04 has been used to demonstrate the additionality of the proposed project activity.

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

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According to ACM0004, the spatial extent of the project boundary comprises the waste heat or gas sources, captive power generating equipment, any equipment 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.

In terms of proposed project activity, the project boundary includes the waste heat recovery system (the boiler), the electricity generation facilities such as the steam turbine and the generator and the power plants connected physically to the electricity grid. It is expressed in the following chart.

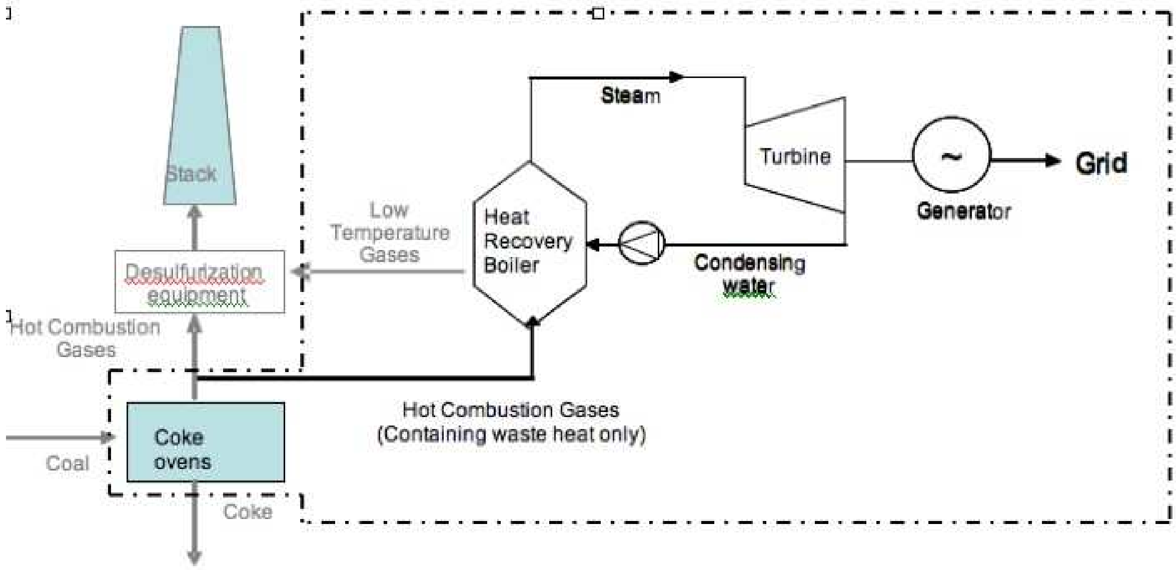

Figure 2 the flowchart of the proposed project showing project boundary

According to the guideline published on December15, 2006 by Chinese DNA[2], the electricity system boundary selected for the proposed project is North China Power Grid which includes Beijing, Tianjin, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region.

The proposed project activity is using the waste heat from the coke production to generate the electricity and selling the electricity to the grid.

The project activity utilises the heat in gases which are being emitted to the atmosphere. Simply utilising the waste heat produces no new additional emissions and therefore the project activity does not produce emissions.

The following table summarizes what emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

[2] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf

	Source	Gas	Included/ excluded	Justification / Explanation
Baseline	Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	Fossil fuel consumption due to the project activity	CO_2	Excluded	The proposed project does not have on-site fossil fuel consumption
		CH_4	Excluded	The proposed project does not have on-site fossil fuel consumption
		N_2O	Excluded	The proposed project does not have on-site fossil fuel consumption

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

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According to ACM0004, the possible alternative scenarios in 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).

According to ACM0004,when analysing alternative scenarios, those baseline options which do not comply with legal and regulatory requirements or that depend on key resources such as fuels, materials or technology that are not available at the project site should be excluded. Based on the above several scenarios and the ACM0004 requirements, the analysis of the above six scenarios are as follows:

Scenario (a) the proposed project activity not undertaken as a CDM project activity:

It is shown in section B.5 that the investment return of the proposed project is 7.53% which is lower than the benchmark hurdle rate for coke production (12%). The proposed project is not economically attractive. Furthermore, the waste heat for electricity generation is from clean-type heat recovery coke ovens which are an advanced technology in China. As this project activity is one of the first of its type in the country there is an increased perception of risk associated with the project activity.

The project owner also faces the barriers described in section B.5.due to the low financial return scenario (a) is not a plausible scenario without the CDM incentive.

Scenario (b) Import of electricity from the grid:

This is same as scenarios (f) i.e. continuation of the current situation of grid-based power supply. The current installed capacity and newly added capacity of North China Power Grid meet the requirements to meet the electricity demand in the region. The continued use of grid electricity by the project investor at the coking facility requires no investment as it is what is done now. Therefore there are no investment barriers or financial barriers to this scenario. This scenario would also involve the continued release of waste heat to the atmosphere. Such a scenario exists now and so is clearly plausible. In addition utilising the heat would require significant investment and there is not sufficient heat load locally for the heat to be used. Therefore the only use for the heat is to produce power for export which is scenario (a). Therefore scenario (b) using the electricity from the grid and waste heat release to the atmosphere is a possible and credible scenario.

Scenario (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 discussed earlier the coking process requires no external thermal energy input. The only energy input is electricity to drive some of the motors at the facility. The amount of power used is very small when compared to the amount of power the proposed project activity will produce and so it is not in any way an operational imperative for the facility to generate its own electricity. For example in the previous year the coking facility and adjoining coal washing plant used 2.5GWh[3] of power according to other operated coke plants with similar scale. The project is expected to produce 134.2GWh of power and it is 50times this amount of power in a year. So there is no necessity or incentive to build a captive power plant to meet internal energy demand.

To discuss the possible captive power plant the availability of the key resources such as fuels, materials or technology at the site of proposed project should be considered. Moreover, compliance with national law and regulations should also be considered.

New captive power generation on-site, using coal, diesel or natural gas is not in line with Chinese regulations. According to *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators*[4], the installation of fossil fuel-fired power units with a capacity of less than 100MW are strictly regulated. Therefore constructing a power plant of the same capacity of the project using coal, diesel oil or natural gas as fuel would be prohibited. This option is hence excluded.

For the situation of existing or new captive power generation on-site, using hydro, is not feasible due to a lack of water resources. Wind is impractical as captive power due to intermittency but even still in any event the wind resources at the site are not suitable.[5] This option is hence excluded.

Given above discussion scenario (c) is not a plausible scenario and should be excluded.

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

Because scenario (c) is not possible scenario therefore scenario (d) should be excluded.

As for the scenario (e) Other uses of the waste heat and waste gas.

There are no compelling regulations requiring the project owner to utilise the waste heat. The project is not located in close proximity to other facilities or accommodation which might require heat. Also heat

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[3] From electricity purchase invoice of 2005 attached.

[4] http://www.chinavalue.net/wiki/showcontent.aspx?titleid=61180

[5] Refer to 2005, China energy statistical yearbook, Page 214, Energy balance of Shanxi-2004

supply in China is usually planed, developed and operated by municipal authority. It is difficult for project owner to sell the heat to third parties. Within the region, direct release of waste heat from the coking process is the common practice. Therefore scenario (e) is not plausible scenario and should be excluded.

Hence, in the absence of the proposed CDM project, the most realistic and credible alternative is using the electricity from the grid and releasing the waste heat to the atmosphere, as is happening now at the site.

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): >>

The following steps are used to demonstrate the additionality of the proposed project according to "Tools for the demonstration and assessment of additionality"(version 04) agreed by Executive Board and requested by the baseline methodology ACM0004.

Step1. Identification of alternatives to the project activity consistent with current laws and regulations.

The objective of this step is to identify realistic and credible alternatives to the proposed project that can be the baseline scenario through the following sub-steps:

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

The possible alternative scenarios in 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).

Based on discussion in section B4 above, scenarios (b) and (f) using the electricity from the grid and waste heat release to the atmosphere is a possible and credible scenario.

Step1b. Enforcement of applicable laws and regulations.

All the alternative scenarios, except for scenario (c) using fossil fuel, have been identified comply with Chinese legal and regulatory requirements:

- The law does not prohibit the utilisation of waste heat from the production process to generate electricity (scenario a) or supply heat (scenario e), therefore scenario (a) and scenario (e) are in compliance with the law.
- There is no restriction on the coking facility using grid electricity, therefore scenario (b) and scenario (f) are in compliance with the law.

- The installation of captive power generation using hydro and wind etc are not forbidden (scenario c, except the use of fossil fuel) , therefore scenario (c) is in compliance with the law.

The construction of the same capacity of fossil fuel-fired captive power plant in scenario (c) is not in compliance with Chinese regulations. Such a new captive power generation on-site, using coal, diesel or natural gas would not be in line with Chinese regulations as according to *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators*[6]. Under these rules the installation of fossil fuel-fired power units with a capacity of less than 100MW are strictly regulated. Therefore constructing a power plant of the same capacity of the project using coal, diesel oil or natural gas as fuel would be prohibited. Therefore scenario (c) with fossil fuel-fired captive power plant is not a plausible scenario and should be excluded.

The following analysis will show that the proposed project in the absence of CDM is not feasible economically (step 2).

Step2. Investment analysis.

This step will determine whether the proposed project is economically or financially less attractive without the revenue from the sale of CERs, compared to alternative (b).

Sub-step 2a. Determine appropriate analysis method.,

The Tools for the Demonstration and Assessment of Additionality recommends three analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The proposed project generates financial and economic benefits through the sales of electricity other than CDM related income therefore the simple cost analysis (Option I) cannot be taken. And the investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario to the proposed project is the use of electricity from the Northeast China Grid and release of waste heat to the atmosphere, rather than investment in a new project. As the alternative scenarios do not require similar amounts of investment benchmark analysis (Option III) shall be chosen for the additionality testing.

Sub-step 2b Apply benchmark analysis.

According to the *Economic Assessment Method and Parameters for Project Construction* 3rd edition (2006), a project will be financially acceptable when the Financial Internal Return Rate (FIRR) is better than the benchmark FIRR of that sector. As per the “Tool for demonstration and assessment of additionality”, the benchmark is to represent standard returns in the market, considering the specific risk of the project type. It is indicated 12% is the benchmark FIRR for the coking industry in page 204 of the *Economic Assessment Method and Parameters for Project Construction*[7]. Given the core business of the project owner is coke production, 12% is chosen as the benchmark FIRR by the project owner and is the minimum requirement for the investment return. If such IRR cannot be expected, the same investor could simply invest further in the coking production other than the project activity.

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

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[6] http://www.chinavalue.net/wiki/showcontent.aspx?titleid=61180

[7] The National Development And Reform Committee and State’s Planning Department, 2006 the *Economic Assessment Method and Parameters for Project Construction* 3rd edition

Table 2 Main parameters for calculation of financial indicators

Item	Unit	Value	Data source
Installed capacity	MW	24	Project design of FSR
Static total investment	Million yuan	103	Project design of FSR
Annual O&M cost	Million yuan	10.29	Project design of FSR
Annual net electricity	GWh/a	134.2	Project design of FSR
Electricity Tariff (including VAT)	Yuan/kWh	0.205	Shanxi Provincial Pricing Bureau[8]
Value Added Tax (VAT)	%	17	Shanxi tax regulations
Urban maintenance and construction tax	%	5	Shanxi tax regulations
Surcharge for education	%	3	Shanxi tax regulations
Income tax	%	33	China Income Tax Law
Project operational life[9]	Year	20	Project design of FSR
Depreciation years	Year	17	Project design of FSR

The financial indicators (FIRR) without and with CER revenues (assumption: 10 US$/t$CO_2$e and 7×3 crediting period) are listed in the following table.

Table 3 Comparison of financial indicators without and with CER revenues

	Without CER revenues	Benchmark	With CER revenues
FIRR(%)	7.53	12	15.78

Without CER revenues, the FIRR of the proposed project is only 7.53%, lower than the benchmark FIRR of 12% for the coke industry. The proposed project is financially unattractive. Due to the low returns, especially for the coke sector, alternative (a) “The proposed project not undertaken as a CDM project activity but as a commercial project.” is not realistic, and should be excluded from further consideration. Considering CER revenues, the FIRR of the proposed project is 15.78%, better than the benchmark, and the proposed project is financially acceptable.

Sub-step 2d. Sensitivity analysis.

The objective of this sub step is to show the conclusion regarding the financial additionality is robust to reasonable variations of the critical assumptions. The result of the investment analysis supports the assertion that the proposed project is not attractive. No sensitivity analysis on the CERs price was conducted as the project has entered into a contract for the sale of CERs at an agreed price and therefore will not be impacted by fluctuations in CER market prices.

Three factors are considered in the following sensitivity analysis:

1) Static total investment.
2) Annual operation and maintenance cost.
3) Income from electricity sales

[8] Shanxi Provincial Pricing Bureau, 2004, *Notice on Adjustment on Electricity Price in Shanxi*

[9] The main WHR equipments’ average operational life is expected to be 20 to 25 years. However the lifetime of the coke ovens (i.e. the source of the waste heat) is more difficult to estimate. The ovens are necessary to produce the waste heat but must be kept operating throughout their life as the cooling of them causes significant contraction and damage. 20 years is used to take into account the risk associated with the coking plant while also reflecting the lifetime of the WHR equipment.

The IRR of the project exceeds above the benchmark in the following scenarios:

- The total investment is 25.49% below assumption.

The feasibility study was conducted by Shanxi Guanghua Electric Power Survey Design institute. The Institute is accredited by the State's Construction Ministry as a Class A agency for feasibility study. The reference of the study include the followings:

  - The investment parameters: *Power Construction Engineering Price Index* (1996) and *National Machinery and Electric Devices Price Index* (1999);
  - The installation costs: *Shanxi Construction and Installation Costing Index (2000)*; and
  - The code of conduct of financial analysis: *Electric Power Project Development Financial Analysis Detailed Rules and Regulations*.

The energy-related sector and coking are both major traditional industrial sectors in Shanxi, with proven experience, recent official reference and strict code of conduct for feasibility study, the estimation are considered to be accurate and reliable. As a large scale industrial project of this type, a variation of 25.49% of investment would be unacceptable for quality concerns. A breakdown of the investment costs has been provided for DOE review during validation.

- The Operation cost is 38.95% below estimate.

As mentioned above, the estimations were made based on feasibility study code of conduct and official reference. 38.95% reduction of O&M cost is not possible to happen unless production is decreased (which has direct impact on revenue).

- The electricity price is 24.82% higher than assumption.

It is very unlikely the sales revenue would be 24.82% higher than the assumption since the establishing and modifying of electricity tariff is highly regulated and controlled by the central government. The price variation to such extend is not anticipated.

The process for setting the tariff is as follows: firstly, the project owner will negotiate the feed-in-tariff with the grid company, then it will be determined by Pricing Bureau of the government, once the electricity tariff is issued, it will strictly be regulated by the government. Therefore the approved the tariff cannot be changed by the project owner or the grid company according to China's Management Rules on Feed-in-Tariff Issued by NDRC[10].

- The operation hour is 25.89% higher than assumption.

The operation hour is 25.89% higher than assumption. The annual electricity output of the project is estimated based on 7,600 hours per annum (87% operation rate). Such estimate is very optimistic. 25.89% increase of operation hours is not anticipated.

The financial analysis shows that the project is not the most financially attractive alternative, and the sensitivity analysis shows that it is unlikely to be financially attractive compared to the benchmark under reasonable variations in the assumptions. However, the revenue from the CERs will greatly improve the financial feasibility of the proposed project.

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[10] Management Rules on Feed-in-Tariff ,No [2005].514, March 28, 2005, http://www.ndrc.gov.cn/zcfb/zcfbtz/zcfbtz2005/t20050613_6670.htm

Step 3. Barriers analysis

The financial unattractiveness of the project activity has been demonstrated in Step 2. Step 3 Barriers Analysis is optional as per the Tool. The project participant proceeds to Step 4 Common Practice Analysis.

Step 4. Common practice analysis

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

Shanxi Province is the biggest coke production base in China. Most coke is produced in the traditional by-product coke ovens. Coke oven gas is the by-product. In a traditional by-product coke oven this combustible gas is mandated for reuse to produce a range of chemicals. However, the project is developed based on a clean type non-chemical-recovery coke oven, which does not release combustible gas but waste heat only.[11]

According to the additionality tool (version 04), "projects are considered similar if they are in the same country/region and/or reply on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc."

Waste heat recovery projects on a traditional by-product coke oven cannot be considered similar to the project activity that recovers waste heat from the clean-type coke oven. Firstly, different regulatory requirement is applied. This also determines the use of the technology used for recovery process and power generation. The table below is a summary of the difference.

Table 5 Comparison of coke oven waste heat recovery projects in Shanxi, China

		Traditional by-product oven	**Clean type coke oven**
Technical difference	***Inflow***	Combustible gases	Waste heat
	Equipment	Combined gas and steam turbines	Heat recovery boilers and steam turbines
Regulatory framework		Waste gas recovery is mandated	No mandatory requirement

It is demonstrated that waste heat recovery from traditional coke oven cannot be considered similar activity to the project. The activities that are considered similar to the project activity include only the recovery of waste heat from the clean type coke ovens. Refer to Table 6 below for the project list.

Table 6 The project activities similar to the proposed project[12]

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Project owner</th><th rowspan="2">Capacity (MW)</th><th colspan="2">By-product</th><th rowspan="2">Remarks</th></tr>
<tr><th>Waste heat</th><th>Combustible gas</th></tr>
</table>

[11] Further background information on the waste heat generation can be found in Section A.4.3.

[12] A clarification letter from the Shanxi Province 21 Agenda Sustainable Development Office (under the Provincial Development and Reform Committee) is submitted for review.

1	Shanxi Qinxin Coal-coke Co. Ltd.	36	Yes	No	Applying for CDM
2	Shanxi Province Gaoping City Sanjia Coking Co. Ltd.	24	Yes	No	Applying for CDM
3	Qinyuan County Mingyuan Coal and Coke Co., Ltd	24	Yes	No	Applying for CDM
4	Shanxi Sanjia Coal & Chemicals Co., Ltd	33	Yes	No	Applying for CDM
5	Gangyuan Coking Co., Ltd	30	Yes	No	Applying for CDM
6	Shanxi Shouyang County Boda Industries Co., Ltd	18	Yes	No	Applying for CDM
7	Sinochem Huanda Coking & Chemicals Co., Ltd	24	Yes	No	Applying for CDM
8	Taiyuan city Wanguang Coal and Coking Co., Ltd	21	Yes	No	Applying for CDM
9	Taiyuan Yingxian Coking & Chemicals Co., Ltd	24	Yes	No	Applying for CDM
10	Lan county Fengda Coking and Chemicals Smelting Co., Ltd	18	Yes	No	Applying for CDM

Sub-step 4b. Discuss any similar options that are occurring:

According to official statistical report there are 717 coke production factories in Shanxi province. [13] Traditional coking technology is used in most of these factories. Only 35 coke production factories have considered using the clean type non-recovery coke oven since 2005. This means only 35 coking facilities have the potential for development of similar activities.

According to official information, at the time of the PDD preparation, waste heat is being directly emitted from these coking facilities, except the 10 facilities (listed in Table 6) that have applied for approval for the waste heat recovery project. The other 25 facilities have not planned to install waste heat recovery units. Similar activities are not widely observed. This has been confirmed by the representative from the Shanxi Development and Reform Commission during the validation interview. Clarifications from the Shanxi Province Agenda 21 Office has been submitted for review.

All of the 10 facilities are applying for CDM registration.

Sub-step 4a and 4b are satisfied, i.e. (1) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained. Therefore, common practice analysis does not oppose but actually confirms the additionality of the proposed project.

The Wonder coking plant has been operational from 2003. The consideration of waste heat recovery project was in 2005. The construction was started with the CDM assistance in November 2005.

[13] Shanxi Coking Installations Category of the Provincial Governmental Document [2005] no.13

The proposed project activity passed all criteria of "Tool for the demonstration and assessment of additionality". In conclusion, the proposed project is additional and not the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to ACM0004, there is no on-site fossil fuel consumption for the proposed project, therefore the project emissions may not be considered. At the same time, the leakage emissions are not considered. Therefore, the proposed project only needs to calculate the baseline emissions.

As for the baseline emissions, it is pointed out in ACM0004 that if the most reliable baseline alternative is (b) "Import of electricity from the grid", the emission factor of the substituted electricity should be calculated according to ACM0002. The most reliable baseline alternative of the proposed project is alternative (b) "Import of electricity from North China Power Grid", so ACM0002 is adopted to calculate the emission factor of the substituted electricity.

The baseline emission factor (EF_y) is calculated as the simple average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$). In accordance with ACM0002, the baseline emission factor can be calculated with the following steps described below.

Step 1 Calculate the Operating Margin emission factor ($EF_{OM,y}$)

According to The Methodology, four alternatives could be used to calculate the OM:

a) Simple OM

b) Simple adjusted OM, or

c) Dispatch Data Analysis OM, or

d) Average OM.

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

1. In China, the State Grid Corporation run the interregional dispatch system and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2. In the most recent 5 years (2001-2005), the proportions of low-cost/must run resources in the total electricity output in North China Power Grid are respectively 1.1%, 0.8%,0.89%,0.86% and 0.76%, much less than 50%. The details can be seen in Annex 3.

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

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2e/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

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

Where $F_{i,j,y}$ is the amount of fuel i consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources j in years y, *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

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

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*. In the China Electric Power Year Book and other data resources, only generation data is available. The generation from source *j* can be translated into electricity delivered to the grid by source *j* by the following formulation:

$$GEN_{j,y}=G_{j,y}\times(1-e_{j,y}) \qquad (2)$$

Where $G_{j,y}$ is the amount of generation (in MWh) by source *j* in year *y*;

$e_{j,y}$ is the rate of plant self consumption of source *j* in year *y*.

The CO_2 emission coefficient of fuel type *i* $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \qquad (3)$$

Where:

NCV_i is the net calorific value per ton or m^3 of a fuel *i* (TJ/tce, TJ/m^3).

$OXID_i$ is the oxidation factor of the fuel *i*.

$EF_{CO2,i}$ is the CO_2 emission factor per TJ of fuel type *i* (tCO_2/TJ).

According to the methodology ACM0002, the Simple OM emission factor is ex-ante calculated as electricity-to-the-grid weighted average in the North China Power Grid during the most recent 3 years (2002-2004), and will be fixed in the first crediting period.

Based on the formula (1), formula (2) and formula (3) and the publication by Chinese DNA[14], the result of OM emission factor in North China Power Grid is 1.1208 tCO2e/MWh.

Step 2 Calculate the Build Margin emission factor ($EF_{BM,y}$)

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants *m*, as follows:

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

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) 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 in year y*.

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[14] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1052.xls

The result of BM emission factor in this project is based on the ex-ante calculation method provided by ACM0002, and the update for the emission factor is not needed in the first crediting period.

Because some data are not available, the BM calculation in this PDD adopts the deviation method agreed by the CDM EB. Calculate first the new installed capacity and its power generation technology mix, then the weights of new capacity in each power generation technology, and finally the BM emission factor at the commercialized optimal efficiency level of each power generation technology.

Because the capacity of the coal-fired, oil-fired and gas-fired technology can not be separated from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance sheets on the most recent year to calculate the proportion of CO2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO2 emissions. Second, use the proportions as the weights, based on the emission factors at the commercialized optimal efficiency level of each power generation technology, calculate the emission factor of the thermal power in each grid. Finally, this thermal emission factor is multiplied by the proportion of thermal power in the new 20% capacity. The result is BM emission factor.

Concrete steps and the formula are as follows:

Sub-step1: Calculation of the proportion of CO2 emissions from solid, liquid and gaseous fuels in the total emissions of CO2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i=Coal,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (5)$$

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

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

Where:

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

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / 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;

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step2: Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \quad (8)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$EF_{Gas,Adv}$ represent the emission factors of the optimal efficient and commercial coal-fired, oil-fuelled and gas-fuelled technologies.

Sub-step 3: Calculation of BM in the grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} * EF_{Thermal} \quad (9)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$is the total added installed capacity for thermal power.

Based on the formula (4), (5), (6), (7) and (8) and the publication by Chinese DNA[15], the result of BM emission factor in North China Power Grid is 0.9397tCO_2e/MWh.

Step3: Calculation the baseline emission factor (EF_y)

According to the baseline methodology (ACM0002), the baseline emission factor (***EF_y***) is calculated as the weighted average of the Operating Margin emission factor (***$EF_{BM,y}$***) and the Build Margin emission factor (***$EF_{OM,y}$***):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (10)$$

where the weights w_{OM} and w_{BM} are 0.5 and 0.5 by the default.

The baseline emission factor is: $EF_y = 0.5 * EF_{OM,y} + 0.5 * EF_{BM,y}$ = 1.0303tCO_2e /MWh.

Step 4 Calculate the baseline emissions (BE_y) and emission reductions (ER_y)

The amount of electricity to be delivered to the grid (net generation) from the project is EG_y=134,200 MWh, so the annual baseline emissions (BE_y), as the product of the baseline emissions factor (EF_y) calculated in Step 3 and the electricity to be supplied by the project activity to the grid, are:

$BE_y=EG_y \times EF_y$=138,266 tCO_2e.

There is no project emission, then PE_y=0.

There is no leakage due to the project activity, then L_y=0.

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

$ER_y=BE_y-PE_y-L_y=EG_y \times EF_y$=138,266 t$CO_2$e.

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

Data and parameters that are available at validation of the operation margin of emission factors are as follows:

Data / Parameter:	NCV_i
Data unit:	MJ/t, or MJ/Km^3
Description:	the net calorific value per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of	According to the latest version of ACM0002, the proposed project uses the national values

[15] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf

measurement methods and procedures actually applied :	
Any comment:	Reasonable

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	the oxidation factor of the fuel i
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the proposed project uses the IPCC default values.
Any comment:	Reasonable

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ(which can be converted to tCO_2e/TJ)
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the proposed project uses the IPCC default values.
Any comment:	Reasonable

Data / Parameter:	$F_{i,j,y}$
Data unit:	a mass or volume unit of the fuel i
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	As for the amount of fuel i consumed by Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region of North China Power Grid in year 2003, 2004 and 2005, please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Accurate

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	the electricity (MWh) generation by source *j*
Source of data used:	China Electric Power Yearbook
Value applied:	The electricity generation by Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region in year 2003, 2004 and 2005 please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Reasonable

Data / Parameter:	$e_{j,y}$
Data unit:	%
Description:	the rate of electricity self-consumption by source *j*
Source of data used:	China Electric Power Yearbook
Value applied:	the rate of electricity self-consumption by source *j* in Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region in year 2003, 2004 and 2005 please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Reasonable

Data / Parameter:	$CAP_{y,,j}$
Data unit:	MW
Description:	The installed capacity of every kind of electricity generation (such as thermal power, hydro power, nuclear power, wind power and other energy sources etc.) of North China Power Grid in the recent years. And to find the change of capacity additions in the North China Power Grid in the past few years.
Source of data used:	China Electric Power Yearbook
Value applied:	For the detailed information please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002 and the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.
Any comment:	Reasonable

Data / Parameter:	$GENE_{best,\ coal}$
Data unit:	%
Description:	The maximized efficiency of coal-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	36.53
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	

Data / Parameter:	$GENE_{best,\ oil.\ gas}$

Data unit:	%
Description:	The maximized efficiency of oil and gas-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	47.67
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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The emission reductions (ER_y) by the project activity are the difference between baseline emissions (BE_y), project emissions (PE_y) and leakage emissions (L_y), as follows: $ER_y=BE_y-PE_y-L_y$.

According to ACM0004, there is no on-site fossil fuel consumption for the proposed project, therefore the project emissions may not be considered. At the same time, the leakage emissions aren't considered. So both the project emissions and leakage emissions are zero, $PE_y+L_y=0$. Therefore, the proposed project only needs to calculate the baseline emissions.

Based on the formula in section B.6.1, the results of combined margin baseline emission factor of North China Power Grid are as follows:

- $EF_{OM,y}$: 1.1208tCO_2e/MWh;
- $EF_{BM,y}$: 0.9397tCO_2e /MWh;
- EF_y: 1.0303tCO_2e /MWh.

According to the Feasibility Study Report of the proposed project, the annual grid-connected power generation is estimated to be 134,200MWh. So the estimated annual baseline emission of the proposed project is $BE_y=EG_y \times EF_y$=138,266tCO_2e. So $ER_y=BE_y-PE_y-L_y=EG_y \times EF_y$=138,266 t$CO_2$e.

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

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Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of Leakage emission (tCO_2e)	Estimation of emission reductions (tCO_2e)
2008	0	138,266	0	138,266
2009	0	138,266	0	138,266
2010	0	138,266	0	138,266
2011	0	138,266	0	138,266
2012	0	138,266	0	138,266
2013	0	138,266	0	138,266
2014	0	138,266	0	138,266
Total (tCO_2e)	0	967,862	0	967,862

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

The ex-ante calculation of emission factor of North China Power Grid is chosen, so in the first crediting period only the net electricity generation from the proposed project activity (EG_y) needs to be monitored. According to ACM0004, EG_y is equal to the total electricity generated (EG_{GEN}) subtracting the auxiliary electricity (EG_{AUX}).

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	EG_{GEN}
Data unit:	MWh
Description:	total electricity generated by the proposed project
Source of data to be used:	Meters at the power plant and remote control system at the grid company
Value of data applied for the purpose of calculating expected emission reductions in section B.5	144,000
Description of measurement methods and procedures to be applied:	The meters at the power plant are adopted to measure the total electricity, and the project owner appoints the staff to record each month and double checked against sales receipts. At the same time, the local power grid can use the remote control system to online measure, check and collect the meter data. All monitoring data will be archived during and at least two years after the crediting period.
QA/QC procedures to be applied:	Calibration of Meters & Metering should be implemented according to national standards and rules. And all the records should be documented and maintained by the project owner for DOE's verification.
Any comment:	

Data / Parameter:	EG_{AUX}
Data unit:	MWh
Description:	the auxiliary electricity consumed by the proposed project
Source of data to be used:	Meters at the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	9,800
Description of measurement methods and procedures to be applied:	The meters at the power plant are adopted to measure the total electricity, and the project owner appoints the staff to record each month. All monitoring data will be archived during and at least two years after the crediting period.
QA/QC procedures to be applied:	Calibration of Meters & Metering should be implemented according to national standards and rules. And all the records should be documented and maintained by the project owner for DOE's verification.
Any comment:	

Data / Parameter:	$EG_{sales,i}$
Data unit:	MWh
Description:	the electricity generated by the project that is sold to the grid or an external facility
Source of data to be used:	Meters at the power plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	134,200
Description of measurement methods and procedures to be applied:	The meters at the power plant are adopted to measure the electricity sold to external entities, and the project owner appoints the staff to record each month. All monitoring data will be archived during and at least two years after the crediting period.
QA/QC procedures to be applied:	Calibration of Meters & Metering should be implemented according to national standards and rules. And all the records should be documented and maintained by the project owner for DOE's verification.
Any comment:	

B.7.2 Description of the monitoring plan:

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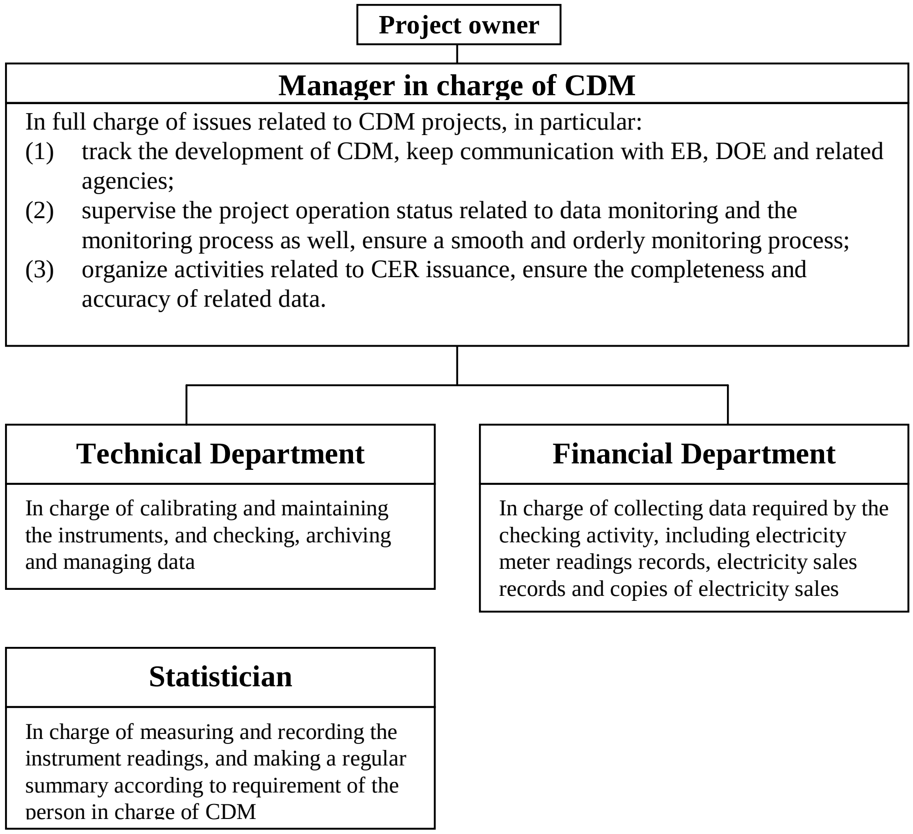
Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established. The proposed project owner is the user of this monitoring plan.

1. The organizational structure of monitoring



2. The data which needs to be monitored

The baseline emission factor for North China Power Grid is fixed on ex-ante calculation and need not to be monitored every year in the first crediting period. Only the net electricity generation from the proposed project activity (EG_y) needs to be monitored. According to ACM0004, EG_y is equal to the total electricity generated (EG_{GEN}) subtracting the auxiliary electricity (EG_{AUX}).Therefore the data needed to be directly measured as follows:

- The total electricity generated (EG_{GEN}): to be measured at the exit of the generators;
- The auxiliary electricity (EG_{AUX}): to be utilized by the power generating equipment in the project boundary.

3. Measurement and Calibration

The electric energy metering should be equipped according the requirements of the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). Before the operation of the proposed project, the project owner and the power grid corporation should examine the electric energy metering according to the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000).

The electricity meter will be installed at the exit of the generators to measure the EG_{GEN}. The DCS will be installed in the proposed project which can online measure, check and collect the meter data.

The electricity meter will be installed in the proper positions to measure the EG_{AUX}. The DCS will be installed in the proposed project which can online measure, check and collect the meter data.

The electricity meters should be calibrated periodically to make sure the precision and reliability of measurement. The proper institute will be employed to calibrate the electricity meters according to the regulations issued by China governments, and the record for calibration should be collected and saved for DOE verification.

The proposed project owner is responsible for installation of the electricity meters, and the grid company takes charge of check and supervision. The electricity meters should be examined and undergo regular field calibration according the relevant standards and regulations of the power industry so as to ensure the sophistication of the meters. After the examination, the meters should be sealed. The lift of the seals requires the presence of both the project owner and the grid company. One party must not lift the seals or fiddle with the meters without the presence of the other party. If the electricity meter or the power check meter requires repair due to the inaccurate readings beyond the error range or the breakdown of the meters, the project owner and the grid company should jointly commission a qualified metering verification institution to make tests and the two parties should keep records on calibration and maintenance.

The steps to monitor the grid-connected power of the proposed project are as follows:

a) The project owner and the grid company will get and record the readings of electricity meters at the grid-connection point within the 24 hours of the last day of every month and check the reading;

b) The project owner does the readings and collection of EG_{GEN} and EG_{AUX};

c) The project owner provides the readings of the electricity meter and copies of invoices to DOE checking personnel.

4. Collection, packing up and storage of the data

The integrated automatic measurement system will automatically read, send and backup all the measurement data which is the original data for monitoring. The person in charge of monitoring should ask the generator operation and management staff to collect and manage the data of monthly grid-connected power generation. At the end of each month, they should backup the monitoring data of that month onto discs and print the data out. The person in charge of monitoring should also keep the copy of electricity sales receipts provided by the project owner to the grid corporation and the settlement certificates given by the grid corporation to the project owner for data check. The yearly grid-connected power generation should be worked out by adding the monthly monitoring data. The discs and written records of the monitoring data and the original data should be kept no less than two years after the crediting period. Moreover, it must be ensured that CDM verification personnel can get the authentic readings of the meters.

5. Monitoring Report

After the proposed project is registered and begins its operation, the monitoring report should be submitted at the end of every year for the verification of DOE. The report should cover the monitoring of grid-connected power generation, check report, report on calibration of the emission reductions and records of monitoring instrument repair and calibration, etc.

The detailed monitoring plan and procedures will be ready prior to the start of crediting period.

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

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The baseline study and monitoring methodology of the proposed project was completed on 30/04/2006.

The entities involved in baseline and monitoring study are:

Da Fei Huang and Ya Qin Chen of EEA Clean Energy China Ltd, email: china@eeafm.com; and

Shanxi Taiyuan Zihuan Environmental Protection Technology Ltd. Address: Dongjihuying Taiyuan City Shanxi, China. Telephone: 86-3513036751, fax: 86-3513036751, e-mail: zj590601@163.com.

The above entities are not the project participants listed in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

01/11/2005

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

>>

21years

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

C.2.1. Renewable crediting period

7×3 years

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

>>

15/05/2008, or the date of CDM registration, whichever takes place latter.

C.2.1.2. Length of the first crediting period:

>>

7years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

SECTION D. Environmental impacts

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

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The Environmental Impact Assessment (EIA) involving this proposed project was carried out by Shanxi Province Chemical Design Institute, which is a second level environment impact assessment entity certified by the State Environmental Protection Administration. The EIA report has already been approved by Shanxi Province Environmental Protection Bureau in 1999. However the project has been delayed to start construction in 2005 because of financial barrier and the unattractiveness of the project. It was only after the project owner became aware of CDM that such barriers were overcome.

According to the *Feasibility Study Report* and the *Environmental Impact Assessment*, environmental impacts possibly caused by the proposed project and protect and guard measures adopted by the project owner are analyzed as follows:

1. Construction period

The proposed project is built at the coking plant with small construction scale, few constructors, short construction period and less land construction work. In the construction period, there is less waste water and solid waste generated by the proposed project. The impact of waste gas and dust because of vehicles transportation on the air quality is small. The noise during the construction period is not big. In all, the impact on the environment of the proposed project can be neglected.

2. Operation period

2.1 Waste gas
The waste gas is from chimney emissions, main pollutant is dust and SO_2.The waste heat collected by the waste heat pipelines is utilized for electricity generation. The waste gas is cooled by the waste heat boilers and then enters the desulphurization equipments. After desulphurization and removing the dust, the gas is emitted into the air through high chimney. The SO_2 reduction rate is 80%, which can meet the second level standard set in GB16297-1996.

2.2 Waste water
The waste water is mainly the production waste water and the life waste water. The production waste water is mainly generated from waste heat boiler and the acid/alkali waste water, which can be solved by supplying desulphurization water. The production waste water also includes the equipments cooling water which can be solved by providing the extinguishing coking water. The waste water resulting from living activities can be treated by septic tank. Through adopting the above measures, the waste water can reach the first level standard set in GB8979-1996.

2.3 Noise

The noise is mainly from the running of the waste heat boiler, steam turbine, generators and other equipments. The equipments with low noise are chosen, and the silencer is installed at the outlet of the waste heat boiler and other equipments. The sound insulation operation rooms will be set up for the water pumps. Through the above measures, the noise can reach the II type standard of GB12348-90 with little impact on the environment.

2.4 Solid wastes

The gypsum generated in the desulphurization equipments and the solid life wastes are collected and transported outside of the power plant to be treated according to the requirements of solid waste treatment.

In order to reduce the negative impacts of the proposed project on the environment, the proposed project owner will also take the following measures:

The project owner will implement the protection measures according to the regulations including the desulphurization system and noise prevention.

The project owner will appoint the staff to monitor the waste gas, waste water and noise.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The EIA report of the proposed project has been approved by the local government. As mentioned above, the environmental impact of the project during the construction period is short, and measures will also be taken to minimize the adverse environmental impacts during operation period. Furthermore, the operation of the proposed project will reduce the “heat pollution” resulting from the waste gas directly emitting to the air. Recovery and utilization of the waste heat for electricity generation is an effective way to realize the clean production of the coking industry. The proposed project plays an important role in improving the local ecological environment.

SECTION E. Stakeholders' comments

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

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During 5th December 2005 to 10th December 2005, the project owner and CDM developer together put out the Soliciting Letter of Public Opinions and the Questionnaires for the proposed project to the stakeholders. The general information for the proposed project, its meaning for local sustainable development and CDM concept is introduced in the Letter.

There are 56 people to participate this investigation. There are 13 persons from the local governments including 3 from Houma City Labour and Social Security Bureau, 6 from Houma City Environmental Protection Bureau, 4 from Houma City Economy and Trade Bureau. There are 18 people from the coking plant and the proposed plant. And 10 people are from other entities: 3 separately from Gaocun Town Middle School, Houma City Huaying Middle School and Dali Town Elementary School, 7 separately from Houma City Central Hospital, Houma City Telecommunication Bureau, Tongcai Architecture Company, Mintian Founding Plant, Dali Founding Plant, Huaqiang Steel Plant etc. There are 15 villagers: 4 from Beiguoma Village, 7 from Dali Village and 4 from Da'nanzhuang Village.

The gender, age and civilization levels of the individuals to participate in this investigation are shown as follows. As for the gender, there are 51 male persons taking up 91.07% and 5 female persons taking up 8.93%. As for the age distribution, there are 8 people at the age of 20～29 accounting for 14.29%, 21 people at the age of 30～39 accounting for 37.50%, 18 people at the age of 40～49 accounting for 32.14%, 7 people at the age of 50～59 accounting for 12.50%,2 people above 60 accounting for 3.57%. As for civilization levels, there are 5 from junior high schools taking up 8.93%, 24 from senior high school taking up 42.86%, 6 from technical secondary school taking up 10.71%, 15 from junior college taking up 26.79% and 6 from college taking up 10.71%.

E.2. Summary of the comments received:

>>

56 questionnaires were distributed to the local people, and 56 questionnaires had been returned. The response rate is 100%. Comments from these questionnaires for local people are summarized in this table.

Numbers	Item	Choice	People(person)	Share
1	Do you know this project?	Know a lot	20	35.71%
		Know a little	34	60.71%
		Know little	2	3.57%
2	How do you think of the environmental protection?	More	24	42.86%
		A little	31	55.36%
		Less	1	1.79%
3	How do you feel the status of the local environment	Good	15	26.79%
		Not so good	32	57.14%
		Bad	9	16.07%
4	What do you think	Realization the clean	27	48.21%

	the main necessity because of the construction of the project	production of coking industry		
		Increase the electricity to the local power grid	23	41.07%
		Improvement of the local environment	6	10.71%
5	The impact on the development of local economy	Positive	56	100%
		Negative	-	-
		Don't know	-	-
6	Considering the advantages and disadvantages of the construction of the proposed project	Advantages bigger than disadvantages, feasible	55	98.21%
		Advantages equal to disadvantages, having no choices	1	1.79%
		Disadvantages bigger advantages not feasible	-	-
7	The attitude for the construction of the proposed project	Support	54	96.43%
		Not support	-	-
		Unaware	2	3.57%
8	Other opinions and suggestions	Taking measures to prevent the pollution from waste water, waste gas and solid waste; Supplying more employment opportunities for local people.		

From the above table, it is shown that 96.43% of the public know the proposed project. 83.93% of the public feel good for local environment, and 16.07% of the public feel the local environment is bad which shows that the proposed project is necessary to be constructed. 48.21% of the public think the proposed project can realize the clean production of coking industry, 41.07% think the proposed project can supply more clean electricity to the power grid and 48.21% think the proposed project can improve the local environment. 100% of the public think the proposed project will be benefit for the development of local economy. The public also brought forward other suggestions and opinions: taking measures to prevent the pollution from waste water, waste gas and solid waste; supplying more employment opportunities for local people. In all, the public hold the positive attitude for the proposed project.

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

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The residents and local government are all very supportive of the proposed project therefore there has been no need to modify the proposed project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No existing official development assistance (ODA) from Annex I countries is involved in the proposed project.

Annex 3

BASELINE INFORMATION

Table A3-1. Electricity generation from fossil fuels in 2003 of North China Grid

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Electricity generation from fossil fuels (MWh)	18608000	32191000	108261000	93962000	65106000	139547000	
station service power consumption rate（%）	7.52	6.79	6.5	7.69	7.66	6.79	
Electricity delivered to the grid from fossil fuels（MWh)	17208678.4	30005231.1	101224035	86736322.2	60118880.4	130071758.7	425364905.8

Source：China Electric Power Yearbook 2004

Table A3-2. Electricity generation from fossil fuels in 2004 of North China Grid

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Electricity generation from fossil fuels (MWh)	18579000	33952000	124970000	104926000	80427000	163918000	
station service power consumption rate（%）	7.94	6.35	6.5	7.7	7.17	7.32	
Electricity delivered to the grid from fossil fuels（MWh)	17103827.4	31796048	116846950	96846698	74660384.1	151919202.4	489173109.9

Source：China Electric Power Yearbook 2005

Table A3-3. Electricity generation from fossil fuels in 2005 of North China Grid

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Electricity generation from fossil fuels (MWh)	20880000	36993000	134348000	128785000	92345000	189880000	
station service power consumption rate（%）	7.73	6.63	6.57	7.42	7.01	7.14	
Electricity delivered to the grid from fossil fuels（MWh)	19,265,976	34540364	125521336	119229153	85871616	176322568	560,751,013

Source：China Electric Power Yearbook 2006

Table A3-4 Calculation of emissions 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=A+B+C +D+E	G	H	I	J=F*G*H*I* 44/12/10000 (mass unit) J=F*G*H*I* 44/12/1000 (volume unit)
Raw coal	10000 t	714.73	1052.74	5482.64	4528.51	3949.32	6808	22535.94	25.8	100	20908	445737636
Cleaned coal	10000 t						9.41	9.41	25.8	100	26344	234511
Other washed coal	10000 t	6.31		67.28	208.21		450.9	732.7	25.8	100	8363	5796681
Coke	10000 t					2.8		2.8	25.8	100	28435	75319
Coke oven gas	100 Mm^3	0.24	1.71		0.9	0.21	0.02	3.08	12.1	100	16726	228560
Other gas	100 Mm^3	16.92		10.63		10.32	1.56	39.43	12.1	100	5227	914400
Crude oil	10000 t						29.68	29.68	20	100	41816	910139
Gasoline	10000 t						0.01	0.01	18.9	100	43070	298
Diesel oil	10000 t	0.29	1.35	4		2.91	5.4	13.95	20.2	100	42652	440693
Fuel oil	10000 t	13.95	0.02	1.11		0.65	10.07	25.8	21.1	100	41816	834672
LPG	10000 t							0	17.2	100	50179	0
Refinery gas	10000 t^3			0.27			0.83	1.1	18.2	100	46055	33807
Natural gas	100 Mm^3		0.5				1.08	1.58	15.3	100	38931	345077
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	9.83					39.21	49.04	0	100	0	0
Total												455551793

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

Table A3-5 Calculation of emissions 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=A+B+C +D+E	G	H	I	J=F*G*H*I* 44/12/10000 (mass unit) J=F*G*H*I* 44/12/1000 (volume unit)
Raw coal	10000 t	823.09	1410	6299.8	5213.2	4932.2	8550	27228.29	25.8	100	20908	538547477
Cleaned coal	10000 t						40	40	25.8	100	26344	996857
Other washed coal	10000 t	6.48		101.04	354.17		284.22	745.91	25.8	100	8363	5901191
Coke	10000 t					0.22		0.22	25.8	100	28435	5918
Coke oven gas	100 Mm^3	0.55		0.54	5.32	0.4	8.73	15.54	12.1	100	16726	1153187
Other gas	100 Mm^3	17.74		24.25	8.2	16.47	1.41	68.07	12.1	100	5227	1578574
Crude oil	10000 t							0	20	100	41816	0
Gasoline	10000 t	0.39	0.84	4.66				5.89	18.9	100	43070	0
Diesel oil	10000 t	14.66		0.16				14.82	20.2	100	42652	186070
Fuel oil	10000 t							0	21.1	100	41816	479451
LPG	10000 t		0.55	1.42				1.97	17.2	100	50179	0
Refinery gas	10000 t^3		0.37		0.19			0.56	18.2	100	46055	60546
Natural gas	100 Mm^3							0	15.3	100	38931	122306
Other petroleum products	10000 t							0	20	100	38369	0
Other coking products	10000 t	9.41		34.64	109.73	4.48		158.26	25.8	100	28435	0
Other energy	10000 tce	823.09	1410	6299.8	5213.2	4932.2	8550	27228.29	0	100	0	0
Total												549031578

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

Table A3-6 Calculation of emissions 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=A+B+C +D+E	G	H	I	J=F*G*H*I* 44/12/10000 (mass unit) J=F*G*H*I* 44/12/1000 (volume unit)
Raw coal	10000 t	897.75	1675.2	6726.5	6176.5	6277.23	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**	25.8	100	28435	8607.8432
Coke oven gas	100 Mm^3	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	100	16726	1742396.483
Other gas	100 Mm^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^3			9.02				**9.02**	18.2	100	46055	277221.0107
Natural gas	100 Mm^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												647686276.3

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

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

Year	2003	2004	2005
Emission from North China Gird (tCO_2)	455551793	549031578	647686276.3
Average Emission Factor of Northeast China Gird (tCO_2e/MWh)	1.1366	1.1741	1.1578
Electricity Import from Northeast China Grid (MWh)	4,244,380	4,514,550	23,423,000
Total Electricity delivery to North China Grid (MWh)	429609285.8	493687659.9	584,174,013
Total Emissions (tCO_2)	451291526.4	543504173.1	674,805,425
Simple OM (tCO_2e/MWh)	1.050470	1.100907	1.155145
Weighted average OM (tCO_2e/MWh)	1.1208		

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

fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Emissions factor (tc/TJ)	Oxidation rate (%)	Heat value (MJ/t, km^3)	Emissions (tCO_2e)
Raw coal	10000 t	897.75	1675.2	6726.5	6176.45	10405.4	6277.23	32158.53	20908	25.8	100	636,062,536
Cleaned coal	10000 t	0	0	0	0	42.18	0	42.18	26344	25.8	100	1,051,186
Other washed coal	10000 t	6.57	0	167.45	373.65	108.69	0	656.36	8363	25.8	100	5,192,725
Coke	10000 t	0	0	0	0	0.11	0.21	0.32	28435	25.8	100	8,608
Sub-total												642,315,054
Crude oil	10000 t	0	0	0	0	0	0.73	0.73	41816	20	100	22,385
Gasoline	10000 t	0	0	0.01	0	0	0	0.01	43070	18.9	100	298
Kerosene	10000 t	0	0	0	0	0	0	0	43070	19.6	100	0
Diesel oil	10000 t	0.48	0	3.54	0	0	0.12	4.14	42652	20.2	100	130,786
Fuel oil	10000 t	12.25	0	0.23	0	0	0.06	12.54	41816	21.1	100	405,690
Other petroleum products	10000 t	0	0	0	0	0	0	0	38369	20	100	0
Sub-total											100	559,160
Natural gas	100 Mm^3	2.8	0.8	0	27.6	0	0	31.2	38931	15.3	100	681,417
Coke oven gas	100 Mm^3	6.4	7.5	6.2	210.8	0	3.9	234.8	16726	12.1	100	1,742,396
Other gas	100 Mm^3	160.9	78.6	388.3	98.8	0	183.7	910.3	5227	12.1	100	2,111,027
LPG	10000 t	0	0	0	0	0	0	0	50179	17.2	100	0
Refinery gas	10000 t	0	0	9.02	0	0	0	9.02	46055	18.2	100	277,221
Sub-total												4,812,062
Total												647,686,276

Accordingly: λ_{Coal} =99.17% , λ_{Oil} =0.08% , λ_{Gas} =0.74%

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

Table A3-9 Installed Capacity of North China Grid in 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

Source: China Electric Power Yearbook 2006

Table A3-10 Installed Capacity of North China Grid in 2004

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
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	111.8	12.4	137.7
total	MW	4514.4	6013.5	20730	18480.5	14321.2	32923.6	96983.2

Source: China Electric Power Yearbook 2005

Table A3-11 Installed Capacity of North China Grid in 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

Source: China Electric Power Yearbook 2004

Table A3-12 Calculation of BM of North China Grid

	Installed capacity in 2003	Installed capacity in 2004	Installed capacity in 2005	Increase between 2003-2005	Ratio of the increase
	A	B	C	D=C-A	
Thermal（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 and others（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 2005	76.22%	84.61%	100%		

$EF_{BM,y}$=0.9465×99.28%=0.9397 tCO_2/MWh

So, CM = 0.5*OM + 0.5*BM = 1.0303 tCO_2/MWh

Annex 4

MONITORING INFORMATION

No further information.

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