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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Name of the Project: Tangshan Xinfeng Thermal & Power Co., Ltd. Waste Gas Power Generation Project
Version of document: 03
Date of document: February 14, 2008

Version 1	19 June 2007	First version, prepared for validation and GSP
Version 2	30 December 2007	Second version, revised based on corrective action requests in the draft validation protocol of the DOE
Version 3	14 February 2008	Final version, additional corrections made based on corrective action requests by the DOE

A.2. Description of the project activity:

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Tangshan Xinfeng Thermal & Power Co., Ltd. Waste Gas Power Generation Project (hereafter referred to as the proposed project) is located in Fengnan District, Tangshan City, Hebei Province and utilizes waste gas (blast furnace gas) generated by Tangshan Guofeng Iron & Steel Co., Ltd. (hereafter referred to as Guofeng Iron & Steel) and Tangshan Bainite Iron and Steel Group Co., Ltd. (hereafter referred to as Bainite Iron & Steel) to generate electricity. After internal gas consumption requirements, there is a surplus of 252,000m^3/h of blast furnace gas available which is not utilized by the two iron and steel facilities (202,000m^3/h from Guofeng Iron & Steel, and 50,000m^3/h from Bainite Iron & Steel). The surplus gas will be used by the proposed project. The max usage of the proposed project will be 201,942m^3/h gas.

The proposed project's installed capacity is 50MW, with 7,200 operation hours per year. It is estimated that the project will generate 360GWh of electricity annually of which 334.8GWh will be supplied to Guofeng transformation station via two 10kV outlets. The electricity generated by the proposed project will be utilized by Guofeng Iron & Steel to satisfy part of its total electricity requirement. Before the implementation of the proposed project, 100% of Guofeng Iron & Steel's electricity requirement was supplied by the North China Power Grid. Therefore, the electricity provided by the proposed project will effectively displace part of the electricity provided by the North China Power Grid (to Guofeng Iron & Steel) which mainly consists of fossil-fuel power plants and therefore avoid GHG emissions. The annual emission reductions are estimated to be 344,777 tCO_2e.

The construction of the proposed project is in line with China's energy industry's priority areas, it supports the sustainable development of host party country and the local area in the following ways:
- Promoting clean production and a circular economy in Iron & Steel industry;
- Supporting the diffusion of waste gas power generation technology within the iron & steel sector;
- Reducing GHG emissions and other pollutants when compared with fossil fuel thermal power sources;
- Creating employment opportunities.

A.3. Project participants:

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The participants of the proposed project include:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Tangshan Xinfeng Thermal & Power Co., Ltd. (Project Owner)	No
United Kingdom	Climate Change Capital Carbon Fund II S.à r.l. (Buyer)	No
United Kingdom	Climate Change Capital Carbon Managed Account Limited (Buyer)	No

Detailed contact information on the Participants and other Parties are provided 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):

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People's Republic of China

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

>>
Hebei Province

A.4.1.3. City/Town/Community etc:

>>
Fengnan District, Tangshan City

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

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The proposed project is located in the north of Fengnan District, Tangshan City, Hebei Province, People's Republic of China. Its geographic location's approximate coordinates are 118°06′24" East longitude and 39°34′31" North latitude and the site is 9 km from the centre of Tangshan City and 150 km from Qinhuangdao Port. The detailed location can be seen in Figure 1.

Figure 1 Geographic location of the proposed project

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

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The project falls within the sectoral scope 1: Energy Industries.

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

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The proposed project generates electricity by utilizing surplus Blast Furnace Gas (BFG) from Guofeng Iron & Steel and Bainite Iron & Steel, and installing two 130t/h boilers and two 25MW condensing turbine generators. The electricity generated by the proposed project will be supplied via two 10kV outlets to the internal electricity grid of Guofeng Iron & Steel. Guofeng Iron & Steel is connected via Guofeng transformation station to the North China Power Grid. The electricity will therefore replace electricity supply by the North China Power Grid to Guofeng Iron & Steel.

The proposed project will burn the gas and generate steam within two 130t/h boilers. Power will be generated by two 25MW condensing turbine generators. Exhaust gases will be vented via a 60-meter high and 3-meter diameter chimney.

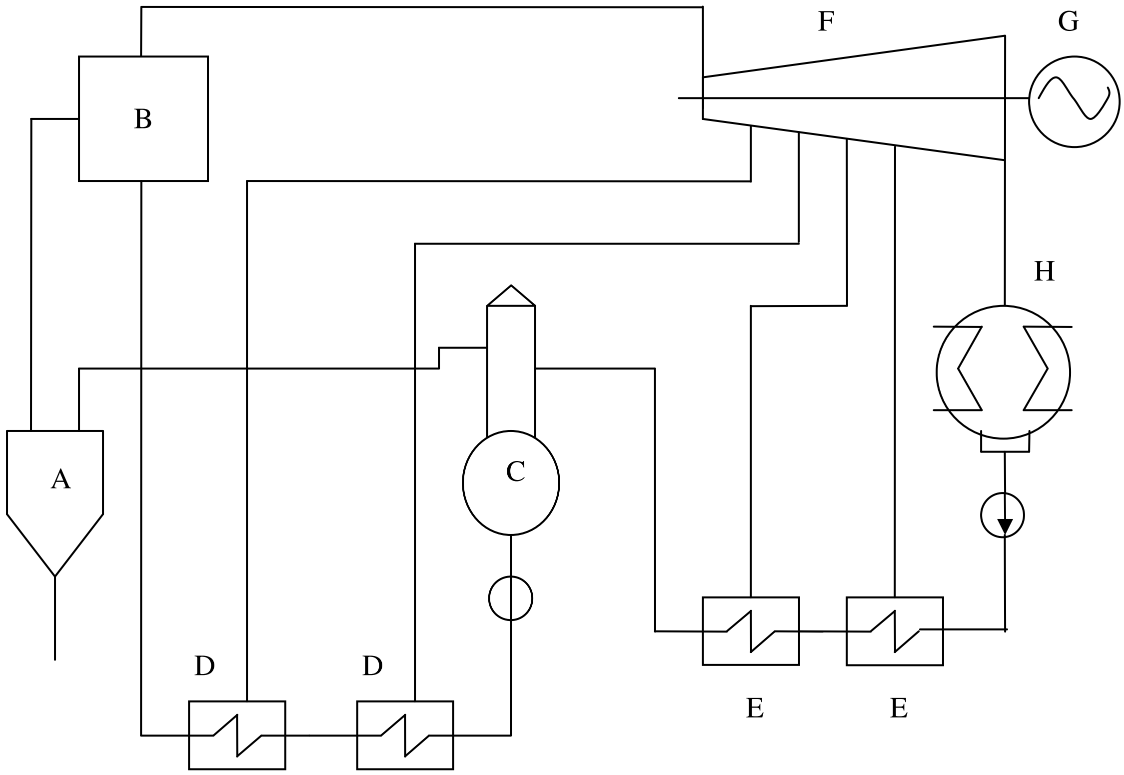
Technical trainings are conducted in accordance with the *training agreement* which sets out the training process, content and frequency. The training agreement is available to the DOE upon request.

The schedule of the implementation of the proposed project is as follows:

-Design (from July 2006 to August 2006);
-Construction (from September 2006 to June 2007);
-Installation (from December 2006 to July 2007);
-Test operation (July 1, 2007 for generator 1# and Aug. 21, 2007 for generator 2#).

Actual operations started late October 2007. As the project is currently in operation, there are no further risks of delay.

Figure 2. Overview schematic of the proposed project



A-BF-gas provision device B-boiler C-deoxidizing device D-high pressure heater
E-low pressure heater F-condensing turbine G-generator H-condenser

The main equipment and parameters are shown in table 1.

Table 1 the main equipments and parameters

Name	Number	Type	Parameters	Producer
Boiler	1	JG-130/5.3-Q	Rated steam pressure: 5.3MPa Rated steam temperature: 485℃ Rated steam volume: 130t/h Thermal efficiency: ≥86.9%	Jiangxi Jianglian Energy & Environment Protection Co., Ltd.
Boiler	1	XD-130/5.3-Qg	Rated steam pressure: 5.3MPa Rated steam temperature: 485℃ Rated steam volume: 130t/h Thermal efficiency: 90%	Tangshan Xinde Boiler Co., Ltd.
Condensing turbine	2	N25-4.9	Rated power: 25MW Rated input steam temperature: 470℃ Rated input steam pressure: 4.9MPa Rated input steam volume: 103t/h Rated output pressure: 0.004MPa	Nanjing Turbine Plant
Generator	2	QF-25-2	Rated voltage: 10.5KV	Nanjing Turbine

			Rated electricity current: 1718A Power factor: 0.8 Rated frequency: 50Hz Rated rotate speed: 3000r/min	Plant
Suction fan	2	Y4-73-11No20D	Volume: 197000m^3/h Pressure: 3500Pa Power: 310KW	Shenyang Fan Co., Ltd.
Blower	2	G4-73-11No12D	Volume: 99500m^3/h Pressure: 3760Pa Power: 160KW	Shenyang Fan Co., Ltd.

No technical transfer is involved in the proposed project as all the technology employed is domestic technology.

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

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The project will apply a 10 years fixed credit period, and will generate an ex-ante estimated 3,447,770 tCO_2e during the fixed 10-year credit period of the project (June 2008 - May 2018)

10-year fixed crediting period (June 2008- May 2018)	
Years	**Annual estimation of emission reductions (in tones of CO_2 e)**
Year 1: 01 June 2008 – 31 May 2009	344,777
Year 2: 01 June 2009 – 31 May 2010	344,777
Year 3: 01 June 2010 – 31 May 2011	344,777
Year 4: 01 June 2011 – 31 May 2012	344,777
Year 5: 01 June 2012 – 31 May 2013	344,777
Year 6: 01 June 2013 – 31 May 2014	344,777
Year 7: 01 June 2014 – 31 May 2015	344,777
Year 8: 01 June 2015 – 31 May 2016	344,777
Year 9: 01 June 2016 – 31 May 2017	344,777
Year 10: 01 June 2017 – 31 May 2018	344,777
Total estimated reductions (tonnes of CO_2e)	**3,447,770**
The number of the crediting years	**10**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**344,777**

A.4.5. Public funding of the project activity:

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No official funds of Parties included in Annex I have been involved in the 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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Baseline and Monitoring Methodology ACM0004: "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation" (ACM0004/Version 02, Sectoral Scope: 01, 03 March. 2006).
The methodology is available on: *http://cdm.unfccc.int/methodologies/approved*

Baseline and monitoring methodology ACM0002: "Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources" (ACM0002/Version 06, Sectoral Scope: 01, 19 May 2006).
The methodology is available on: *http://cdm.unfccc.int/ methodologies/approved*

Tool for the demonstration and assessment of additionality (Version 03, EB29)
The tool is available on: *http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html*

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

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The methodology sets out applicability criteria, all of which are met by the project activity:

- The project activity generates electricity by utilizing the surplus waste gas from Guofeng Iron & Steel and Bainite Iron & Steel to displace supply of electric power from the North China Power Grid to Guofeng Iron & Steel, which satisfies the methodology applicability of "The project that displaces electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels".
- There is no fuel switch in the proposed project activity (the proposed project will solely utilize surplus waste gas which was not utilized before the implementation of the project and the generation of waste gas in Guofeng Iron & Steel and Bainite Iron & Steel will not be increased due to the proposed project), which satisfies the methodology applicability of "The project where no fuel switch is done in the process, where the waste heat or pressure or the waste gas is produced, after the implementation of the project activity".
- The project activity involves the construction of a new facility which satisfies the methodology applicability of "The methodology covers both new and existing facilities".

Therefore, the methodology ACM0004 is applicable to the proposed project.

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

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The spatial extent of the project boundary in accordance with methodology ACM0004 comprises of the proposed CDM project activity itself (i.e. the Gas transportation system, the power plant, generator equipments and internal power lines) and all power plants connecting to North China Power Grid as defined below.

The proposed CDM project activity is connected to internal electricity grid of Guofeng Iron & Steel, which is connected to the Hebei Power Grid. According to "Bulletin about confirming baseline emission factor of regional power grid in China" announced by Office of National Coordination Committee on Climate Change, National Development and Reform Commission (NDRC) of China (DNA of China) on

Dec. 15th, 2006[1], North China Power Grid is a regional grid in China. It consists of the six provincial power grids of Beijing, Tianjin, Hebei, Shanxi, Shandong, and Inner Mongolia. The North China Power Grid imports electricity from the North East China Power grid. We have therefore selected the North East China Power grid as the connected electricity system. These imports are taken into account when calculating the combined margin emission factor of the North China grid.

In accordance with Methodology ACM0004, the only gas accounted for is CO_2 due to grid electricity generation in the baseline. The sources and gases included in the project boundary are described below:

	Source	Gas		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.
	Captive electricity generation	CO_2	Excluded	Not applicable as there is no captive power generation at the project site.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel consumption due to the project activity	CO_2	Excluded	Not included as the project consumes no fossil fuels; no fossil fuels will be used as auxiliary fuels.
		CH_4	Excluded	Excluded for simplification in accordance with the methodology.
		N_2O	Excluded	Excluded for simplification in accordance with the methodology.
	Combustion of waste gas for electricity generation	CO_2	Excluded	The gas would have been flared in the baseline scenario.
		CH_4	Excluded	Excluded for simplification in accordance with the methodology.
		N_2O	Excluded	Excluded for simplification in accordance with the methodology.

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

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The possible alternative scenarios in absence of the CDM project activity are as follows:

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

(b) Import of electric power from North China Power Grid and flaring and/or venting of surplus Gas;

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

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

(e) Other uses of the waste gas.

1 http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235

Alternative (a) is not a financially feasible alternative as will be demonstrated in Section B.5, to which we refer for details.

Alternative (b) is consistent with current laws and regulations and is economically feasible. Therefore, alternative (b) is a possible baseline scenario.

Alternative (c) is not feasible. There is no resource of hydropower, wind energy, solar energy or bio-energy at the local area of the proposed project, so constructing a new power generation plant utilising these renewable energy sources is infeasible. Regarding new fossil based generation capacity, the "Notice from General Office of the PRC State Council on Strictly Prohibiting Constructing Thermal Power Units with the Capacity under 135MW" (state council public notice [2002] NO.6) publicly proclaimed to prohibit constructing fossil fuel power plants with the capacity under 135MW. Therefore, constructing a thermal power plant with the capacity under 135MW as a baseline scenario alternative of the proposed project (50MW) violates the national regulation. For these two reasons, the alternative (c) is not feasible as a baseline scenario.

Alternative (d) is a mix of alternative (b) and (c). As outlined above, alternative (c) can not be the baseline scenario, so the alternative (d) is also not feasible.

Alternative (e) is not feasible. From a technical standpoint, the surplus BF gas could only be flared (as in the baseline) or used to generate power, and there is no other utilization for the surplus Gas. Therefore, the alternative (e) is not feasible as a baseline scenario.

We conclude that the baseline scenario of the proposed project is alternative (b): importing electric power from North China Power Grid and flaring of surplus Gas of Guofeng Iron & Steel and Bainite Iron & Steel.

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

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In accordance with the methodology, the *Tool for the demonstration and assessment of additionality* (Version 03) is used to demonstrate the additionality of the proposed project.

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

The step 1 is to identify feasible alternative to the proposed project activity and the alternative will be baseline scenario (or a part of baseline scenario)

Sub-step 1a. Identify alternatives to the project activity:

Plausible and credible alternatives available to the project that provide outputs or services comparable with the proposed CDM project activity include:

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

(b) Import electric power from North China Power Grid and flaring and/or venting of surplus Gas;

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

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

(e) Other uses of the waste gas.

As outlined in Section B4, alternatives (c), (d) and (e) are not feasible scenarios for technical reasons.

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

According to electric power regulations in China, the construction of fossil fuel power plants with an installed capacity below 135MW are prohibited if the district is covered by a large power grid[2], and the construction of thermal power units with the single-unit capacity below 100MW[3] is strictly controlled. Therefore, constructing a fossil fuel power plant with 50MW capacity will violate the requirements of national regulations and laws. Therefore, alternative (c) and alternative (d) are not feasible.

In accordance with the above, alternative (a) and (b) are the only feasible alternative scenarios.

Step 2. Investment Analysis

An investment analysis has been conducted to demonstrate whether the proposed project is financial attractive without CDM support (alternative a).

Sub-step 2a. Determine appropriate analysis method

The *Tools for the demonstration and assessment of additionality* mentions three investment analysis methods: simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the proposed project will obtain the revenues not only from decreasing electricity purchase but also from CDM, the simple cost analysis method (option I) is not appropriate. Investment comparison analysis method (option II) is applicable to projects whose alternatives are also investment projects. Only on such basis, comparison analysis can be conducted. The alternative baseline scenario of the project is the North China Power Grid rather than new investment projects. Therefore the option II is not an appropriate method for the decision-making context. The project will use the benchmark analysis method, which is described in more details below.

Sub-step 2b. Benchmark Analysis Method (Option3)

The iron and steel industry sectoral benchmark is used as benchmark. According to *Economic Evaluation Method and Parameter of Construction Projects* (version 3), the iron & steel industry's benchmark equity Internal Rate of Return (equity IRR) is 13% and the benchmark project Internal Rate of Return (project IRR) is 12%. This benchmark is applicable, because the waste gas utilized comes from an iron and steel enterprise. The risks associated with the project are therefore those of the iron and steel sector, while the two iron and steel industry enterprises from which the waste gas is obtained could also implement the project themselves. Therefore, the iron & steel industry sectoral benchmark is applied.
We have chosen to conduct the analysis on the basis of the project IRR, which is less unambiguously defined than the equity IRR. Therefore, we will calculate the project IRR and compare it with the applicable benchmark rate of 12%. We would like to note, however, that a calculation of the equity IRR and comparison with the equity IRR benchmark rate of 13% leads to the same conclusion. Both spreadsheets, calculating the project IRR and the equity IRR respectively, have been provided to the DOE for checking.

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[2] *Notification from State Council on Prohibiting Constructing Thermal Power Units with the Installation Capability under135 Thousand KWh,* 2002.

[3] Temporary Rules on Small-scale Thermal Power Units' Construction Management (August, 1997).

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

(1) Basic parameters for calculation of financial indicators

Based on the feasibility study report of the proposed project, basic parameters for calculation of financial indicators are as follows:

Project information		
Indicator	**Value**	**Source**
Installed capacity	50MW	FSR[4], p.58
Estimated annual power supply	334.8GWh	FSR, p.60
Construction period	1yr	FSR, p.60
Project lifetime	20+1yrs	FSR, p.60
Total investment	211.5million RMB	FSR, p.60/61
Working capital	3.7 million RMB	FSR, p.61
Equity	67.18 million RMB	FSR, p.60/61
Expected bus-bar tariff	0.4 RMB/kWh (incl. VAT)	Electricity Purchase Agreement
Annual O&M cost	27.7245 million RMB	FSR, p.61 + grid company document
Value added tax(VAT) rate	17%	Electricity Purchase Agreement
Urban maintenance and construction tax	7% of VAT	FSR, page 61
Education fee	3.5% of VAT	FSR, page 61
Income tax income	33%	FSR, p.61
CER price	8 EURO/tCO_2e	Assumption; NDRC minimum price
Exchange rate	10.758 RMB/EUR	http://finance.yahoo.com/currency
Crediting period	10yrs	This PDD
Loan information		
Indicator	**Value**	**Source**
Debt – short term (2 years)	80,000,000 RMB	Loan agreement
Interest rate short term debt	6.85%	Loan agreement
Debt – long term (15 years)	25,000,000 RMB	Loan agreement
Interest rate long term debt	7.03%	Loan agreement

(2) Comparison of project IRR for the proposed project with the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicator (project IRR after taxes) of the project is lower than the benchmark of 12%, the proposed project is not considered as financially attractive.

The project IRRs of the Project, with and without CDM revenues, are shown as Table 2. Without CDM revenue, the project IRR of total project investment is 7.63%, which is below the benchmark of 12%. The proposed project, without the CDM revenue can therefore be considered as financially unattractive to investors.

With the CDM revenues included (calculated at the NDRC minimum price of Euro 8/tCO_2e, and based on a 10-year crediting period), the revenue from the sale of CERs revenue will significantly improve the project IRR bringing it up to 15.78% and over the benchmark project IRR. Therefore, the project with CDM revenue can be considered as financially attractive to investors and feasible from a business perspective.

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[4] FSR = Feasibility Study Report

Table 2 Financial indicators of the proposed project

	Without CDM	Benchmark	With CDM
Project IRR	7.63%	12%	15.78%

Sub-step 2d. Sensitivity analysis

For the proposed project, the following financial parameters were taken as uncertain factors for a financial sensitivity analysis:

- Investment cost
- Annual power supply
- Annual O&M cost

Provided the three parameters fluctuate within the range of -10%-+10% conform with the instructions of the Chinese authorities for the preparation of feasibility study reports. The corresponding impacts on IRR of the project's investment are shown in Table 3 and Figure 3 for details.

Table 3 Project IRR sensitivity to different financial parameters of the project

Without CDM			
	-10%	**0%**	**+10%**
Investment cost	8.97%	7.63%	6.47%
Annual power supply	6.13%	7.63%	9.06%
Annual O&M costs	8.82%	7.63%	6.39%
With CDM			
	-10%	**0%**	**+10%**
CER price	14.92%	15.78%	16.65%

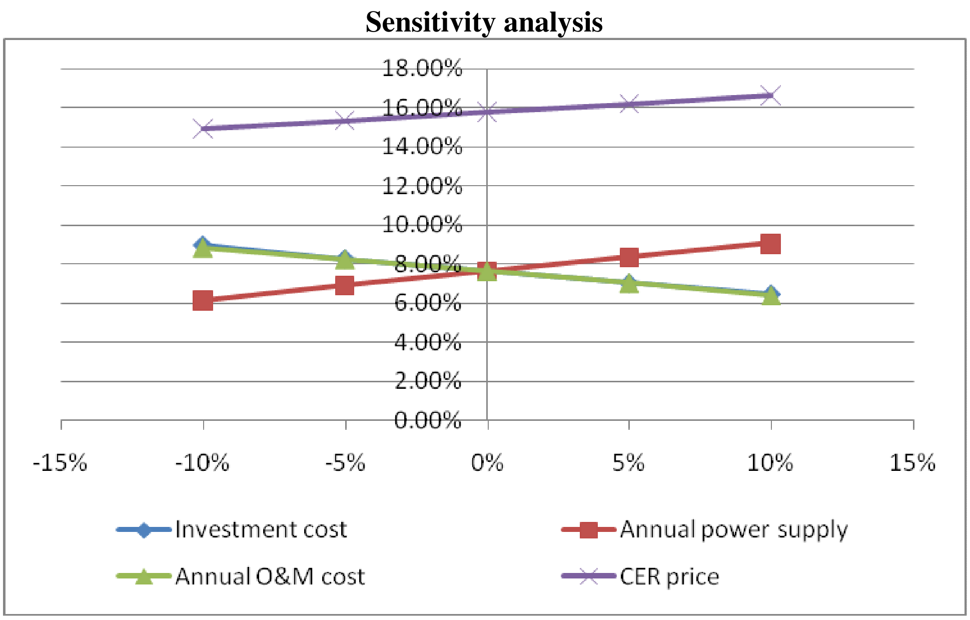


Figure 3. Project IRR sensitivity to different financial parameters of the proposed project (without CDM)

When the above three financial parameters vary within the range from -10% to +10%, the project IRR of the project (without CDM revenues) remains below the benchmark of 12%, as shown in table 3 and figure 3. Therefore, the sensitivity analysis confirms the result of the benchmark analysis using the project IRR.

According to the above analysis, alternative (a), the proposed project activity not undertaken as a CDM project activity is economically infeasible, and hence the project may be considered additional.

With the revenues from CDM added in, the picture is dramatically different. The project IRR is increased to a level in the range of 14-17% (depending on the CER price assumed), which is substantially above the benchmark for the project IRR. Hence the CDM revenues make the project attractive to the investor.

Step 3. Barrier Analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

In accordance with the tool for the demonstration and assessment of additionality, this sub-step is skipped.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

In accordance with the tool for the demonstration and assessment of additionality, this sub-step is skipped.

Step 4 Common practice analysis

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

The proposed project is a newly built 50MW waste gas power generation project in Hebei Province. For the common practice analysis, we have analyzed all similar projects with and installed capacity between 25 and 100 MW in the North China Power Grid that started operations after 2002 or are still under construction. Similar activities identified with such criteria are listed in the follow table.

Project name	Installed capacity (MW)	status
Tangshan Jinxi Iron & Steel CO., LTD. BF-gas generation project	25	Operation in 2003
Laiwu Iron & Steel Group Laigang Inc. 25MW Waste Gas Power Generation Project	25	Applying for CDM
Yinshan Profiled Iron Co., Ltd. 25 MW Waste Gas Power Generation Project of Laiwu Iron & Steel Group Corp.	25	
48MW Waste Gases Recovery and Power Generation Project of Shandong Weifang Iron & Steel Group Corporation, China	48	
50MW Tangshan Iron & Steel Co., Ltd. BF-gas generation project	50	

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

Tangshan Jinxi Iron & Steel Co., Ltd. BF-gas Generation Project started operations in 2003 and has the advantage that it can utilise its own available waste gas, whereas the proposed CDM project activity has to purchase the waste gas form Guofeng Iron & Steel and Bainite Steel & Steel. The cost of purchasing the waste gas has a significant impact in the returns of investment, as has been evidenced in the investment analysis. We therefore conclude that this project can not be considered similar to the proposed CDM project activity.

All of the remaining projects are receiving CDM support or are in the process of applying for CDM project status. We therefore conclude that these projects are experiencing the same poor returns on investments and that the common practise confirms the outcome of the previous steps, i.e. that the proposed project activity without the support of CDM is not common practise and not a feasible alternative.

Conclusion:

It is clear from the above steps that the proposed project activity without the support of CDM revenues is not a feasible alternative. The project entity was aware of this at an early stage and the prospects of CDM revenues were a crucial factor in the decision to implement the project. This is evidenced by the fact that on the 18th of May 2006, long before the start of construction activities in September 2006 (which can be considered as the irreversible decision to implement the project), the board of directors decided to apply for CDM support. Without the prospects of CDM revenues, the proposed CDM project activity would not have been implemented. We conclude that the additionality argument has been satisfied.

The inclusion of CDM revenues increases the project IRR from 7.63% to 15.78%, in other words from a level below the benchmark of 20% to a level above the benchmark of 12%.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The proposed project will calculate GHG emission reductions carried out by the project activity according to methodology ACM0004. The calculation includes:

- Calculate baseline emission;
- Calculate the project emission;
- Calculate leakage;
- Calculate emission reduction.

1. Estimate the Baseline Emission (BE_y)

As the baseline scenario of the proposed project is the provision of electricity by the North China Power Grid to Guofeng Iron & Steel, and therefore option 2 of ACM0004 is adopted to calculate the emission factor of baseline emissions.

Option 2: if the the baseline scenario is grid power imports
If the baseline scenario is determined to be grid power supply, the Emission Factor for displaced electricity is calculated as in ACM0002.

In accordance with the ACM0002 methodology, the baseline emission factor is calculated as a combined margin: an equally weighted average of the operating margin emission factor and the build margin emission factor. The latter is in this particular case calculated *ex ante* on the basis the latest additions to the grid.

This PDD refers to the latest Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor published by the Chinese DNA. We will refer to these emission factors as the 'published emission factors'. As explained in Annex 3, we have compared the data used by the Chinese DNA to the original data sets and used the original data sets where they differ from the data used by the Chinese DNA. Our calculation results in a slightly lower combined margin emission factor than the one that can be calculated based on the published OM and BM emission factor. We have used our own calculated combined margin emission factor in the calculation of emission reductions, **this is conservative**.

For more information on the published OM and BM emission factors, please refer to:
http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=2190

-Baseline emission factors: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
-Calculation of OM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
-Calculation of BM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

The description below focuses on the key elements in the calculation of the published emission factors and the subsequent calculation of emission reductions. The full process of the calculation of the emission factors and all underlying data are presented in English in Annex 3 to this PDD.

Selection of values for net calorific values, CO2 emission factors and oxidation rates of various fuels.

As mentioned above, the Chinese DNA has entrusted key experts with the calculation of the grid emission factors. In these calculations choices have been made for the values of net calorific values, CO2 emission factors, and oxidation rates. The net calorific values are based on the China Energy Statistical Yearbook, and the oxidation rates and the CO2 emission factors are based on IPCC default values. Their use in the calculation of the published emission factors means that these values are deemed appropriate by the Chinese authorities for the calculations of the Chinese emission factors. The following table summarizes the values used. Note that the table lists the carbon emission factor of the fuels, the CO2 emission factor has been obtained by multiplying with 44/12. Rounded figures have been reported but exact figures have been used in the calculations in this PDD.

Default values used for net calorific values, oxidation factors, and CO2 emission factors of fuels

Fuel	Unit	NCV	Oxidation factor	Carbon emission factor	CO2 emission factor
		(TJ/unit)	(Fraction)	(TC/TJ)	(TCO2/TJ)
Raw coal	10^4 Tons	209.08	1	25.8	94.60
Clean coal	10^4 Tons	263.44	1	25.8	94.60
Other washed coal	10^4 Tons	83.63	1	25.8	94.60
Coke	10^4 Tons	284.35	1	29.2	107.07
Coke oven gas	10^8 m^3	1672.6	1	12.1	44.37
Other gas	10^8 m^3	522.70	1	12.1	44.37
Crude oil	10^4 Tons	418.16	1	20.0	73.33
Gasoline	10^4 Tons	430.70	1	18.9	69.30
Diesel	10^4 Tons	426.52	1	20.2	74.07
Fuel oil	10^4 Tons	418.16	1	21.1	77.37
LPG	10^4 Tons	501.79	1	17.2	63.07
Refinery gas	10^4 Tons	460.55	1	15.7	57.57
Natural gas	10^8 m^3	3893.10	1	15.3	56.10
Other petroleum products	10^4 Tons	383.69	1	20.0	73.33
Other coking products	10^4 Tons	284.35	1	25.8	94.60
Other E (standard coal)	10^4 Tce	292.70	1	0.0	0.00

Data source: All data are from the files mentioned above, and have been crosschecked against the original sources cited, as follows:

- Net calorific values: China Energy Statistical Yearbook, 2004 p. 302;
- Oxidation factors: IPCC default values, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy;
- Carbon emission factors: IPCC default values, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy.
- CO2 emission factors: calculated from carbon emission factors

Description of the calculation process

The key methodological steps are:

1. Calculation of the Operating Margin (OM) Emission Factor
2. Calculation of the Build Margin (BM) Emission Factor
3. Calculation of the Baseline Emission Factor
4. Calculation of the Baseline emissions

The methodology is applied to the North China Power grid which is defined as including the grids of Beijing, East and West Inner Mongolia, Hebei, Shandong, Shanxi, and Tianjin, as is further elaborated in Section B.3. Section B.3 also describes how the project boundary is decided.

Step 1. Calculation of the Operating Margin Emission Factor

The ACM0002 methodology offers several options for the calculation of the OM emission factor. Of these, the methodologically preferred one, dispatch analysis, cannot be used, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used. The average OM cannot be used, because low cost/must run resources constitute less than 50% of total grid generation (see Table below). Therefore, the calculation method of simple OM is suitable for this project activity.

Installed capacity and electricity generation of the North China Power Grid, 2001-2005

Year	Installed capacity (%)					Electricity supplied (%)				
	Thermal	Hydro	Nuclear	Others	Total	Thermal	Hydro	Nuclear	Others	Total
2001	95	5	0	0	100	99	1	0	0	100
2002	96	4	0	0	100	99	1	0	0	100
2003	96	4	0	0	100	99	1	0	0	100
2004	97	3	0	0	100	99	1	0	0	100
2005	97	3	0	0	100	99	1	0	0	100

Source: China Electric Power Yearbook (editions 2002, 2003, 2004, 2005 and 2006).

Accordingly, the OM emission factor is calculated as the generation-weighted average emissions per unit of electricity (measured in tCO_2/MWh) of all generating sources serving the system, excluding the low-operating cost and must run power plants.

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (B.1)$$

With:

- $F_{i,j,y}$ 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 costs and must-run power plants. Imports (from North East China Power Grid) are considered a power source, and the relevant emissions are determined using the average emission factor of the North East China Power Grid.
- $COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of fuels used by relevant power sources *j* and the percentage oxidation of the fuel in year(s) *y*;
- $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO2 emission coefficient is equal to the net calorific value of fuel i, multiplied by the oxidation factor of the fuel and the CO2 emission factor per unit of energy of the fuel i.

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (B.2)$$

With:

- 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,
- $EFC_{O2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Data vintage selection

In accordance with the ACM0002 methodology and the choice for an ex ante calculation of the OM Emission Factor, the formula is applied to the three latest years for which data are available, and a full-generation weighted average value is taken for the OM Emission Factor.

Choice of aggregated data sources

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the CO2 emission factor and the oxidation rate. According to the ACM0002 methodology, the selection of aggregated data for the calculation of the emission factors should be used, but the disaggregated data needed for all three more preferred methodological choices is not publicly available in China.

Calculation of the OM emission factor as a three-year full generation weighted average

On the basis of these data, the Operating Margin emission factors for 2003, 2004 and 2005 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Annex 3. We calculate the Operation Margin Emission Factor as 1.1203 tCO2/MWh.[5]

The calculation of the OM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period.

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

The Build Margin Emission Factor is, according to ACM0002, calculated as the generation weighted average emission factor (measured in tCO_2/MWh) of a sample of *m* power plants:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \text{(B.3)}$$

$F_{i,m,y}$, $COEF_{i,m}$ *and* $GEN_{m,y}$ in the formula above are analogous to those in equation 1, except for the fact that the index *m* is over specific power plants rather than types of power plants, and that low cost/must run sources are not excluded. The sample, according to the methodology, should be over the latest 5 power plants added to the grid, or over the last added power plants accounting for at least 20% of power generation, whatever is the greater.

A direct application of this approach is difficult in China. The Executive Board (EB) has provided guidance on this matter with respect to the application of the AMS-1.D and AM0005 methodologies for projects in China on 7 October 2005 in response to a request for clarification by DNV on this matter. The EB accepted the use of capacity additions to identify the share of thermal power plants in additions to the grid instead of using power generation. The relevance of this EB guidance extends to the ACM0002 methodology as 1) the AM0005 methodology has been discontinued and the ACM0002 methodology incorporates in terms of scope projects that would have been eligible to use AM0005, 2) the ACM0002 methodology is based, among others, on NM0023, which was the basis for AM0005, and thus ACM0002 among its possible calculation methods incorporates the AM0005 methodology, and 3) the AMS-1.D methodology refers to the ACM0002 methodology for the baseline emission factor calculation method.

The calculation of the published BM Emission Factor is based on this approach and is described below:

First we calculate the newly–added installed capacity and the share of each power generation technology in the total capacity. Second, we calculate the weights of each power generation technology in the

5 The OM emission factor published by the Chinese DNA is 1.1208 tCO2/MWh.

newly-added installed capacity.[6] Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology, IPCC default oxidation factors and a weighted average carbon emission factor on the basis of IPCC default carbon emission factors of individual fuels.

Since the exact data are aggregated, the calculation will apply the following method: We calculate the share of the CO_2 emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

Using the emission factor for advanced efficient technology we calculate the emission factor for thermal power; the BM emission factor of the power grid will be calculated by multiplying the emission factor of the thermal power with the share of the thermal power in the most recently added 20% of total installed capacity.

Detailed steps and formulas are as below:

First, we calculate the share of CO_2 emissions of the solid, liquid and gaseous fuels in total emissions respectively.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (B.4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (B.5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (B.6)$$

with:

- $F_{i,j,y}$ the amount of the fuel i consumed in y year of j province (measured in tce;
- $COEF_{i,j,y}$ the emission factor of fuel i (measured in tCO2/tce) while taking into account the carbon content and oxidation rate of the fuel *i* consumed in year *y*;
- *COAL,OIL* and *GAS* subscripts standing for the solid fuel, liquid fuel and gas fuel

Second, we calculate the emission factor of the thermal power

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad (B.7)$$

[6] Newly added capacity is determined as follows. First, the latest year (2005) for which data on total installed capacity are available is identified. Then, the last year is identified in which the total installed capacity was below 80% of the total installed capacity in 2005. This defines “newly added capacity”. Note that this approach does not follow the EB decision in response to the DNV request as mentioned in the main text to the letter, but the approach taken is the one that has been followed in numerous PDDs since the EB decision.

While $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the emission factors of advanced coal-fired , oil-fired and gas-fired power generation technology, see detailed parameter and calculation in Annex 3.

Third, we calculate BM of the power grid

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad \text{(B.8)}$$

While CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity. The λs are calculated on the basis of the weight of CO2 emissions of each type of fuel in the total CO2 emissions from thermal power.

We obtain a Build Margin emission factor value of 0.9394 tCO_2/MWh.[7] For details we refer to Annex 3.

The calculation of the BM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the advantage of simplifying monitoring and verification of emission reductions.

Step 3. Calculation of the Grid Power Baseline Emission Factor

The Emission Factor for Grid Power is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_{Elec,y} = (w_{OM} * EF_{OM,y}) + (w_{BM} * EF_{BM,y}) \quad \text{(B.9)}$$

The default weights are used, i.e. each of the Operating Margin and Build Margin is weighted equally.

$w_{OM} = w_{BM} = 0.5$

Applying the default weights, we calculate a Grid Power Baseline Emission Factor of **1.0298** tCO2 / MWh. As this factor is below the combined margin emission factor that can be calculated based on the published OM and BM emission factors, our calculated value is therefore conservative to use.[8]

The calculation of the Baseline Emission Factor is done once (*ex ante*) and will *not* be updated during the first crediting period. The ex ante approach has been used to increase the predictability of the total amount of emission reductions to be generated by the project. This is of value to both the project owner and the buyer of the CERs. Furthermore, the ex ante approach minimizes the amount of work required for the preparation of the monitoring report, and thus minimizes the transaction costs involved in the CER transaction as part of this CDM project activity.

Step 4. Calculation of Baseline Emissions

[7] The BM emission factor published by the Chinese DNA is 0.9397 tCO2/MWh.

[8] Based on the published OM and BM emission factors, we would calculate a CM emission factor of 1.03025 tCO2/MWh. It is therefore conservative to use our own value.

Baseline Emissions are calculated by multiplying the Baseline Emission factor by the net quantity of electricity supplied to the North China Power Grid (i.e. replace electricity supply by the North China Power Grid to Guofeng Iron & Steel) by the proposed project according to the below formulae:

$$BE_{electricity,y} = EG_y * EF_{Electricity,y}$$

2. Estimate the Project Emission (PE_y)

According to the baseline and monitoring methodology ACM0004, project emission (PE_y) is the project emission fueled assistant fossil fuel.

Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler. There are no auxiliary fuels in the project activity, so $PE_y = 0$.

3. Estimating leakage (LE_y)

According to ACM0004, the leakage effect of the project activity can be neglected.

4.Calculate emission reduction(ER_y)

The emission reduction in year y is the difference between baseline emission(EB_y) and project emission(PE_y).

$$ER_y = EB_y - PE_y \quad \text{(B.10)}$$

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

Data / Parameter:	Power generation by source
Data unit:	GWh (per annum)
Description:	Provincial level power generation data by source
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Internal power consumption of power plants
Data unit:	Percentage
Description:	Internal consumption of power by source
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Electric Power Yearbook (Editions 2004, 2005 and 2006)

Value applied:	For detailed values, see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best and most recent data available, and use the same data publication as the calculation of the emission factors published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Amount of each fossil fuel consumed by each power source**
Data unit:	10^4 tons, 10^8 m^3, 10^4 tce, depending on the specific fuel. We refer to Annex for details.
Description:	Physical amount of fuel input, for 17 different fuels
Source of data used:	China Energy Statistical Yearbook 2006, 2005 and 2004 Editions
Value applied:	For detailed values, see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Efficiency of advanced thermal power plant additions**
Data unit:	%
Description:	
Source of data used:	See the downloadable files mentioned above for the full data set. Data are based on the best technologies available in China.
Value applied:	Coal: 35.82%; Oil: 47.67%; Gas: 47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	**Capacity by power generation source**
Data unit:	MW
Description:	For the different power generation sources, installed capacity in 2003, 2004 and 2005 in the North China Grid. Calculated by summing provincial data.
Source of data used:	China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values, see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	Oxidation Factor
Data unit:	Percentage
Description:	Oxidation factors for 17 different fuels
Source of data used:	Data used are IPCC default values. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied:	For detailed values see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These are the most recent data.
Any comment:	

Data / Parameter:	Fuel Emission Coefficients
Data unit:	Tons C/TJ
Description:	Carbon emission factors for 17 different fuels
Source of data used:	Data used are IPCC default values. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied:	For detailed values see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These are the most recent data.
Any comment:	

Data / Parameter:	Electricity imports from connected grids
Data unit:	MWh (per annum)
Description:	Electricity imports of power from other grids
Source of data used:	Original data are from China Electric Power Yearbook (Editions 2004, 2005 and 2006)
Value applied:	For detailed values: see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Original data are from China Electric Power Yearbook (Editions 2004 and 2005) and statistics from the China State Grid Website (2006)
Any comment:	

Data / Parameter:	Net Calorific Value
Data unit:	$TJ/10^4$ tons; $TJ/10^4$ tce; $TJ/10^8m^3$
Description:	Net calorific values of 17 different fuels in TJ per unit.
Source of data used:	See the downloadable files mentioned above for the full data set. Original data are from China Energy Statistical Yearbook, (2004) p. 302.
Value applied:	For detailed values: see Annex 3
Justification of the	These data are the best data available, and have been published by the

choice of data or description of measurement methods and procedures actually applied :	Chinese authorities.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

According to Section B.6.1, the calculation of emission reduction of the proposed project activity is as follows:

1. Baseline emission
According to *Project Application Report*, the proposed project will supply 334.8GWh to Guofeng Iron & Steel (which is connected the North China Power Grid). As explained in Section B.6.1 and Annex 3, we will employ a combined margin emission factor of 1.0298 tCO_2e/MWh. Therefore, the baseline emission of the proposed project is estimated as 344,777 tCO_2e per year.

$$BE_y = EG_y \times EF_y = 334.8 \times 1000 \times 1.0298 = 344{,}777 \text{ tCO}_2\text{e}$$

2. Project emission
The emission of the project activity is zero (see also section B.6.1). $PE_y = 0$

3. Leakage
Leakage is not considered in the project activity (see also section B.6.1). $L_y = 0$

4. Emission reduction

The emission reduction of the proposed project is 344,777 tCO_2e.

$ER_y = EB_y - PE_y$ = 344,777 – 0 = 344,777 tCO_2e.

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

The net emission reduction induced by the project activity in the 10-year fixed crediting period (June 2008 - May 2018) is estimated to be 3,447,770 tCO_2e.

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
Year 1: 01 June 2008 – 31 May 2009	344,777	0	0	344,777
Year 2: 01 June 2009 – 31 May 2010	344,777	0	0	344,777
Year 3: 01 June 2010 – 31 May 2011	344,777	0	0	344,777
Year 4: 01 June 2011 – 31 May 2012	344,777	0	0	344,777
Year 5: 01 June 2012 – 31 May 2013	344,777	0	0	344,777
Year 6: 01 June 2013 – 31 May 2014	344,777	0	0	344,777
Year 7: 01 June 2014 – 31 May 2015	344,777	0	0	344,777
Year 8: 01 June 2015 – 31 May 2016	344,777	0	0	344,777
Year 9: 01 June 2016 – 31 May 2017	344,777	0	0	344,777
Year 10: 01 June 2017 – 31 May 2018	344,777	0	0	344,777
Total emission reductions (tCO_2e)	3,447,770	0	0	3,447,770

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**4.** EG_{GEN}
Data unit:	MWh
Description:	Total Electricity Generated by the project activity
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	360,000 MWh
Description of measurement methods and procedures to be applied:	Directly measured. The generation of power by the project will be measured through national standard electricity metering instruments. The metering instruments will be maintained regularly and calibrated annually in accordance with the "Technical administrative code of electric energy metering (DL/T448 - 2000)" and will have a minimum accuracy of accuracy class 0.5S. **Recording frequency:** Measured continuously and reported on a monthly basis. **Data record:** Electronic with paper back-up. Data will be kept for the duration of the crediting period + 2 years. **Proportion of the data to be monitored:** 100%
QA/QC procedures to be applied:	EG_{GEN} will be metered at project location with standard electronic metering instruments. Calibration will be carried out as described in section B.7.2.
Any comment:	See section B.7.2 for details

Data / Parameter:	**5.** EG_{AUX}
Data unit:	MWh

Description:	Auxiliary Electricity consumed by the project activity
Source of data to be used:	Directly measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	25,200 MWh
Description of measurement methods and procedures to be applied:	Directly measured. The auxiliary electricity consumption by the project will be measured through national standard electricity metering instruments. The metering instruments will be maintained regularly and calibrated annually in accordance with the "Technical administrative code of electric energy metering (DL/T448 - 2000)" and will have a minimum accuracy of accuracy class 0.5S. **Recording frequency:** Measured continuously and reported on a monthly basis. **Data record:** Electronic with paper back-up. Data will be kept for the duration of the crediting period + 2 years. **Proportion of the data to be monitored:** 100%
QA/QC procedures to be applied:	EG_{AUX} will be metered at project location with standard electronic metering instruments. Calibration will be carried out as described in section B.7.2.
Any comment:	See section B.7.2 for details

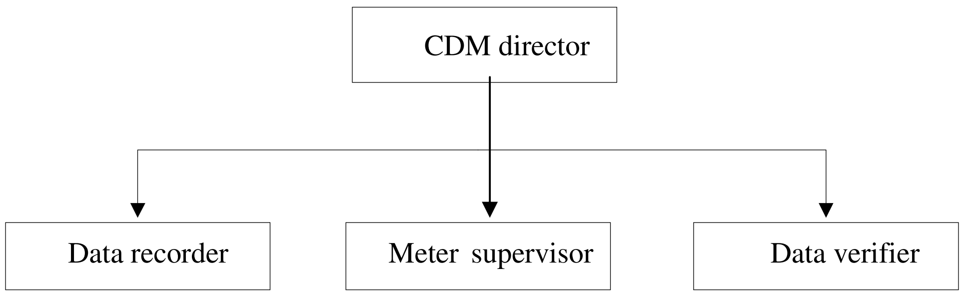
Data / Parameter:	**6.** EG_y
Data unit:	MWh
Description:	Net quantity of electricity supplied to Guofeng Iron & Steel during the year y in MWh
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	334,800 MWh
Description of measurement methods and procedures to be applied:	Calculated from measured parameters as $EG_y = EG_{GEN} – EG_{AUX}$. For details see section B.7.2. **Frequency:** Calculated monthly in the basis of hourly data (EG_{GEN} and EG_{AUX}) **Data record:** Electronic with paper back-up. Data will be kept for the duration of the crediting period + 2 years. **Proportion of the data to be monitored:** 100%
QA/QC procedures to be applied:	The plausibility of EG_y will be verified through the metering record of additional metering instruments which measure power supplied and received more directly (for more information; see section B.7.2).
Any comment:	See section B.7.2 for details

B.7.2 Description of the monitoring plan:

The implementation of the monitoring plan will be the responsibility of the project owner.

1. Monitoring organization

The project owner will set up a special CDM group which will be responsible for data collection, supervision, verification and maintaining records. The group will receive training for implementation of the monitoring plan from CDM consultants. The CDM group will be organized as follows:



2. Monitoring data

Because the baseline emission factor is calculated ex-ante, only net electricity supply (EG_y) by the proposed project will be monitored (calculation of net electricity supply is described below).

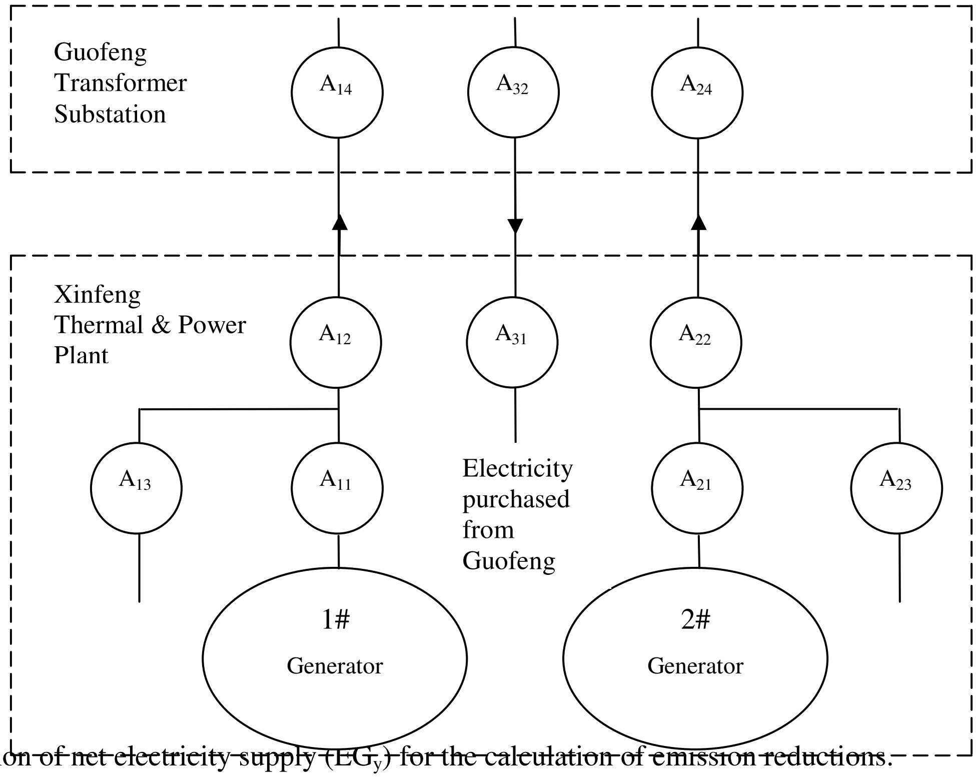
3. Monitoring equipment and installation

Monitoring equipment will be installed and operated in accordance with the "Technical administrative code of electric energy metering (DL/T448 - 2000)" (issued by State Economic and Trade Commission on Nov.03, 2000 and implemented on Jan.1, 2001). Before the operation of this monitoring equipment, the project owner and Guofeng Iron & steel will undertake the appropriate testing and calibration checks in accordance with the above mentioned code.

The proposed project involves the installation of ten ammeters (precision 0.5s). The location of the metering instruments is shown in the figure below.

-Ammeters A_{11} and A_{21} read electricity generated by generators 1# and 2# (EG_{GEN});
-Ammeters A_{13} and A_{23} read auxiliary electricity (EG_{AUX});
-Ammeters A_{12} and A_{22} and ammeters A_{14} and A_{24} read electricity provided to Guofeng Iron & Steel at the proposed project site and at the site of Guofeng Iron & Steel respectively;
-Ammeter A_{31} and A_{32} read electricity purchased from Guofeng Transformer Substation at the proposed project site and at the site of Guofeng Iron & Steel respectively.

All the ammeters will be checked and calibrated in accordance with the appropriate regulations.



4. Calculation of net electricity supply (EG_y) for the calculation of emission reductions.

Net electricity supply by the proposed project activity used in the calculation of emission reductions will be calculated according to the following formulae:

Net supply = $EG_{GEN} - EG_{AUX} = (A_{11} + A_{21}) – (A_{13} - A_{23})$

If for some reason the above metering instruments are defective or fail to provide accurate readings the following formulae can be employed:

Net supply = $A_{12} + A_{22} – A_{31}$

Finally, to confirm the readings of the above metering instruments, net supply will be calculated according to the below formulae:

Net supply: $A_{14} + A_{24} - A_{32}$

In the unlikely case that all metering instruments are damaged or none of the above options provide an accurate estimation of net electricity supply by the proposed project activity, the project entity and Guofeng Iron & Steel will together come up with a conservative estimate of net electricity supply for the period for which no data could be obtained and submit this together with a statement regarding the cause of malfunctioning of the metering instruments to the Verifier. Both the conservative estimate and the statement should be signed by both parties.

5. Data collection

The steps for monitoring project data are as follows:
Metering instruments will be recorded at 24:00 on last day of every month;

Guofeng Iron & Steel will provide a sales receipt for electricity received from the project entity and the project entity will receive invoices for electricity purchased;
The project owner will keep electronic records of all readings of its own ammeters in accordance with the requirements.

5. Maintenance and Adjustment

In order to maintain the required level of metering accuracy, calibration will be implemented periodically in according with relevant state and/or sector standards and regulations and certificated after calibration.

All of the installed metering instruments will be tested and calibrated by a measurement and inspection institution entrusted by both the project owner and Guofeng Iron& Steel, 10 days after one of the following events:
(1) The measured error of the ammeter and the check ammeter is larger than the accepted error;
(2) Ammeter has been repaired.

In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the following procedure for declaring the emergency period to be over:

1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The project entity and Guofeng Iron & Steel will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

6. Data management

The CDM group appointed by the project owner will record monitoring data within the electronic archives at the end of every month. Electronic records should be stored both in hard copy and electronically. The project owner should keep copies of electricity sales records / purchase invoices. Paper documents, such as maps, forms, EIA report etc, will be used with monitoring plan to check authenticity of data. To facilitate verification, the project owner will prepare an index of available project documents and monitoring reports. All of the paper documentation will be kept in the archives by the CDM team, and all of the documents should have at least one back-up copy. All of the data should be stored for at least 2 years after the crediting period.

7. Monitoring report

The project entity will prepare monitoring reports in accordance with the requirements of the methodology.

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

The study of the baseline and the monitoring methodology was completed on December 30, 2007.

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Fax: +86(10) 6500 7569
Email: ever000@126.com

The above individual / organization is not the project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

26/09/2006 (start of construction activities construction)

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

20 years

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

C.2.1. Renewable crediting period

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/06/2008 (or the date of registration, whichever is 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:

According to the requirement of the national environmental protection rules and regulations, the project has completed the environmental assessment report, and Hebei Environment Protection Bureau has ratified the environmental assessment report and agreed to implement the proposed project (Document No.: Jihuanbiao[2006]140). The environmental assessment report emphasizes the following points:

Atmosphere impact

The emission source is from the exhaust gas of the boiler. According to *Emission standard of air pollutants for coal--burning oil-burnig gas-fired boilers (GB 13271-2001)*, the dust content of the proposed project is far below the national standard. After the construction of the proposed project, the emission of exhaust gas and pollutants will not increase, and the pollution loadings at the local area will not increase as a result of the proposed project. Therefore, the operation of the proposed project will not affect the atmosphere.

Noise

During the operation phase, the noise impact mainly comes from fans, turbines, generators, water pump and cooling tower. The project owner will set up special workshops, soundproof rooms and silencers to mitigate the noises. The noise is expected to make very little impact on surrounding villages.

Waste water

Waste water during the construction period mainly comprises of waste water from residence and production. The production waste water mainly comes from boiler and cycle water system. Production waste water will be collected up into municipal pipeline grid and disposed by waste water treatment plant. By taking these measures, the surrounding water environmental quality will not be affected.

Solid waste

Solid waste is mainly composed of construction waste and domestic garbage. The solid waste will be collected to be disposed by the sanitation department.

Ecology impacts

The construction of the proposed project will bring some disadvantage impacts to local entironment. After the construction, the local environment will be improved via trees and grass planting.

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

According to the report of environment impacts and the ratification of relative government departments, the project's environment impacts are not considered significant.

SECTION E. Stakeholders' comments

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

In Jan., 2007, the project owner had a workshop to investigate the stakeholders' attitudes towards the proposed project. Stakeholders who participated included project staff, government representatives, staff from Guofeng Iron & Steel company, and local residents. The summary of the workshop will be narrated in the section E.2.

Local government provided a letter of support, which can be reviewed by the DOE.

E.2. Summary of the comments received:

The workshop was held at the company meeting room on Jan. 12, 2007. Attendees include official, general manager, staff representatives (10 persons), Guofeng Iron & Steel staff representatives (3 persons) and 11 local residents.

The stakeholder workshop can be summarized as follows:

- Staff representatives of the proposed project: the project will improve the employment rate, increase factory income, increase worker income, decrease pollution etc. The project is feasible, and all of the workers support the project.
- Staff representatives of Guofeng Iron & Steel company: the project can provide electricity and reduce pollutants emission by utilizing surplus Gas of Iron & Steel company; Iron & Steel company will benefit from selling Gas. Guofeng Iron & Steel company representatives support the construction of the proposed project.
- Local residents: the project will not bring any negative affect and improve the local environment; the proposed project can also provide residents work opportunities. The residents support the project.

In conclusion, stakeholders think that the project is beneficial to improve environment, advance economy development, energy saving and reduce electric power demand from grid.

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

>>
All of the local residents and government support the project. According to the assessment from stakeholders, there is no necessity to adjust the design, construction and operation manner of the project at present.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No official funds from any Annex 1 country are involved in the proposed project.

Annex 3

BASELINE INFORMATION

As described in Section B.6.1, the key element in the determination of the baseline for this project is the emission factor with which the net power supply from the proposed project activity to the North China Grid (i.e. to Guofeng Iron & Steel, which is connected to the North China Power Grid) is to be multiplied. The emission factor is the combined margin emission factor of the North China Power Grid. Below we provide baseline information used for the calculation of the combined margin emission factor of the North China Power Grid.

Combined margin emission factor calculation of the North China Power Grid

Our baseline calculation follows the methodology used in the OM and BM emission factors baseline calculation published by the office of national coordination committee on climate change on the Internet. Full information on this can be found at their website:
http://cdm.ccchina.gov.cn:80/english/NewsInfo.asp?NewsId=1891

For more detailed information, please see:
-Baseline emission factors: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf
-Calculation of OM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
-Calculation of BM: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Below we provide the main data used in the calculation of the baseline emission factor. Please note that all primary data are from the files downloaded and mentioned above, crosschecked against the data sources mentioned in these documents. For example, if we cite below the China Energy Statistical Yearbook, then that is the primary data source used in the published calculations. Where the primary data source differed from the data used in the calculation of the published emission factor, we have relied on the primary data source. Our final result (the calculated combined margin emission factor) is slightly lower than the result that can be calculated based on the published OM and BM emission factor. In the calculation of emission reductions in this PDD, we have used our own lower calculated combined margin emission factor, **this is conservative**.

Table A1. Calculation of the Combined Margin Emission Factor

	Emission factor A	Value and Source B	Weight C	Weighted value D = B * C
1	EF_{OM}	1.1203	0.5	0.5601
		Table A2		
2	EF_{BM}	0.9394	0.5	0.4697
		Table A10c		
3	CM			1.0298
				D1 + D2

Table A2. Calculation of the Operating Margin Emission Factor

	Variable	2003 A	2004 B	2005 C	Total D
1	Supply of thermal power to North China grid (MWh)	425,364,906	489,173,110	560,751,013	1,475,289,029
		Table A3c, C7	Table A3b, C7	Table A3a, C7	D1 = A1 + B1 + C1
2	Imports of power from North East China grid (MWh)	4,244,380	4,514,550	3,929,000	12,687,930
		Files cited above	Files cited above	Files cited above	D2 = A2 + B2 + C2

3	Total power supply for calculation EF_{OM} (MWh)	429,609,286	493,687,660	564,680,013	1,487,976,959
		A3 = A1 + A2	B3 = B1 + B2	C3 = C1 + C2	D3 = D1 + D2
4	CO2 emissions associated with thermal power generation on North China grid (tCO2)	455,557,075	549,024,041	647,686,276	1,652,267,392
		Table A4c, E	Table A4b, E	Table A4a, E	D4 = A4 + B4 + C4
5	CO2 emissions associated with power imports from North East China grid (tCO2)	4,823,462	5,299,346	4,548,366	14,671,174
		Table A9c, E	Table A9b, E	Table A9a, E	D5 = A5 + B5 + C5
6	Total CO2 emissions for calculation EF_{OM} (tCO2)	460,380,537	554,323,387	652,234,642	1,666,938,567
		A6 = A4 + A5	B6 = B4 + B5	C6 = C4 + C5	D6 = D4 + D5
7	EFOM (tCO2/MWh)	1.07163	1.12282	1.15505	1.12027
		A6 / A3	B6 / B3	C6 / C3	D6 / D3

Table A3a. Calculation of thermal power supply to North China Grid, 2005

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Beijing	20,880,000	7.73	19,265,976
2	Tianjin	36,993,000	6.63	34,540,364
3	Hebei	134,348,000	6.57	125,521,336
4	Shanxi	128,785,000	7.42	119,229,153
5	Inner Mongolia	92,345,000	7.01	85,871,616
6	Shandong	189,880,000	7.14	176,322,568
7	North China			***560,751,013*** C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above, original data are from China Electric Power Yearbook 2006, p. 559-560, 568.

Table A3b. Calculation of thermal power supply to North China Grid, 2004

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Beijing	18,579,000	7.94	17,103,827
2	Tianjin	33,952,000	6.35	31,796,048
3	Hebei	124,970,000	6.5	116,846,950
4	Shanxi	104,926,000	7.7	96,846,698
5	Inner Mongolia	80,427,000	7.17	74,660,384
6	Shandong	163,918,000	7.32	151,919,202
7	North China			***489,173,110*** C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2005, p. 472-474.

Table A3c. Calculation of thermal power supply to North China Grid, 2003

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Beijing	18,608,000	7.52	17,208,678
2	Tianjin	32,191,000	6.79	30,005,231
3	Hebei	108,261,000	6.5	101,224,035
4	Shanxi	93,962,000	7.69	86,736,322
5	Inner Mongolia	65,106,000	7.66	60,118,880
6	Shandong	139,547,000	6.79	130,071,759
7	North China			***425,364,906*** C7 = C1 + C2 + C3 + C4 + C5 + C6

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2004, p. 670, p.709.

Table A4a. Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2005. [9]

Fuel	Unit	Inner Mongolia	Shanxi	Hebei	Shandong	Beijing	Tianjin	North China Grid	NCV (TJ/unit)	Oxidation factor (Fraction)	Carbon coefficient (TC/TJ)	CO2 emissions (tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	6277.23	6176.45	6726.5	10405.4	897.75	1675.2	32158.53	209.08	1	25.8	636,062,536
Clean coal	10^4 Tons	0	0	0	42.18	0	0	42.18	263.44	1	25.8	1,051,186
Other washed coal	10^4 Tons	0	373.65	167.45	108.69	6.57	0	656.36	83.63	1	25.8	5,192,725
Coke	10^4 Tons	0.21	0	0	0.11	0	0	0.32	284.35	1	25.8	8,608
Coke oven gas	10^8 m^3	0.39	21.08	0.62	0	0.64	0.75	23.48	1672.6	1	12.1	1,742,396
Other gas	10^8 m^3	18.37	9.88	38.83	0	16.09	7.86	91.03	522.7	1	12.1	2,111,027
Crude oil	10^4 Tons	0.73	0	0	0	0	0	0.73	418.16	1	20	22,385
Gasoline	10^4 Tons	0	0	0.01	0	0	0	0.01	430.7	1	18.9	298
Diesel	10^4 Tons	0.12	0	3.54	0	0.48	0	4.14	426.52	1	20.2	130,786
Fuel oil	10^4 Tons	0.06	0	0.23	0	12.25	0	12.54	418.16	1	21.1	405,690
LPG	10^4 Tons	0	0	0	0	0	0	0	501.79	1	17.2	0
Refinery gas	10^4 Tons	0	0	9.02	0	0	0	9.02	460.55	1	18.2	277,221
Natural gas	10^8 m^3	0	2.76	0	0	0.28	0.08	3.12	3893.1	1	15.3	681,417
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0	0	0	0	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	7.27	69.31	32.35	118.9	8.58	0	236.41	292.7	1	0	0
Total												647,686,276
												$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2006. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

9 The values used for the carbon coefficients of "Coke" and "Refinery Gas" throughout the baseline calculation are from the original data source (i.e. IPCC 2006 default values), the published emission factors use slightly different values.

Table A4b. Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2004.

Fuel	Unit	Inner Mongolia	Shanxi	Hebei	Shandong	Beijing	Tianjin	North China Grid	NCV (TJ/unit)	Oxidation factor (Fraction)	Carbon coefficient (TC/TJ)	CO2 emissions (tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	4932.2	5213.2	6299.8	8550	823.09	1410	27228.29	209.08	1	25.8	538,547,477
Clean coal	10^4 Tons	0	0	0	40	0	0	40	263.44	1	25.8	996,857
Other washed coal	10^4 Tons	0	354.17	101.04	284.22	6.48	0	745.91	83.63	1	25.8	5,901,191
Coke	10^4 Tons	0.22	0	0	0	0	0	0.22	284.35	1	29.2	6,698
Coke oven gas	10^8 m^3	0.4	5.32	0.54	8.73	0.55	0	15.54	1672.6	1	12.1	1,153,187
Other gas	10^8 m^3	16.47	8.2	24.25	1.41	17.74	0	68.07	522.7	1	12.1	1,578,574
Crude oil	10^4 Tons	0	0	0	0	0	0	0	418.16	1	20	0
Gasoline	10^4 Tons	0	0	0	0	0	0	0	430.7	1	18.9	0
Diesel	10^4 Tons	0	0	4.66	0	0.39	0.84	5.89	426.52	1	20.2	186,070
Fuel oil	10^4 Tons	0	0	0.16	0	14.66	0	14.82	418.16	1	21.1	479,451
LPG	10^4 Tons	0	0	0	0	0	0	0	501.79	1	17.2	0
Refinery gas	10^4 Tons	0	0	1.42	0	0	0.55	1.97	460.55	1	15.7	52,229
Natural gas	10^8 m^3	0	0.19	0	0	0	0.37	0.56	3893.1	1	15.3	122,306
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0	0	0	0	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	4.48	109.73	34.64	0	9.41	0	158.26	292.7	1	0	0
Total												549,024,041
												$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2005. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A4c. Calculation of CO2 emissions from fuels for thermal power production, North China Grid, 2003.

Fuel	Unit	Inner Mongolia	Shanxi	Hebei	Shandong	Beijing	Tianjin	North China Grid	NCV (TJ/unit)	Oxidation factor (Fraction)	Carbon coefficient (TC/TJ)	CO2 emissions (tCO2)
								A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	3949.32	4528.51	5482.64	6808	714.73	1052.74	22535.94	209.08	1	25.8	445,737,636
Clean coal	10^4 Tons	0	0	0	9.41	0	0	9.41	263.44	1	25.8	234,511
Other washed coal	10^4 Tons	0	208.21	67.28	450.9	6.31	0	732.7	83.63	1	25.8	5,796,681
Coke	10^4 Tons	2.8	0	0	0	0	0	2.8	284.35	1	29.2	85,244
Coke oven gas	10^8 m^3	0.21	0.9	0	0.02	0.24	1.71	3.08	1672.6	1	12.1	228,560
Other gas	10^8 m^3	10.32	0	10.63	1.56	16.92	0	39.43	522.7	1	12.1	914,400
Crude oil	10^4 Tons	0	0	0	29.68	0	0	29.68	418.16	1	20	910,139
Gasoline	10^4 Tons	0	0	0	0.01	0	0	0.01	430.7	1	18.9	298
Diesel	10^4 Tons	2.91	0	4	5.4	0.29	1.35	13.95	426.52	1	20.2	440,693
Fuel oil	10^4 Tons	0.65	0	1.11	10.07	13.95	0.02	25.8	418.16	1	21.1	834,672
LPG	10^4 Tons	0	0	0	0	0	0	0	501.79	1	17.2	0
Refinery gas	10^4 Tons	0	0	0.27	0.83	0	0	1.1	460.55	1	15.7	29,164
Natural gas	10^8 m^3	0	0	0	1.08	0	0.5	1.58	3893.1	1	15.3	345,077
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0	0	0	0	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	0	0	0	39.21	9.83	0	49.04	292.7	1	0	0
Total												455,557,075
												$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2004. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A5. Calculation of emissions associated with imports from North East China Grid

Year	Imports (MWh) A	Average emission factor (tCO2/MWh) B	Associated CO2 emissions (tCO2) C = B * A
2005	3,929,000	1.15764	4,548,366
		Table A6	
2004	4,514,550	1.17384	5,299,346
		Table A6	
2003	4,244,380	1.13644	4,823,462
		Table A6	

Table A6. Calculation of average emission factors of North East China Power Grid

		2003	2004	2005
1	Total power supply (MWh)	153,227,363	170,132,885	179,031,569
		Table A7	Table A7	Table A7
2	Total CO2 Emissions (tCO2)	174,132,944	199,708,287	207,254,040
		Table A9c	Table A9b	Table A9a
3 = 2/1	Average emission Factor (tCO2/MWh)	1.13644	1.17384	1.15764

Table A7. Calculation of total power supply on North East China Power Grid[10]

		2003	2004	2005
1	Thermal power supply (MWh)	145,975,752	158,425,475	164,164,426
		Table A8c	Table A8b	Table A8a
2	Non-thermal power supply (MWh)	7,251,611	11,707,410	14,867,143
		Table A8f	Table A8e	Table A8d
3 = 1 + 2	Total power supply (MWh)	153,227,363	170,132,885	179,031,569

Table A8a. Calculation of thermal power supply to North East China Grid, 2005

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Liaoning	83,697,000	7.03	77,813,101
2	Jilin	35,294,000	6.59	32,968,125
3	Heilongjiang	58,000,000	7.96	53,383,200
4	Northeast China			164,164,426
				C4 = C1 + C2 + C3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2006, p. 559-560, 568.

[10] Losses for specific power generation sources are not reported as such in the China Electrical Power Yearbook 2006 and 2004. We have therefore used losses for total power generation listed in the respective yearbooks and applied them to thermal power generation (tables A8a and A8c) and hydro power and other power generation (tables A8d and A8f) in 2005 and 2003. The China Electric Power Yearbook 2005 does list specific losses for thermal power generation and hydro power generation in 2004. We have applied the losses for thermal power to thermal power generation in table A8b and apply the losses for hydro power to hydro power generation in table A8e. Losses for "other generation" in 2004 are not reported, we have therefore assumed them zero. This approach is conservative.

Table A8b. Calculation of thermal power supply to North East China Grid, 2004

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Liaoning	84,543,000	7.21	78,447,450
2	Jilin	33,242,000	7.68	30,689,014
3	Heilongjiang	53,482,000	7.84	49,289,011
4	Northeast China			158,425,475 C4 = C1 + C2 + C3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2005, p. 472-474.

Table A8c. Calculation of thermal power supply to North East China Grid, 2003

	Grid	Thermal Power generation (MWh) A	Losses (%) B	Thermal power supply (MWh) C = A * (100 - B) / 100
1	Liaoning	79,751,000	7.17	74,032,853
2	Jilin	29,739,000	7.32	27,562,105
3	Heilongjiang	48,493,000	8.48	44,380,794
4	Northeast China			145,975,752 C4 = C1 + C2 + C3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2004, p. 670, p.709.

Table A8d. Calculation of non-thermal power supply to North East China Grid, 2005

	Grid	Hydropower generation (MWh) A	Other generation (MWh) B	Non-thermal power generation (MWh) C = A + B	Losses (%) D	Non-thermal power supply (MWh) E = C * (100 - D) / 100
1	Liaoning	5,726,000	245,000	5,971,000	7.03	5,551,239
2	Jilin	8,002,000	99,000	8,101,000	6.59	7,567,144
3	Heilongjiang	1,800,000	100,000	1,900,000	7.96	1,748,760
4	North East China					14,867,143 E4 = E1 + E2 + E3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2006, p. 559-560, 568.

Table A8e. Calculation of non-thermal power supply to North East China Grid, 2004

	Grid	Hydropower generation (MWh) A	Losses (%) B	Hydro power supply (MWh) C = A * (100 - B) / 100	Other supply (MWh) D	Total non-thermal power supply E = C + D
1	Liaoning	3,947,000	1.33	3,894,505	264,000	4,158,505
2	Jilin	6,147,000	0.75	6,100,898	81,000	6,181,898
3	Heilongjiang	1,338,000	1.27	1,321,007	46,000	1,367,007
4	Northeast China			11,316,410	391,000	11,707,410
				C4 = C1 + C2 + C3	D4 = D1 + D2 + D3	E4 = E1 + E2 + E3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2005, p. 472-474.

Table A8f. Calculation of non-thermal power supply to North East China Grid, 2003

	Grid	Hydropower generation (MWh) A	Other generation (MWh) B	Non-thermal power generation (MWh) C = A + B	Losses (%) D	Non-thermal power supply (MWh) E = C * (100 - D) / 100
1	Liaoning	2,383,000	202,000	2,585,000	7.17	2,399,656
2	Jilin	4,080,000	64,000	4,144,000	7.32	3,840,659
3	Heilongjiang	1,105,000	0	1,105,000	8.48	1,011,296
4	North East China					7,251,611
						E4 = E1 + E2 + E3

Source: Files mentioned above. Original data are from China Electric Power Yearbook 2004, p. 670, p.709.

Table A9a. Calculation of CO2 emissions from fuels for thermal power production, North East China Grid, 2005.

Fuel	Unit	Heilongjiang	Liaoning	Jilin	North East China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
						(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
					A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	3,383.21	4,305.41	2,446.13	10,134.75	209.08	1	25.8	200,454,896
Clean coal	10^4 Tons	0	0	0	0.00	263.44	1	25.8	0
Other washed coal	10^4 Tons	24.16	524.74	19.26	568.16	83.63	1	25.8	4,494,940
Coke	10^4 Tons	0	0	0	0.00	284.35	1	29.2	0
Coke oven gas	10^8 m^3	0.68	1.03	3.57	5.28	1672.6	1	12.1	391,817
Other gas	10^8 m^3	0	12.62	8.37	20.99	522.7	1	12.1	486,768
Crude oil	10^4 Tons	0	1.16	0	1.16	418.16	1	20	35,571
Gasoline	10^4 Tons	0	0	0	0.00	430.7	1	18.9	0
Diesel	10^4 Tons	0.57	1.18	1.48	3.23	426.52	1	20.2	102,039
Fuel oil	10^4 Tons	1.55	9.32	2.46	13.33	418.16	1	21.1	431,247
LPG	10^4 Tons	0	0.12	0	0.12	501.79	1	17.2	3,798
Refinery gas	10^4 Tons	1.32	5.48	0	6.80	460.55	1	15.7	180,284
Natural gas	10^8 m^3	2.24	0	0.84	3.08	3893.1	1	15.3	672,681
Other petroleum products	10^4 Tons	0	0	0	0.00	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	0	16.18	0	16.18	292.7	1	0	0
Total									207,254,040
									$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2006. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A9b. Calculation of CO2 emissions from fuels for thermal power production, North East China Grid, 2004.

Fuel	Unit	Heilongjiang	Liaoning	Jilin	North East China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
						(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
					A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	3,084.80	4,144.20	2,310.90	9,539.90	209.08	1	25.8	188,689,377
Clean coal	10^4 Tons	4.88	84.75	1.09	90.72	263.44	1	25.8	2,260,872
Other washed coal	10^4 Tons	61	577.67	14.26	652.93	83.63	1	25.8	5,165,589
Coke	10^4 Tons	0	0	0	0.00	284.35	1	29.2	0
Coke oven gas	10^8 m^3	0	4.83	2.91	7.74	1672.6	1	12.1	574,367
Other gas	10^8 m^3	0	57.33	4.19	61.52	522.7	1	12.1	1,426,677
Crude oil	10^4 Tons	0	0	0	0.00	418.16	1	20	0
Gasoline	10^4 Tons	0	0	0	0.00	430.7	1	18.9	0
Diesel	10^4 Tons	0.24	2.04	1.16	3.44	426.52	1	20.2	108,673
Fuel oil	10^4 Tons	2.86	12.81	1.78	17.45	418.16	1	21.1	564,536
LPG	10^4 Tons	0	2.19	0	2.19	501.79	1	17.2	69,305
Refinery gas	10^4 Tons	1.14	9.79	0	10.93	460.55	1	15.7	289,780
Natural gas	10^8 m^3	2.53	0	0.03	2.56	3893.1	1	15.3	559,111
Other petroleum products	10^4 Tons	0	0	0	0.00	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	0	26.97	5.07	32.04	292.7	1	0	0
Total									199,708,287
									$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2005. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A9c. Calculation of CO2 emissions from fuels for thermal power production, North East China Grid, 2003.

Fuel	Unit	Heilongjiang	Liaoning	Jilin	North East China Grid	NCV	Oxidation factor	Carbon coefficient	CO2 emissions
						(TJ/unit)	(Fraction)	(TC/TJ)	(tCO2)
					A	B	C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	2,763.62	3,556.51	2,006.66	8,326.79	209.08	1	25.8	164,695,313
Clean coal	10^4 Tons	3	70.83	0	73.83	263.44	1	25.8	1,839,949
Other washed coal	10^4 Tons	53.41	617.04	15.9	686.35	83.63	1	25.8	5,429,988
Coke	10^4 Tons	0	0	0	0.00	284.35	1	29.2	0
Coke oven gas	10^8 m^3	0	1.66	0	1.66	1672.6	1	12.1	123,185
Other gas	10^8 m^3	0	5.31	0	5.31	522.7	1	12.1	123,141
Crude oil	10^4 Tons	0	3.39	0	3.39	418.16	1	20	103,955
Gasoline	10^4 Tons	0	0	0	0.00	430.7	1	18.9	0
Diesel	10^4 Tons	0	0.32	0.34	0.66	426.52	1	20.2	20,850
Fuel oil	10^4 Tons	4.32	14.87	0.7	19.89	418.16	1	21.1	643,474
LPG	10^4 Tons	0	1.55	0	1.55	501.79	1	17.2	49,052
Refinery gas	10^4 Tons	0.46	4.03	0	4.49	460.55	1	15.7	119,040
Natural gas	10^8 m^3	4.47	0	0.04	4.51	3893.1	1	15.3	984,997
Other petroleum products	10^4 Tons	0	0	0	0.00	383.69	1	20	0
Other coking products	10^4 Tons	0	0	0	0.00	284.35	1	25.8	0
Other E (standard coal)	10^4 Tce	0	29.38	0	29.38	292.7	1	0	0
Total									174,132,944
									$\Sigma(E_i)$

Data source: Fuel consumption data are from files mentioned above and crosschecked against the China Energy Statistical Yearbook 2004. Net calorific values are from the files mentioned above and crosschecked against China Energy Statistical Yearbook, 2004 p. 302; Oxidation factors and fuel emission coefficients are from the files mentioned above and crosschecked against IPCC default values, see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (energy).

Table A10. Calculation of the BM Emission Factor, North China Grid

$EF_{thermal}$ (tCO2/MWh)	Share of thermal power in added capacity, 2005-2003	EF_{BM} (tCO2/MWh)
A	B	C = A * B
0.94614	99.28%	0.93935
Table A11	Table A14	

Table A11. Calculation of EF thermal

		λ A	EF_{adv} B	$EF_{thermal}$ calculation C = A * B
1	Coal	99.17%	0.95075	0.94287
		Table A13	Table A12	
2	Gas	0.74%	0.37635	0.00280
		Table A13	Table A12	
3	Oil	0.09%	0.55028	0.00048
		Table A13	Table A12	
4	$EF_{thermal}$			0.94614

Table A12. Calculation of Emission factors of fuel using advanced technologies

Fuel	Efficiency (%) A	Carbon coefficient (tc/TJ) B	Oxidation factor C	EF_{adv} (tCO2/MWh) D=(3.6/(A*1000))*B*C*44/12
Coal	35.82%	25.8	1	0.95075
Gas	47.67%	13.6	1	0.37635
Oil	47.67%	19.9	1	0.55028

Source: Files downloaded and mentioned above.

Table A13. Calculation of λs for the calculation of the BM, North China Grid.

Fuel	Unit	North China Grid	NCV	Total energy consumption North China	Oxidation factor	Carbon coefficient	CO_2 emissions
			(TJ/unit)	TJ	(Fraction)	(TC/TJ)	(tCO_2)
		A	B		C	D	E = A*B*C*D*44/12
Raw coal	10^4 Tons	32158.53	209.08	6,723,705	1	25.8	636,062,536
Clean coal	10^4 Tons	42.18	263.44	11,112	1	25.8	1,051,186
Other washed coal	10^4 Tons	656.36	83.63	54,891	1	25.8	5,192,725
Coke	10^4 Tons	0.32	284.35	91	1	25.8	8,608
Other coking products	10^4 Tons	0	284.35	0	1	25.8	0
Coal, total				***6,789,800***			***642,315,054***
Coke oven gas	10^8 m^3	23.48	1672.6	47,581	1	12.1	1,742,396
Other gas	10^8 m^3	91.03	522.7	0	1	12.1	2,111,027
LPG	10^4 Tons	0	501.79	4,154	1	17.2	0
Refinery gas	10^4 Tons	9.02	460.55	12,146	1	18.2	277,221
Natural gas	10^8 m^3	3.12	3893.1	0	1	15.3	681,417
Gas total				***63,882***			***4,812,062***
Crude oil	10^4 Tons	0.73	418.16	4	1	20	22,385
Gasoline	10^4 Tons	0.01	430.7	1,766	1	18.9	298
Diesel	10^4 Tons	4.14	426.52	5,244	1	20.2	130,786
Fuel oil	10^4 Tons	12.54	418.16	0	1	21.1	405,690
Other petroleum products	10^4 Tons	0	383.69	0	1	20	0
Oil total				***7,014***			***559,160***
Total							***647,686,276***
							$\Sigma(E_i)$

Share of fuel group in total CO2 emissions	
λ coal	99.17%
λ gas	0.74%
λ oil	0.09%

Weighted average carbon coefficient (tc/TJ)	
Coal	25.8
Gas	13.6
Oil	19.9

Note: Main data are from table A4a. *λ is calculated as the share of coal, gas respectively oil in total CO_2 emissions.* The weighted average carbon coefficients of the fuel groups (coal, gas and oil) have been calculated as a weighted average with the share of total energy consumption as weights.

Table A14. Calculation of the share of thermal power in recently added capacity

Installed capacity	2003 A	2004 B	2005 C	Capacity added in 2003-2005 D=C-A	Share in added capacity
Thermal (MW)	84006.6	93594.9	111068.7	27062.1	99.28%
Hydropower (MW)	3266	3250.7	3216.2	-49.8	-0.18%
Nuclear (MW)	0	0	0	0	0.00%
Other (MW)	90.1	137.5	335.5	245.4	0.90%
Total (MW)	87362.7	96983.1	114620.4	27257.7	100.00%
Percentage of 2005 capacity	76.22%	84.61%	100%		

Source: China Electric Power Yearbook 2006, p. 571; China Electric Power Yearbook 2005, p. 473; and China Electric Power Yearbook 2004, p. 670, p.709

Annex 4

MONITORING INFORMATION

Detailed information on monitoring is available in section B.7.2.