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:

Project Title: Wu'an Municipality Tongbao Coking Oven and CDQ Waste Heat Recovery Project
PDD Version: 2.0
Date: 15th April 2008

Revision history of the PDD

Version	Date	Comments
Version 1.0	1st March 2008	First version of PDD, prepared for the host country approval process
Version 2.0	15th April 2008	PDD submitted to DOE for validation (start GSP)

A.2. Description of the project activity:

Summary

The purpose of the proposed project is to utilize waste heat from coking process for power generation at Hebei Wu'an Tongbao Coking Co., Ltd.. Currently the plant is producing coke with clean coke ovens. Clean coke oven is also known as non-recovery type oven, which burns chemical produces and harmful substance from coking process thoroughly inside to prevent coking fume from being discharged into atmosphere. Tail gas from this kind of ovens is not combustible but contains a lot of heat, which is going to be recovered for electricity generation by proposed project. Another source of heat is the counter-flowing gas within the coke dry quenching (CDQ) system, which absorbs heat from the hot carbonized coke from ovens. The proposed project is to adopt heat-exchange-type boilers to collect the waste heat to produce steam propelling turbines and generators for power generation. Five boilers will be installed for heat recovery from coke ovens and another one boiler is to be installed for waste heat recovery from CDQ system. There will be six boilers in total. Besides electricity generation, a small portion of the steam generated by boilers will be used to replace the current running coal-based boiler to supply heat to the residents of the plant in winter.

The total installation capacity is 60 MW. The estimated utilization time is 7920 hours (330 days). The project is expected to generate electricity of about 3.8×10^5 MWh annually. The electricity generated will replace equivalent amount of electricity from North China Power Grid. In absence of the project, equivalent amount of electricity exported to the grid by the proposed project would have otherwise been supplied by North China Power Grid; equivalent amount of heat supplied by the waste heat recovery boiler would have otherwise been supplied by the coal-based boiler. Greenhouse gas (GHG) emissions will be reduced by avoiding CO2 emissions from those fuel-based power plants connected to the grid and by avoiding CO2 emissions from the coal-based boiler in the plant. The expected annual emission reductions is 391,495 tonnes CO2e[1]. Emission reductions from steam generation with waste heat are not counted as a conservative approach.

[1] The proposed project consists of two units of generators. One unit will start a half year earlier than the other one. Hence the expected emission reductions in the first half year of the crediting periods will be 97,847 tonnes CO2e, one fourth of the annual emission reductions of two units. As a result, the average annual emission reductions in the crediting periods (7 years) will also be lower than 391,495 tonnes CO2e, the annual emission reductions of two units.

Contribution to sustainable development
The project activity contributes significantly to the region's sustainable development in the following ways:

- In recent years, China has experienced a huge increase in power consumption. Both public and private parties are struggling to meet the demand of electricity. The proposed project will bridge the gap between supply and demand of power in a sustainable manner on a regional and national level.
- Energy and resource will be saved by utilization of waste heat to generate electricity. This is in accordance with the national and local industry policies. Local environment will reduce the pollution by eliminating the heat brought by directly discharging waste heat into the atmosphere in absence of the project activity. In China, more than 80% of total electricity is generated from coal-based power plants. Being so heavily dependant on coal for its energy demand, this project carries environmental benefits to the country's air, soil and water sources. The project activity will replace the generation of fossil fuel power plants and reduce CO2, SOx and NOx emissions significantly, as well as mitigate the air pollution and its adverse impacts on human health. The proposed project will contribute in mitigating the global warming and climate change by preventing anthropogenic emissions of greenhouse gas that would have otherwise happened in absence of the project activity.
- By utilizing the modern technology of clean coking ovens with heat recovery technology, the proposed project will contribute in promoting advanced environment-friendly technology in coking industry of China.
- The proposed project activity will bring more employment opportunities for local people. The plant owner estimated that more than 200 people will be engaged in construction period of one year and there will be 154 people engaged on the plant operation on a regular basis (according to the FSR).

Sustainable Development Assessment (required by Gold Standard)

The project participants are planning to apply for Gold Standard for the proposed project. In order for the project to be eligible for the Gold Standard, the project activity is assessed against a matrix of sustainable development indicators.

Component • Indicators	**Score** (-2 to +2)	**Rational**
Local / Regional / Global Environment		
• Water quality and quantity	+2*	In absence of the project activity, the coke wet quenching facility (CWQ) would have consumed huge amount of water. According to the Feasibility Study Report, 500 kg water will be saved from quenching of each tonne of coke with CDQ. With 5 sets of coke ovens, the annual coke production is about 600,000 tonnes. Based on this figure, the annual water saving would be around 300,000 tonnes.
• Air quality (emissions other than GHG)	+2*	Besides GHG emission reductions, implementation of the project also has other advantages over baseline scenario in terms of impacts on air quality.

		By installing de-dusting facility, dust emissions will be greatly reduced. Since the quenching will take place in closed cooling chamber, emissions of carbon monoxide (CO) and hydrogen sulphide (H2S) will be reduced too. Installation of the de-sulphur unit ensures final emission will be within the standard of GB13223-2003.
• Other pollutants (including, where relevant, toxicity, radioactivity, POPs, stratospheric ozone layer depleting gases)	0	There is no significant difference on this point.
• Soil condition (quality and quantity)	0	Construction of the project is on vacant land within the plant boundary. Implementation of the project does not lead to soil pollution. As compared to the baseline, there is no significant change in soil condition, in quality and quantity.
• Biodiversity (species and habitat conservation)	0	As compared to the baseline, no significant change in biodiversity is expected since the project only takes place within the plant boundary.
Sub Total	**+4**	
Social Sustainability and Development		
• Employment (including job quality, fulfilment of labour standards)	+2*	The project leads to employment generation in the power plant itself and in the implementation as a GS CDM project. The project participants will record how many people are engaged for the project each year. The quality of the job will be improved also, mainly because it is the first time local employee gets to know GHG, global warming and other relative issues. Project manager and operators in the plant will have chance to learn new knowledge of sophisticated monitoring equipments and computer operations.
• Livelihood of the poor (including poverty alleviation, distributional equity, and access to essential services)	+1	Wu'an municipality is a less developed place with annual income less than 500 EU per capita. The project will generate additional income to people involved.
• Access to energy services	+2*	China has been in lack of power for years due to its fast economy development. The project activity adds new capacity to grid and helps improving electricity availability. Power generation from the project activity will be monitored and reported to verifier.
• Human and institutional capacity (including empowerment, education, involvement, gender)	+1	People involved are trained with skills for operation of the power generation facility and knowledge of Kyoto Protocol. This is the first time local people are organised to work on a project under the Kyoto Protocol. Success of the project will contribute a team with experience of waste heat recovery and CDQ technology to Chinese coke industry.
Sub Total	**+6**	

Economic and Technological Development		
• Employment (numbers)	+2*	The project activity generates employment opportunities during the project's construction and operation period. Preliminary design and feasibility study of the project also involved many manpower input. Project participants will monitor and record how much manpower demand is generated by construction and operation of the project.
• Balance of payments (sustainability)	0	All equipments of the proposed project are purchased from domestic manufactures. No import and export is involved in the project activity. Hence, compared with baseline scenario there is no significant difference in term of balance of payments.
• Technological self reliance (including project replicability, hard currency liability, institutional capacity, technology transfer)	+1	Implementation of the project does not involve technology transfer. While the success of the project surely will encourage more clean production practice in coke plants in China. Currently most of the coke plants in China are still running with conventional technology of coke wet quenching and the waste heat is emitted into atmosphere directly without waste heat recovery. The proposed project will contribute in shifting the less developed image of the coke industry in China.
Sub Total	**+3**	
Total	**+13**	

A.3. Project participants:

Table A.1 Projects Participants

Name of Party Involved ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Wu'an Tongbao Coking Co., Ltd.	No
Switzerland	South Pole Carbon Asset Management Ltd. (CER Buyer)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Hebei Province

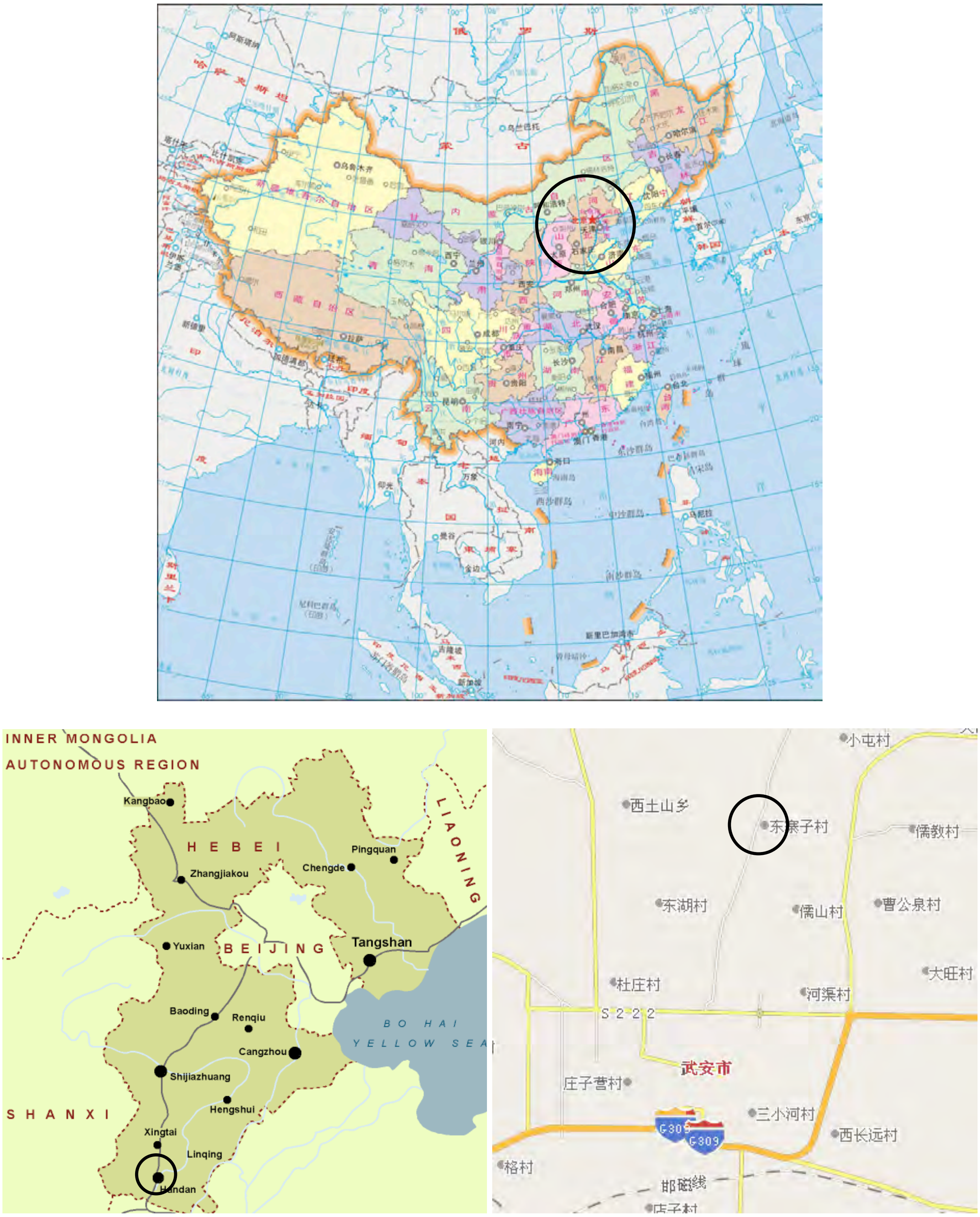
A.4.1.3. City/Town/Community etc:

Dongzhaizi Village, Xitushan Town, Wu'an City (county-level city), Handan City (region)

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

The project is located in Dongzhaizi Village, Xitushan Town, Wu'an City (county-level city), Handan City, Hebei Province, P.R.China. The plant is by national road G309. The exact location of the plant is 36°44′13″N 114°12′40″E. A map indicating the location of the project site is provided in Fig A.1:

Fig A.1. Location of the proposed project



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

Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)
Sectoral Scope 4: Manufacturing industries

Gold Standard Eligibility

The proposed project falls under following category of Gold Standard:
End Use Energy Efficiency Improvement: Industrial energy efficiency
The plant will consume part of the electricity generated by the project activity internally to replace the power supplied by North China Power Grid. Surplus power generation will be sent to the grid.

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

Heat source of the proposed project is tail gas from clean-type coke ovens and counter-flowing gas of coke dry quenching (CDQ) system. Tail tail gas from clean-type coke ovens is not combustible but contains a lot of sensible heat. The temperature is around 1050 °C. Before implementation of the proposed project, tail gas from coke ovens are directly emitted into atmosphere. Currently the plant is planning to replace the coke wet quenching (CWQ) system with coke dry quenching (CDQ) system. Tail heat of the counter-flowing gas of CDQ process will also be recovered by the proposed project.

The proposed project will install six units of boilers with heat exchangers to collect waste heat from waste gas and produce steam for electricity generation. The key parameters of the steam boilers are summarized as Table A.2 below.

Table A.2 Key Parameters of Boiler

Boiler Parameter	Value
Model	Q120/650-35-3.82/450
Quantity	6
Rated Steam Capacity	35 tonnes/h
Rated Steam Pressure	3.82 MPa
Rated Steam Temperature	450 °C
Temperature of Water Feed	105-120 °C
Temperature of Emitted Fume	150 °C

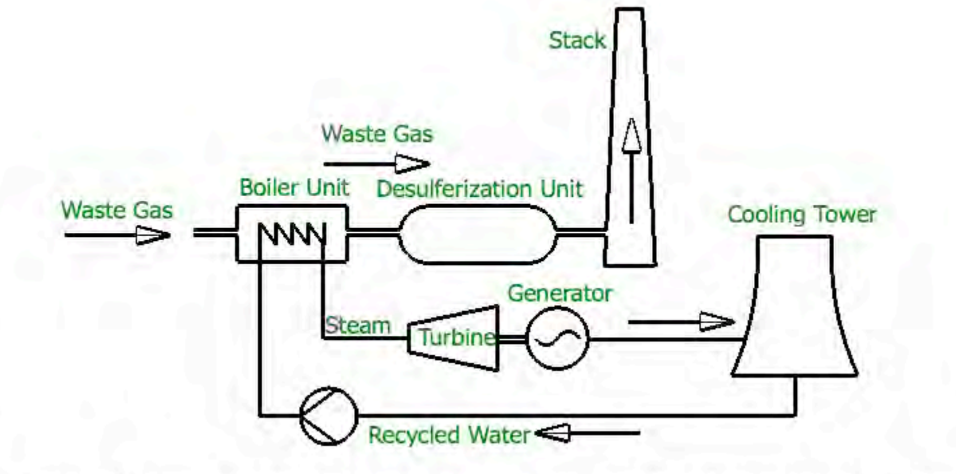
Steam from boilers will be used to drive two units of turbines and generators. Each has installation capacity of 30 MW. The key parameters of the generators are summarized as Table A.3 below.

Table A.3 Key Parameters of Turbine and Generator

Turbine Parameter	Value	Generator Parameter	Value
Model	N6-35	Model	QF-K6-2
Quantity	2	Quantity	2
Rated Capacity	30 MW	Rated Capacity	30 MW
Rated Rotating Speed	3000 r.p.m.	Rated Rotating Speed	3000 r.p.m.
Inlet Pressure	3.43 MPa	Rated Current	412.2 A
Inlet Temperature	435 °C	Rated Voltage	10.5 kV
		Power Factor	0.8

Tail gas out of boiler heat exchanger will pass through desulfuration unit and be vented into air when it meets national emission standard. Since technology for boilers, turbines and generators are quite advanced in China, all the equipments will be purchased from domestic manufactures. There is no technology transfer involved in the proposed project activity. Figure A.2 shows the process of the proposed project activity.

Fig A.2 Schematic Diagram of Waste Heat Recovery for Electricity Generation Process



Process Diagram of Waste Heat to Energy Project at Tongbao Coking Co., Ltd.

GOLD STANDARD: Knowledge innovation of clean type coke ovens and CDQ

Clean Type Coke Ovens
Clean type coke ovens use the volatile compounds driven from the coal as fuel to heat the ovens. This kind of oven eliminates the complicated recovery piping systems that are prone to leaks and breakage. The U.S. Environmental Protection Agency considers clean type coke making technology to be the best achievable technology under the federal Clean Air Act[2].
Shanxi Provincial Chemical Design Institute (SPCDI), manufacture of QRD ovens, is a leading design institute approved by the government, has many patents and proprietary technology. It is reported that QRD type is the most advanced clean type coke oven so far[3].

CDQ Facilities
CDQ is the equipment that quenches red-hot coke by means of circulating inert gas in a quenching chamber (red-hot coke is dry distilled in a coke oven). The introduction of CDQ equipment brings excellent benefits. The working environment around CDQ equipment is improved, because CDQ equipment prevents dust from spreading into atmosphere by enclosing all the process. The sensible heat of the red-hot coke is recovered and heat-exchanged into steam by a boiler. The steam produced without additional energy is used for the generation of electric power. The moderate cooling rate of the red-hot coke in the CDQ equipment improves coke quality and stabilizes blast furnace operation.

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

The specific project activity applies for renewable crediting periods, and the estimation of the emission reductions during the first crediting period (from 2008 to 2015) is provided in Table A.4. Total estimated emission reductions during the first crediting period amount to 2,642,591 tCO_2e.

Table A.4 Estimation of the Emission Reductions during the First Crediting Period

[2] http://www.epa.gov/

[3] HUANG Ling, LI Zhong-qing. Sci/Tech Information Development & Economy, 2005 Volume 21, The Highest Level of Chinese Non-recovery Coking Technique--Introduction of the QRD Anthracite Clear-type Thermal-recovery Stamping Mechanical Coke Oven.

Years	Estimation of annual emission reductions (tCO_2e)
2008 (from 1/7/2008)	97,874[4]
2009	391,495
2010	391,495
2011	391,495
2012	391,495
2013	391,495
2014	391,495
2015 (until 30/June/2018)	195,747
Total estimated reductions (tonnes of CO_2 e)	**2,642,591**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	**377,513**

A.4.5. Public funding of the project activity:

There is no public funding from Annex I countries involved in the project activity.

ADDITIONAL REQUIREMENTS FOR THE GOLD STANDARD

ODA Additionality Screen

In order to meet the requirements of the Gold Standard, the project participants here claim that the project activity do not use Official Development Assistance (ODA) funding, directly or indirectly.

A clear and transparent finance plan will be provided on request of DOE so the validator can assess whether the project financing includes ODA. This will be presented as a separate document, and remains in commercial confidence.

[4] The proposed project consists of two units of generators. One unit will start a half year earlier than the other one. Hence the expected emission reductions in the first half year of the crediting periods will be 97,847 tonnes CO2e, one fourth of the annual emission reductions of two units. As a result, the average annual emission reductions in the crediting periods will also be lower than 391,495 tonnes CO2e, the annual emission reductions of two units.

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:

The approved consolidated baseline and monitoring methodology ACM0012 *"Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system" (*Version 02*)* is applied to the project activity.

For calculation of the combined margin baseline emission factor of *North China Power Grid*, this methodology also refers to the *"Tool to calculate the emission factor for an electricity system"* (Version 01).

For demonstrate additionality of the proposed project, the latest version of the *"Tool for the demonstration and assessment of additionality"* (Version 04) is used.

For more information about the methodology, the emission factor tool and the additionality tool please refer to the website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The approved consolidated methodology is applicable to the project due to following reasons summarized in Table B.1 below:

Table B.1 Applicability of the Methodology to the Project

Serial No.	Applicable Conditions of the Methodology	Conditions of the Proposed Project
1	The consolidated methodology is for project activities that utilize waste gas and/or waste heat as an energy source for cogeneration, or generation of electricity, or direct use as process heat source, or for generation of heat in element process. The consolidated methodology is also applicable to project activities that use waste pressure to generate electricity.	The proposed project activity is to utilize waste heat as an energy source for generation of electricity.
2	If project activity is use of waste pressure to generate electricity, electricity generated using waste gas pressure should be measurable.	Electricity generated in the project activity will be measured with meters.
3	Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility. The electricity generated in the project activity may be exported to the grid	Electricity generated in the project activity will be exported to North China Power Grid.
4	Energy in the project activity can be generated by the owner of the industrial facility producing the waste gas/heat or by a third party (e.g. ESCO) within the industrial facility.	Energy in the project will be generated by Wu'an Tongbao Coking Co., Ltd. itself.
5	Regulations do not constrain the industrial facility generating waste gas from using the fossil fuels being used prior to the implementation of the project activity.	The plant owner has sufficient permits to consume coal for coke production, from which waste heat is generated.

6	The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	The proposed project activity consists two units. Unit I is to utilize waste heat from existing coke ovens of unit 1,2 and 3; Unit II is to utilize waste heat from coke ovens of unit 4, 5 and the CDQ facility. Unit 4 and 5 and the CDQ facility are still under construction.
7	The waste gas/pressure utilized in the project activity was flared or released into the atmosphere in the absence of the project activity at existing facility. This shall be proven by either direct measurements, or energy balance, or energy bills, or process, or on site checks by DOE prior to project implementation.	The plant owner will provide the original schemes of the plant process for DOE check. DOE will also check it prior to commissioning of the electricity generation facility.
8	The credits are claimed by the generator of energy using waste gas/heat/pressure.	Coking plant owner itself is the generator.
9	Waste gas/pressure that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for.	The waste heat to be recovered by the project is released under normal operation prior to project implementation.
10	Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation.	Not applicable to the proposed project.

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

As per ACM0012, the geographical extent project boundary shall include the following:

1. The industrial facility where waste gas/heat/pressure is generated (generator of waste energy). For the proposed project, it is the coke ovens and the CDQ facility within plant boundary of Wu'an Tongbao Coking Co., Ltd..

2. The facility where process heat/steam/electricity in element process are generated (generator of process heat/steam/electricity). Equipment providing auxiliary heat to the waste heat recovery process shall be included within the project boundary. For the proposed project, it is the power plant that recovers the waste heat and its auxiliary facilities.

3. The facility/s where the process heat/steam/electricity in element process is used (the recipient plant(s)) and/or grid where electricity is exported, if applicable. For this case, it is the North China Power Grid, to which the electricity will be exported.

Spatial extent of the grid is as defined in the "Tool to calculate the emission factor for an electricity system". The PDD will discuss the spatial extent of the grid in B.4 below in details.

As per ACM0012, overview of emission sources included in or excluded from the project boundary is provided in the following table B.2:

Table B.2 Summary of Gases and Sources Included in the Project Boundary

	Source	Gas	Included/ Excluded	Justification/Explanation

Baseline	• Electricity generation, grid or captive source; • Fossil fuel consumption in boiler for thermal energy; • Fossil fuel consumption in cogeneration plant; • Baseline emissions from generation of steam used in the flaring process, if any.	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	• Supplemental fossil fuel consumption at the project plant; • Supplemental electricity consumption; • Project emissions from cleaning of gas.	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

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

As per ACM0012, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s). Realistic and credible alternatives should be determined for:

- Waste gas/heat/pressure use in the absence of the project activity; and
- Power generation in the absence of the project activity; and
- Steam/heat generation in the absence of the project activity

In line with the methodology ACM0012, the PDD here provides a stepwise demonstration of determination of the baseline scenario for the proposed project as following:

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations.

For the use of waste gas/heat/pressure, ACM0012 provides four alternatives for consideration. The proposed project activity here discusses them in following Table B.3 below:

Table B.3 Discussion of Alternatives of Use of Waste Heat

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
W1	Waste gas is directly vented to atmosphere without incineration	The tail gas from clean type coke ovens installed in the plant is already after-incineration within ovens. The tail gas is not combustible. Hence it is not the exact "waste gas" mentioned in the methodology and this alternative is not applicable.	N
W2	Waste gas is released to the atmosphere after incineration or waste heat is released to the atmosphere (waste	Waste heat being released to the atmosphere is the current situation. This is the original design of the coking process and the emission of the tail gas meets the national environmental standards. The original design documents and EIA report of the plant with	Y

	pressure energy is not utilized)	approval will be shown to DOE during site validation upon request. Hence, W2 is a plausible alternative.	
W3	Waste gas/heat is sold as an energy source	Waste heat is a type of thermal energy. The only way to utilize waste heat from the plant is to generate steam for electricity generation/heat supply. There is no third party nearby uses waste heat as energy source, and in fact that a third party would still need as much investment as modifying the plant to collect the waste heat. In addition, waste heat would have a significant loss if it were transmitted for a long distance. To conclude, W3 is not a plausible alternative.	N
W4	Waste gas/heat/pressure is used for meeting energy demand	Coking is a process that emits heat. The only energy demand of a coking plant is electricity for auxiliary equipments, coal as feedstock for coke production and fuel consumed by transporting vehicles. Waste heat cannot be directly used to meet any of the demand. While waste heat can be utilized for electricity generation. This is part of the project activity not undertaken as a CDM project discussed in P1 below. Therefore, W4 is not plausible.	Y

For power generation, the baseline alternatives presented in ACM0012 are discussed below in Table B.4:

Table B.4 Discussion of Alternatives of Power Generation

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
P1	Proposed project activity not undertaken as a CDM project activity;	The proposed project activity not undertaken as a CDM project is not against any laws or regulations of China. According to the *Feasibility Study Report*, the project activity is technically feasible (although poses poor economical factors). Hence, P1 is a plausible alternative.	Y
P2	On-site or off-site existing/new fossil fuel fired cogeneration plant	The proposed project activity generates electricity only; it is not cogeneration. P2 is not parallel to the proposed project; hence this option is not applicable.	N
P3	On-site or off-site existing/new renewable energy based cogeneration plant	There is no renewable energy resource available at the site of the proposed project; The project activity generates electricity only. P3 is not an applicable alternative.	N
P4	On-site or off-site existing/new fossil fuel based existing captive or identified plant	There is no existing fossil fuel based captive plant or identified plant that can directly provide electricity to Tong Bao Coking; According to Chinese regulations, coal-fired power	N

		plants with capacity less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids, and the fossil fuel power units with less than 100MW is strictly regulated for installation[5]. Considering that the capacity of the proposed project activity is 60 MW, a new fossil fuel based captive plant with equivalent amount of capacity is now allowed in China. As a conclusion, P4 is not plausible.	
P5	On-site or off-site existing/new renewable energy based existing captive or identified plant	As mentioned previously in P3, there is no renewable energy resource available at the site of the proposed project. P5 is not plausible.	N
P6	Sourced Grid-connected power plants	This is current situation and common practice of coking plants. The grid is North China Power Grid. P6 is plausible.	Y
P7	Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity)	There is no such technology to generate electricity with lower efficiency and financially attractive at same time. P7 is not plausible.	N
P8	Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity)	Not parallel since the project activity does not involve cogeneration. P8 is not plausible.	N

For heat generation, the methodology ACM0012 presents 9 alternatives for discussion. While for the specific case of the proposed project, they are all not applicable/plausible due to the following reasons discussed in Table B.5:

Table B.5 Discussion of Alternatives of Heat Generation

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
H1-H9	Alternatives from H1 to H9 in ACM0012 for heat generation	The proposed project activity does not involve heat generation; the alternatives for heat generation are not parallel to the project activity. As per ACM0012, if the methodology is to be applicable where the waste heat is used for generating one form of energy only (electricity or heat), then the baseline too should be	N

[5] This regulation has been valid since 2002, the notification is available on the Internet: http://www.gov.cn/gongbao/content/2002/content_61480.htm.

		only generation of one form of energy (electricity or heat respectively). Hence, alternatives from H1 to H9, which are for heat generation, are not plausible.	

Based on discussion above, the plausible alternatives are:

- W2: waste heat is released to the atmosphere
- W4: Waste gas/heat/pressure is used for meeting energy demand.
- P1: Proposed project activity not undertaken as a CDM project activity.
- P6: Sourced Grid-connected power plants.

The plausible combinations of baseline options are summarized in Table B.6 as following:

Table B.6 Plausible Combinations of Baseline Options

ID	Baseline Options			Description of Combinations
	Use of Waste Heat	Power Generation	Heat Generation	
B1	W2	P6	/	Waste heat from coke ovens is released to the atmosphere as usual; equivalent amount of electricity is supplied from North China Power Grid.
B2	W4	P1	/	Proposed project activity not undertaken as a CDM project activity.

STEP 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable.

Both alternative B1 and alternative B2 from STEP1 do not involve any direct consumption of fossil fuels. For baseline scenario B1, there is no electricity supply constraint in North China Power Grid.

STEP 3: Application of Step 2 and/or Step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality"

Version 4 of "Tool for the demonstration and assessment of additionality" are used for the proposed project. According to the investment analysis in section B.5 below, alternative B1, which is also continuation of current situation, does not need any additional investment. While the proposed project activity not undertaken as a CDM project poses poor financial indicator such as IRR of 7.7%, which is lower than the 13% benchmark.
As a conclusion, the proposed project activity not undertaken a CDM project is not financially attractive hence not a feasible baseline option. Alternative B1 remains as the only alternative.

Please refer to section B.5 for more details.

STEP 4: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario.

As a result of the analysis in preceding steps, there is only one credible and plausible scenario remains, which is:

Baseline Scenario: Waste heat from coke ovens is released to the atmosphere directly and equivalent amount of electricity is obtained from North China Power Grid.

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

As per ACM0012, the additionality of the project activity will be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board. Version 4 of the tool is the latest one.

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

Sub-step 1a. Define alternatives to the project activity:
As stated in preceding section B.4, the alternatives to the project activity are combinations of options for using waste heat (options from W1 to W4), power generation (options from P1 to P8) and heat generation (options from H1 to H9). The realistic and credible options for use of waste heat are W2 and W4; the realistic and credible options for power generation are P1 and P6; there is no baseline scenario option needs to be discussed for heat generation due to the fact that the proposed project activity itself does not involve heat generation. As a result, the plausible combinations of baseline scenario alternatives are:

- B1: Waste heat from coke ovens is released to the atmosphere as usual; equivalent amount of electricity is supplied from North China Power Grid.
- B2: Proposed project activity not undertaken as a CDM project activity.

B1 is also continuation of current situation.
Outcome of Step 1a: The realistic and credible alternative scenarios to the project activity are scenario B1 and B2 stated above. Please refer to section B.4 for more details of options identification.

Sub-step 1b. Consistency with mandatory laws and regulations:

Scenario B1, current operation of the plant is in compliance with mandatory legislation and regulations applicable in Heibei Province and China. Wu'an Tongbao Coking Co., Ltd. has valid business license and tax registrations for operation of the plant; the company performed EIA and FSR prior to construction of the coking plant; the emission of the tail gas is in line with relevant environmental regulations.

Scenario B2, the proposed project activity undertaken without registered as a CDM project is also in compliance with mandatory legislation and regulations. The plant owner has performed EIA and FSR for the power generation facility and CDQ facility in November 2006 and September 2008 respectively; the plant has acquired approval of the EIA and FSR from local government; Surplus power generation will be supplied to North China Power Grid according to the Connection Agreement and Electricity Purchase Contract signed between Tongbao Coking and Handan Grid.

All relevant documents and evidence are available to be shown to DOE by time of validation.

Outcome of Step 1b: Alternative scenarios B1 and B2 both are in compliance with mandatory legislation and regulations applicable in Hebei Province and China. Neither of them is against any EB decisions on national and/or sectoral policies and regulations.

Step 2. Investment analysis

Investment analysis determines whether the proposed project activity is economically or financially less attractive than alternative B1, identified in step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, the PDD uses the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

The "Tool for the Demonstration and Assessment of Additionality" provides three investment analysis methods for selection, which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Besides the revenue from the CDM, the project activity does generate financial and economic benefits through sale of electricity. Therefore Option I "simple cost analysis" is not appropriate. Currently the plant owner does not have any investment options other than the proposed project activity, hence Option II "investment comparison analysis" is not preferable; the PDD here applies Option III "benchmark analysis" to perform the investment analysis and demonstrate that the proposed project activity is not likely to be the most financially attractive option.

Sub-step 2b – Option III. Apply benchmark analysis

The proposed project uses project IRR as the financial indicator. The official benchmark IRRs are publicly available. According to "The Economic Assessment Method and Parameters for Construction Projects (version 03)[6]", the project benchmark IRR is 13%.

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

The key figures and project IRR with and without revenue from CERs are listed in the following Table B.7. Without CERs revenue, the project IRR of the proposed project is 7.7%, lower than the benchmark IRR. While considering CERs revenue, the IRR of the proposed project is 22%, higher than the benchmark.

Table B.7 Key Financial figures and Projet IRR with/without CERs Revenue

Parameter	Unit	Value	Source
Total Investment	10,000 RMB	15,000	FSR
Annual Operation Cost	10,000 RMB	7,285	FSR
Installation Capacity	MW	60	FSR
Annual Net Power Supply	MWh	380,000	FSR
Electricity Teriff	RMB/ kWh	0.35	FSR
Annual CERs	tonnes/ Yr	391,495	Estimation
CERs Price	RMB/ tonne	80	Market Price
Project Lifetime	Yr	20	FSR
IRR without CERs Revenue	%	7.7%	FSR
IRR with CERs Revenue	%	22%	FSR

Sub-step 2d. Sensitivity analysis:

Purpose of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The variables chosen for sensitivity analysis are total investment, cost of operation and maintenance (O&M) and sales from electricity, which the variation is basically from fluctuation in power generation.

Variations in IRR driven from fluctuation of O&M cost and sales of electricity are summarized in Table B.8 as following:

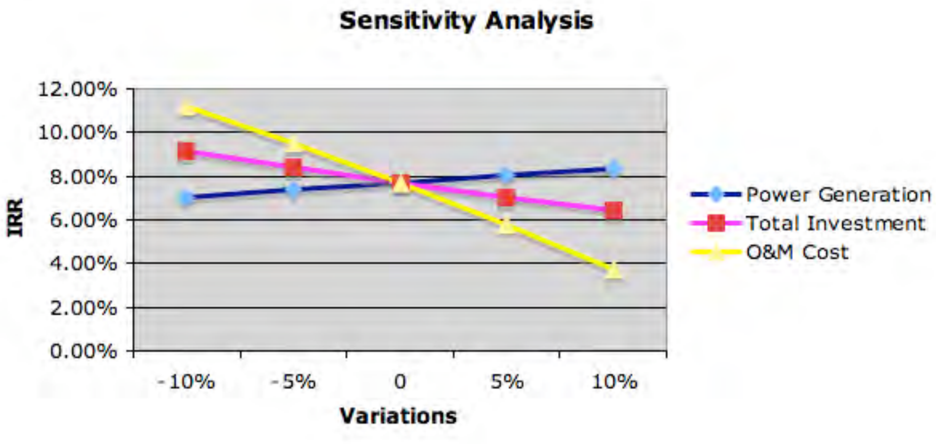
Table B.8 Sensitive Analysis of IRR

[6] Issued by the National Development and Reform Commission and the Ministry of Construction, published by China Planning Publishing House.

Variable	-10%	-5%	0	+5%	+10%
O&M Cost	11.66%	9.92%	7.7%	6.16%	4.06%
Sales of Electricity	7.31%	7.71%	7.7%	8.48%	8.86%
Total Investment	9.59%	8.81%	7.7%	7.44%	6.82%

The analysis shows that the IRR is more sensitive to the net electricity supply, while it is less elastic to O&M cost. The IRR is maintained to be less than the benchmark of 13% while the two parameters fluctuate in the range of -10% to +10%.

Fig. B.1 Sensitivity Analysis



Outcome of Step 2:

Since after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be financially attractive, then step 3 of "barrier analysis" is not required by the additionality tool.

Step 3. Barrier analysis
With total investment of 15×10^7 RMB, the plant owners can only finance 2/3 of the total investment by themselves. The plant is still seeking loan from local bank or incentives from the government. The chance of loan is rather small due to the large amount of investment. Incentives from government are not possible either due to the fact the plant is a private company owned by local peasants. Hence, fund from CDM is extraordinary important to finish construction of the project. Without applying for CDM, the chance for the project is very small.

Step 4. Common practice analysis
This is the only coking plant that installed QRD clean type coke ovens in Hebei Province. Handan of Hebei Province is famous for its rich iron ore resources and, consequently iron and steel production. There are lots of coking plants providing coke for steel plants. Tongbao coking is the first of them install waste heat recovery facilities for power generation.
Annual coke production of China is over 280×10^6 tonnes in 2006. In 2007, the production is expected to be over 330×10^6 tonnes[7,8]. While, most of the production is in low efficiency and poses high pollution. Take Shanxi Province as an example, less than 40% of the coke ovens are higher than 4.3 meters, which is the limit favored by the national directional policy for coking industry. The most advanced coke oven in Shanxi is 6 meters in height, which has already started being eliminated in advanced countries[9].

[7] http://www.21360.com.cn/cpcl/a/200711/5765.html

[8] http://www.21360.com.cn/cpcl/a/200801/24290.html

[9] http://www.zsr.cc/PostdoctorHome/LearnedIntercourse/200611/56197.html

Application of non-recovery clean type coke ovens is till at its primary stage. Among the coke production of China, only small portion of the coke production is from non-recovery clean type coke ovens. Even less plants have installed waste heat recovery for power generation facility. Please see Table B.8 for more details about similar plants.

Table B.8 Comparison between coking plants employing waste heat recovery systems in China

Plant Owner	Completion Date	Oven Model	Installation Capacity	Annual Coke Production	Comments and Justification
Shanxi Sinochem Huanda Industrial Co., Ltd.	July 2007	DQJ-50	24 MW	5×10^5 tonnes	According to some report, Shanxi Sinochem Huanda Industrial Co., Ltd is the first coking plant that installed non-recovery type coke ovens in China[10]. This project is now applying for CDM project with name of “24MW power generation from coking waste heat generated in the clean-type heat-recovery coke ovens at Shanxi Sinochem Wonder Industries Co.Ltd in China” according to UNFCCC website[11].
Shanxi Qinxin Coal-Coke Co., Ltd.	July 2007	QRD-2000	36 MW	6×10^5 tonnes	This project is now applying for CDM project with name of “36MW power generation from coking waste heat generated in the clean-type heat-recovery coke ovens at Shanxi Qinxin Coal-Coke Co.Ltd in China” according to UNFCCC website[12].
Shanxi Province Gaoping City Sanjia Coking Co., Ltd.	July 2007	JNR-2	24 MW	6×10^5 tonnes	This project is now applying for CDM project with name of “24MW power generation from coking waste heat generated in the clean-type heat-recovery coke ovens at Shanxi Province Gaoping City Sanjia Coking Co.Ltd in China” according to UNFCCC website[13].
Xinggao Coking Group Co. Ltd.	Dec 2005	QRD-2000	30 MW	4×10^5 tonnes	This project is a pilot project supported by “Energy

[10] Current situation and future of heat-recovery type stamping coke ovens in China. Chai Dongjun, Shanxi Science and Technology, Volume 6, 2004.

[11] https://cdm.unfccc.int/Projects/Validation/DB/UUZ90GJQ4WCH7R0U3T4XBZ5QS3TUA9/view.html

[12] http://cdm.unfccc.int/Projects/Validation/DB/6JNAFIAC2HXS11TNNYUFSIU6OGKM2R/view.html

[13] http://cdm.unfccc.int/Projects/Validation/DB/7TY2KRBFJVJJUZFCGQOR3LC1NX8B08/view.html

					Conservation and GHG Emission Reduction in Chinese Township and Village Enterprises (TVE), Unit II" by UNDP and GEF[14]. Although there is no direct indication found that the project is applying for CDM, an invitation of CDM local stakeholders consultation from their website shows they are probably considering it[15].
Taiyuan Gangyuan Coking & Chemicals Co., Ltd	N/A*	QRD-2000	30 MW	4×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Taiyuan Gangyuan Coking & Chemicals Co., Ltd in China" according to UNFCCC website[16].
Lan County Fengda Coking and Chemicals Smelting Co., Ltd.	N/A*	QRD-2000	18 MW	4×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Lan County Fengda Coking and Chemicals Smelting Co., Ltd in Shanxi, China" according to UNFCCC website[17].
Taiyuan Yingxian Coking & Chemicals Co., Ltd.	N/A*	YX-21QJL-1	24 MW	10×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Taiyuan Yingxian Coking & Chemicals Co., Ltd in Shanxi, China" according to UNFCCC website[18].
Taiyuan City Wanguang Coal and Coking Co., Ltd.	N/A*	QRD-2000	21 MW	8×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Taiyuan city Wanguang Coal and Coking Co., Ltd in China"

14 http://www.undp.org/gef/05/portfolio/writeups/cc/china_TVEs.html

15 http://www.sxgaoping.gov.cn/112/2006-11-8/1@5369.htm

16 http://cdm.unfccc.int/Projects/Validation/DB/F8SPLA422J0HBKAHY9A441KF4ZCOSY/view.html

17 http://cdm.unfccc.int/Projects/Validation/DB/H8X1ZURKURH6DDB5HB2X40Y7HCFYGT/view.html

18 http://cdm.unfccc.int/Projects/Validation/DB/AIJKM28L3NTRYLHTCL7321VWN1C0EM/view.html

					according to UNFCCC website[19].
Shouyang Xingguang Coking & Chemicals Co., Ltd.	N/A*	QRD-2001	36 MW	8×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Shouyang Xingguang Coking & Chemicals Co., Ltd in Shanxi, China" according to UNFCCC website[20].
Shanxi Shouyang County Boda Industries Co., Ltd.	N/A*	QRD-2004N	18 MW	4×10^5 tonnes	This project is now applying for CDM project with name of "Power generation from coking waste heat utilization project at Shanxi Shouyang County Boda Industries Co., Ltd in Shanxi, China" according to UNFCCC website[21].

* Indicates the project is still under construction

From the table above, we can see that all similar plants are applying for CDM except Xinggao Coking, which the specific situation is addressed in the table. Even though, with the total coke production capacity of less than 100×10^5 tonnes each year, coke production from clean-type coke ovens is far from being common practice in comparison with the total coke production of 330 $\times10^6$ tonnes per year in China.

Early Consideration
There is no "public announcement of the project going ahead without the CDM" situation in this proposed project. CDM is considered and discussed seriously and comprehensively in early stage of feasibility study.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The proposed project applies ACM0012 Version 2 to calculate emission reductions.

(1) Baseline Emissions

As per the methodology, the baseline emissions for the year *y* shall be determined as follows:

$$BE_y = BE_{En,y} + BE_{flst,y} \qquad (1)$$

Where:

BE_y are total baseline emissions during the year y in tons of CO2

$BEE_{n,y}$ are baseline emissions from energy generated by project activity during the year y in tons of CO2

$BE_{flst,y}$ baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO2e per year). This is relevant for those project activities where in the baseline steam is used to flare the waste gas.

[19] http://cdm.unfccc.int/Projects/Validation/DB/NMVCFNSKJRK7EC2GCFWJ7VNGN8KGSY/view.html

[20] http://cdm.unfccc.int/Projects/Validation/DB/H1IORNDZICXPQ2U5EL3OMNV5O40OVX/view.html

[21] https://cdm.unfccc.int/Projects/Validation/DB/59DMP97IKMJ98LDC7Y1VLEV9JO2ACI/view.html

Calculation of $BE_{En,y}$

The calculation of baseline emissions ($BE_{En,y}$) depends on the identified baseline scenario. The ACM0012 provides two scenarios:

- Scenario 1 represents the situation where the electricity is obtained from a specific existing power plant or from the grid and heat from a fossil fuel based element process (e.g. steam boiler, hot water generator, hot air generator, hot oil generator).
- Scenario 2 represents the situation where the recipient plant(s) obtains electricity and/or heat generated (steam, hot air, hot oil or hot water, etc.) by a fossil fuel based existing/ new cogeneration plant.

Baseline scenario of the proposed project falls under Scenario *1* above. As per the methodology, equation (*1a*) applies for calculation of $BE_{En,y}$:

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad (1a)$$

$BE_{Elec,y}$ are baseline emissions from electricity during the year y in tons of CO2
$BE_{Ther,y}$ are baseline emissions from thermal energy (due to heat generation by element process) during the year *y* in tons of CO2

a) Baseline emissions from electricity ($BE_{Elec,y}$) that is displaced by the project activity:

$$BE_{Elec,y} = f_{cap} * f_{wg} * \sum_{j}\sum_{i}(EG_{i,j,y} * EF_{Elec,i,j,y}) \quad (1a\text{-}1)$$

Where:
$BE_{elec,y}$ are baseline emissions due to displacement of electricity during the year *y* in tons of CO2.
$EG_{i,j,y}$ is the quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from i^{th} source (*i* can be either grid or identified source) during the year *y* in MWh, and
$EF_{elec,i,j,y}$ is the CO2 emission factor for the electricity source *i* (*i*=gr (grid) or *i*=is (identified source)), displaced due to the project activity, during the year *y* in tons CO2/MWh
f_{wg} Fraction of total electricity generated by the project activity using waste gas. This fraction is 1 if the electricity generation is purely from use of waste gas. If the boiler providing steam for electricity generation uses both waste and fossil fuels, this factor is estimated using equation (1d) of ACM0012. If the steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1d/1e) of ACM0012.
NOTE: For project activity using waste pressure to generate electricity, electricity generated from waste pressure use should be measurable and this fraction is 1.
f_{cap} Energy that would have been produced in project year *y* using waste gas/heat generated in base year expressed as a fraction of total energy produced using waste gas in year *y*. The ratio is 1 if the waste gas/heat/pressure generated in project year *y* is same or less then that generated in base year. The value is estimated using equation (1f), or (1f) and (1f-1) of ACM0012. The proportion of electricity that would have been sourced from the i^{th} source to the j^{th} recipient plant should be estimated based on historical data of the proportion received during the three most recent years.

$$f_{cap} = \frac{Q_{WG,BL}}{Q_{WG,y}} \quad (1f)$$

Where:

$QW_{G,BL}$ Quantity of waste gas generated prior to the start of the project activity. (Nm3)
$QW_{G,y}$ Quantity of waste gas used for energy generation during year y (Nm3)

For the proposed project, the conditions are:

The North China Power Grid is the only recipient of the electricity generation;
The North China Power Grid is the only source in absence of the proposed project;
The electricity generation of the proposed project is purely from use of waste gas;

For the proposed project activity, equation (1a-1) can be simplified as following:

$$BE_{Elec,y} = f_{cap} \times EG_y \times EF_{Grid,y} \quad (1a-1)$$

As per ACM0012, the CO2 emission factor of North China Power Grid, $EF_{Grid,y}$, will be determined following the guidance provided in the "Tool to calculate the emission factor for an electricity system".

b) Baseline emissions from thermal energy ($BE_{ther,y}$)

The proposed project activity generates electricity only; hence the baseline emissions from thermal energy are neglected.

$$BE_{ther,y} = 0$$

(2) Project Emissions

Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and emissions due to consumption of electricity for cleaning of gas before being used for generation of heat/energy/electricity.

$$PE_y = PE_{AF,y} + PE_{EL,y} \quad (2)$$

Where:
PE_y Project emissions due to project activity.
$PE_{AF,y}$ Project activity emissions from on-site consumption of fossil fuels by the cogeneration plants, in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason.
$PE_{EL,y}$ Project activity emissions from on-site consumption of electricity for gas cleaning equipment.

Note: In case the electricity was consumed in gas cleaning equipment in baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored.

1) Project emissions due to auxiliary fossil fuel

The proposed project does not involve any consumption of fossil fuel. Hence project emissions due to auxiliary fossil fuel is neglected.

2) Project emissions due to electricity consumption of gas cleaning equipment

Project emissions from consumption of additional electricity by the project are determined as follows:

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y} \quad (2b)$$

Where:
$PE_{EL,y}$ Project emissions from consumption of electricity in gas cleaning equipment of project activity (t CO2/yr)

$EC_{PJ,y}$ Additional electricity consumed in year y as a result of the implementation of the project activity (MWh)
$EF_{CO2,EL,y}$ CO2 emission factor for electricity consumed by the project activity in year y (t CO2/MWh)

The electricity will be purchased from North China Power Grid, the CO2 emission factor for electricity ($EF_{CO2,EL,y}$) will be determined by using the combined margin emission factor, determined according to the latest approved version of the "Tool to calculate the emission factor for an electricity system", as addressed in section (4) below.

(3) Leakage

No leakage is applicable under this methodology.

(4) Calculation of Emission Factor of North China Power Grid

Step 1. Identify the relevant electric power system

As per delineation of Chinese national electric system published by *National Development and Reform Commission*, which is also Chinese DNA, the relevant electric power system is *North China Power Grid*. The Project's electricity generation unit is connected to the *Hebei Power Grid* via local grid network, and thus finally to the *North China Power Grid*. The *North China Power Grid* is a large regional grid, which consists of six sub-grids: *Beijing Power Grid, Tianjin Power Grid, Hebei Power Grid, Shanxi Power Grid, Shandong Power Grid* and *Inner Mongolia Power Grid*. There is substantial inter-grid power exchange among the above-mentioned sub-grids of the *North China Power Grid*. The *North China Power Grid* can be clearly identified as regional grid and information on the characteristics of this grid is publicly available. [22]
To determine the operating margin emission factor, use the simple operating margin emission rate of the exporting grid, determined as described in step 3 (a) to calculate the CO_2 emission factor(s) for net electricity imports ($EF_{grid,import,y}$) from a connected electricity system within the same host country(ies).

Step 2. Select an operating margin (OM) method

"Tool to calculate the emission factor for an electricity system" (Version 1) outlines four options for the calculation of the Operating Margin emission factor(s) ($EF_{OM,y}$):

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

As per *"Tool to calculate the emission factor for an electricity system"* (Version 1), any of the four methods can be used. "Dispatch Data Analysis" method is not selected herein, because 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 Simple OM method has been chosen instead. This is possible because low cost/ must run resources account for less than 50% of the power generation in the grid in most recent years. From 2001 to 2005, according to gross annual power generation statistics for the *North China Power Grid*, the ratio of power

[22] National Development and Reform Commission of China published delineation of the electricity grid of China. Please visit http://cdm.ccchina.gov.cn/web/index.asp for more details.

generated by hydro-power and other low cost/compulsory resources was: 0.85% in 2001, 0.89% in 2002, 0.86% in 2003, 0.76% in 2004, 0.75% in 2005 respectively, significantly lower than 50%.[23]

The simple OM of the grid for the proposed project is calculated using the ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

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

The simple Operating Margin (OM) emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. As per *"Tool to calculate the emission factor for an electricity system"* (Version 1), it may be calculated:

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

Since neither the data of fuel consumption nor the net electricity generation for every single electricity generation plant/unit is publicly available for *North China Power Grid*, the proposed project uses Option C for simple OM calculation. The calculation is based on the total net electricity generation and the fuel types and total fuel consumption of each provincial sub-grid of *North China Power Grid*. Electricity importation from *Northeast China Power Grid* is also counted. A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used ("ex-ante" approach).

The calculation equation of the Simple OM is as follows:

$$EF_{Grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum_{m} EG_{m,y}} \quad \text{Equation (13)}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO2 emission factor in year *y* (tCO2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type *i* consumed by power plant/unit m in year *y* (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)
$EG_{m,y}$	Net electricity generated and delivered to the grid by power plant/unit *m* in year *y* (MWh)
m	All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units [24]
i	All fossil fuel types combusted in power plant / unit m in year y

[23] *China Energy Year Book, 2002-2006*

[24] Here the proposed project uses each provincial sub-grid as an electricity plant/unit in this equation, since total electricity generation and fuels consumption is available for each sub-grid. Electricity imports from a connected electricity system should be considered as one power source j.

y Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

The Operating Margin emission factors for 2003, 2004 and 2005 are calculated separately and then the three-year average is calculated as a full-generation-weighted average of the emission factors. For details please refer to Annex 3. The result of the Operation Margin Emission Factor calculation is 1.1208 tCO_2e/MWh.

The operating margin emission factor of the baseline is calculated as a fixed ex-ante value and will not be renewed within the first crediting period of the project activity.

Step 4. Identify the cohort of power units to be included in the build margin

As per the emission factor tool, the sample group of power units m used to calculate the build margin consists of either:

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

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

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[25] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

2) Proportional weights that correlate to the distribution of installed capacity in place during the selected period above are applied, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency levels of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

[25] This is in accordance with the „Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex- post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Project participants have chosen *Option 1* for BM calculation.

Step 5. Calculate the build margin emission factor

As per the method of Chinese NDRC accepted by EB, since there is no way to separate the different generation technology capacities based on coal, oil or gas fuel etc from the generic term "thermal power" in the present energy statistics, the following calculation measures will be taken:

First, according to the energy statistics of the selected period in which approximately 20% capacity has been added to the grid, determine the ratio of CO_2 emissions produced by solid, liquid, and gas fuel consumption for power generation; than multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency. Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1

Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}$$ Equation (16)

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}$$ Equation (17)

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}$$ Equation (18)

Where,

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

$COEF_{i,j,m}$ is the CO_2 emission coefficient of fuel i (tCO_2e/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants m and the oxidation percentage of the fuel in year(s) y,

Coal, Oil and *Gas* stands for solid, liquid and gas fuels respectively.

Sub-step 2: Calculate the operating margin emission factor of fuel-based generation.

$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv}$$ Equation (19)

Where,

$EF_{Thermal}$ is the weighted emissions factor of thermal power generation with the efficiency level of the best commercially available technology in China in the previous three years.

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors of coal, oil and gas-fired power generation with efficiency levels of the best commercially available technology in China in the previous three years.

A coal-fired power plant with a total installed capacity of 600 MW is assumed to be the best commercially available technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 343.33 gce/kWh, which corresponds to an efficiency of 35.82% for electricity generation.

For gas and oil power plants a 200MW power plant with a specific fuel consumption of 258 gce/kWh, which corresponds to an efficiency of 47.67% for electricity generation, is selected as the best commercially available technology in terms of efficiency.

The main parameters used for calculation of the thermal power plant emission factors $EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ are provided in Annex3.

Sub-step 3: Calculate the Build Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \cdot EF_{Thermal} \qquad \text{Equation (20)}$$

Where,

CAP_{Total} is the total capacity addition of the selected period in which approximately 20% capacity has been added to the grid,

$CAP_{Thermal}$ is the total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

Detailed calculations are provided in Annex 3.

The result of the Build Margin emission factor calculation is 0.9397 tCO_2e/MWh.

As mentioned above, the build margin emission factor of the baseline is calculated as a fixed ex-ante value and will not be renewed within the first crediting period.

The data sources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants for the years 2003 to 2005
   Source: *China Electric Power Yearbook* (2004-2006)
2. Fuel consumption and the net caloric value of thermal power plants the years 2003 to 2005
   Source: *China Energy Statistics Yearbook* (figures are for 2004-2006)
3. Carbon emission factor and carbon oxidation factor of each fuel
   Source: *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook*, P1.23 and P1.24 in Chapter one.

Step 6. Calculate the combined margin emissions factor

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

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y}$$ Equation (21)

The operating margin emission factor ($EF_{grid,OM,y}$) of China Southern Grid is 1.1208 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.9397 tCO_2e/MWh. The defaults weights are used as specified in the emission factor tool: $w_{OM} = 0.5$; $w_{BM} = 0.5$

The result of the Baseline Emission Factor (EF_y) calculation is 1.0303 tCO_2e/MWh.

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

Data / Parameter:	$Q_{coke,BL}$
Data unit:	Tonnes/year
Description:	Plant or departmental. Production process, which most logically relates to waste gas generation in baseline. This is estimated based on overall capacity of the ovens and other rated parameters of ovens. (Tons/yr or m3/yr or other relevant unit).
Source of data used:	Feasibility Study Report of coking plant.
Value applied:	600,000 tonnes/year (300,000 tonnes/year for each unit)
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to Feasibility Study Report of coking plant, this is the annual coke production on 330 days of operation.
Any comment:	

Data / Parameter:	$q_{WH,BL}$
Data unit:	kWh/tonne, 86,000 m3/h, 950 degree Celsius
Description:	Specific waste gas production per unit of product (departmental or plant product which most logically relates to waste gas generation) generated as per manufacturer's or external expert's data. This parameter should be analysed for each modification in process, which can potentially impact the waste gas quantity. (m3/Ton or m3/m3 or other relevant units)
Source of data used:	Feasibility Study Report of coking plant and power generation plant.
Value applied:	792 kWh/tonne
Justification of the choice of data or description of measurement methods and procedures actually applied :	Due to the fact that this needs history data of the volume of the tail gas, the proposed project here applies an alternative approach to calculate the cap of waste heat production per unit of coke production. It is calculated as power generation divided by coke production with data from FSR. In baseline scenario, there is no fan for tail gas venting. Tail gas from coke ovens is driven by pressure difference origins from stack of 60×2.5 meters. Typical venting temperature is 950 ℃. The maxim venting temperature from metallurgy coke production is 1200 degree Celsius; for casting coke production it is 1230 degree; for special coke it is 1230 degree Celsius. Invited by Tongbao, Matou thermal power plant provided measurement to the flow of tail gas. The typical value is 86,000 m3/h.

Any comment:	

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO2e/MWh
Description:	Operation margin baseline emission factor of North China Power Grid
Source of data used:	China Electric Power Yearbook (2004-2006) China Energy Statistics Yearbook (figures are for 2004-2006) Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	1.1208 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 1). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO2e/MWh
Description:	Build margin baseline emission factor of North China Power Grid
Source of data used:	China Electric Power Yearbook (2004-2006) China Energy Statistics Yearbook (figures are for 2004-2006) Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	0.9398 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 1). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2e/MWh
Description:	Combined margin baseline emission factor of North China Power Grid
Source of data used:	China Electric Power Yearbook (2004-2006) China Energy Statistics Yearbook (figures are for 2004-2006) Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	1.0303 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 1). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Ex-ante calculation of emission reductions and applied value of involved parameters are summarized in Table B.8 as following:

Table B.8 Ex-ante Calculation of Emission Reductions

	Parameter	Unit	Applied Value
Emission Factor	$EF_{grid,OM,y}$	tCO2e/MWh	1.1208
	$EF_{grid,BM,y}$	tCO2e/MWh	0.9397
	$EF_{CM,grid,y}$	tCO2e/MWh	1.0303
Baseline Emissions	Installation Capacity	MW	60
	Utilization Hours	h/yr	7,920
	EG_y	MWh/yr	418,179
	f_{cap}	-	1
	BE_y	tCO2e/yr	430,829
Project Emissions	$EC_{PJ,y}$	MWh/yr	38,179
	PE_y	tCO2e/yr	39,334
Emission Reductions	ER_y	tCO2e/yr	391,495

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

Table B.9 Summary of the ex-ante estimation of emission reductions

Year	Estimation of project activity emissions (tonnes of CO e)	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO e)
2008	9,833	107,707	0	97,874[26]
2009	39,334	430,829	0	391,495
2010	39,334	430,829	0	391,495
2011	39,334	430,829	0	391,495
2012	39,334	430,829	0	391,495
2013	39,334	430,829	0	391,495
2014	39,334	430,829	0	391,495
2015	19,667	215,414	0	195,747
Total (tones of CO2e)	**265,504**	**2,908,095**	0	**2,642,591**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$Q_{coke,y}$
Data unit:	tonne

[26] The proposed project consists of two units of generators. One unit will start a half year earlier than the other one. Hence the expected emission reductions in the first half year of the crediting periods will be 97,847 tonnes CO2e, one fourth of the annual emission reductions of two units. As a result, the average annual emission reductions in the crediting periods will also be lower than 391,495 tonnes CO2e, the annual emission reductions of two units.

Description:	Quantity of coke produced for during year y (tonne)
Source of data to be used:	Production log of coke plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	600,000 tonnes/year
Description of measurement methods and procedures to be applied:	Continuously measured by project participants through a scale meter. Data will be recorded on a monthly basis.
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular equipment. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	

Data / Parameter:	f_{cap}
Data unit:	/
Description:	Energy that would have been produced in project year y using waste heat generated in base year expressed as a fraction of total energy produced using waste heat in year *y*.
Source of data to be used:	Production log of coke plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1
Description of measurement methods and procedures to be applied:	Project participants will continuously measure Coke production through a scale meter. f_{cap} will be calculated with equation (1f). The ratio is 1 if the coke production in project year y is same or less then it is in base year, which is 600,000 tonnes/year (300,000 tonnes/year for each unit).
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular equipment. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Quantity of electricity supplied to the recipient plant j by the project activity during the year *y* in MWh
Source of data to be used:	Measurement records of the generators
Value of data applied for the purpose of calculating expected emission reductions in section B.5	418,179
Description of measurement methods and procedures to be	Continuously monitored and recorded on a monthly basis.

applied:	
QA/QC procedures to be applied:	The energy meters will undergo maintenance/calibration to the national standards and industry standards. Sales records and purchase receipts are used to ensure the consistency.
Any comment:	Data will be measured at the grid and at the generation plant for cross check. Sales receipts will be used for verification. DOEs will verify that total energy supplied by the generator is equal to total electricity received by the grid.

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Additional electricity consumed in year *y*, for gas cleaning equipment, as a result of the implementation of the project activity.
Source of data to be used:	Actual measurements, plant operational records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	38,179
Description of measurement methods and procedures to be applied:	Measured constantly using an electricity meter, which is calibrated regularly. Continuously, aggregated monthly/yearly. In case the electricity was consumed in gas cleaning equipment in baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored.
QA/QC procedures to be applied:	Double checked with receipts of purchase for electricity (if applicable)
Any comment:	

Data / Parameter:	***T***
Data unit:	Degree Celsius
Description:	Temperature of venting gas from coke ovens
Source of data to be used:	Monitoring system of coke production. Monitored with thermocouples.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	950 ℃ for metallurgy coke and casting coke, 980 for specially tailored coke production. The maxim temperatures are 1200 and 1230 respectively.
Description of measurement methods and procedures to be applied:	The temperature of venting gas from each oven is continuously monitored by monitoring system. The temperature is recorded once in an hour. Hours in which temperature beyond the limit will be recorded also.
QA/QC procedures to be applied:	
Any comment:	

Data to be collected in order to monitor the project's performance on the sustainable development indicators:

Data / Parameter:	WC_y
Data unit:	Tonne/yr

Description:	Annual water consumption by project activity
Source of data to be used:	Water meters installed in the plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	The water meters will be under inspection of the Water Supplying Bureau of Wu'an city. Meters will be calibrated in compliance with relevant regulations and standards.
QA/QC procedures to be applied:	Receipts from the Water Supplying Bureau of Wu'an city will be used for cross-check
Any comment:	

Data / Parameter:	***AQ_y***
Data unit:	n/a
Description:	Monitoring report of the gas emissions from Tongbao Coking Municipality
Source of data to be used:	Monitors from EPA of Wu'an city
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Wu'an EPA will inspect gas emissions fro stacks of Tongbao Coking Co., Ltd. regularly. Certificates that the plant is in compliance with the national environmental regulations will be issued by EPA.
QA/QC procedures to be applied:	Certificates from the EPA will be provided to DOE.
Any comment:	

Data / Parameter:	***Emp_y***
Data unit:	n/a
Description:	Employment opportunities generated by the project activity
Source of data to be used:	Accounting report by human resource office of the plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	People engaged during the fiscal year will be recorded in the accounting system of the plant. The number of people engaged, the gender, the responsibilities of them and the training they take will all be covered in the report.
QA/QC procedures to be applied:	Pay roll of these employees will be provided as evidence for contribution in employment of local people
Any comment:	

B.7.2 Description of the monitoring plan:

The proposed project applies "Approved consolidated baseline and monitoring methodology ACM0012" Version 2 for preparing the monitoring plan.

Monitoring Objective

The baseline emission factor of North China Power is fixed during the first crediting period by ex-ante calculations. Annex III of the PDD has details of the calculation. Hence, the monitoring plan does not provide further monitoring work for baseline emissions.

For project emissions, project participant will monitor the annual electricity generation and auxiliary power consumption. Implementation of the project will not lead to additional consumption of fossil fuels.

As per ACM0012, there is no need of leakage calculation or monitoring for this kind of activity.

Operational and Management Structure

The operational and management structure of the proposed project is summarized within Table B.10 below.

Table B.10 Operational and Management Structure

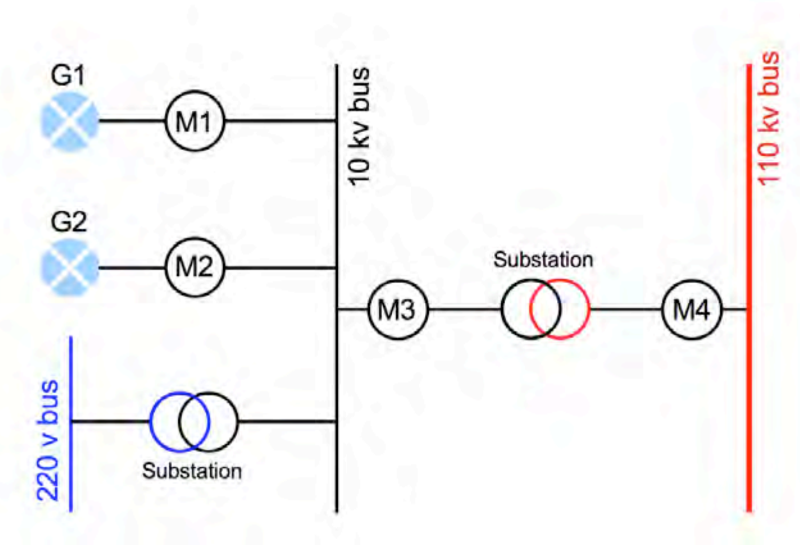
Name	Organization	Responsibility
Mr. Sun Xuebing	Tongbao Coking	Mr. Sun is the chairman of Wu'an Tongbao Coking Co., Ltd.. He has extended knowledge about Kyoto Protocol and CDM Authority and takes the responsibility of overall project management.
Mr. Li Ji	Tongbao Coking	Mr. Li is the monitoring manager of the plant. He is responsible for training of monitoring personnel. Training courses will be held for monitoring staff about basic knowledge and operational procedures of all monitors and the data processing system. Previously, South Pole Carbon has provided sufficient training about Kyoto, CDM and requirements of them.
Mr. Li Ji	Tongbao Coking	Mr. Li Ji is the monitoring system engineer of Tongbao Coking. He is in charge of data recording processing and reporting for the project. The data will be either automatically recorded or manually recorder by operators. All data will be imported to Excel for validation or verification. Please see Section B.7.1 for more details of procedures of monitoring and recording.
South Pole Carbon	South Pole Carbon	South Pole Carbon Asset Management Co., Ltd. Will provide review of reported data before they are submitted to DOE for validation or verification.
Mr. Li Ji	Tongbao Coking	Mr. Li Ji is the manager for safety and environment. He is responsible of validation, registration and verification from the plant owner's part under assistance of South Pole Carbon.

Monitoring Equipment and Program

According to the Chinese national standard "*Technical Management Code for Electricity Metering" (DL/T448-2000),* the electricity metering equipment will be properly configured and the metering equipment will be checked by both the project owner and the grid company before the project is in operation.

Four meters will be used. Meter M1 and M2 are installed to measure gross power generation of generators. M3 measures net electricity output from the proposed project. Owned by the grid, M4 measures the net power supply to the grid. M3 is the key meter for emission reduction calculation since reading of M3 does not include auxiliary power consumption of the plant. Reading of M4 is used from crosscheck. When readings from M3 are questionable (due to abnormal circumstances) or not possible (due to meter failure or meter reparation), the project owner will use the data monitored by the M4. Please see Fig. B.1 for the simplified diagram of electric layout.

Fig. B.1 Simplified Diagram of the Electric Layout



Data Collection:

The project owner and the Grid Company are responsible for operation monitoring of the main meters and guarantee that the measuring equipments are in good operation and completely sealed.
The electricity recorded by the main meter alone will suffice for the purpose of billing and emission reduction verification as long as the main meter error is within the allowable tolerance. The main monitoring process is as follows:

- i The project owner and Grid Company read and check the backup meter and the main meter and record the data at 24:00 on the last day of every month;
- ii The project owner sells the electricity to the Grid Company;
- iii The project owner provides an electricity sales invoice to the Grid Company. A copy of the invoice is stored by the project owner, together with a record of the payment by the grid company.
- iv The Grid Company provides an electricity receipt confirmation to the project owner and the confirmation is stored by the project owner.
- v The project owner records the net electricity supplied to the grid electronically;
- vi The project owner keeps the records of the main meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the main meter exceeds the allowable tolerance, when the meter operates abnormally during a month or any other unexpected problems occur, the net amount of electricity exported to the grid shall be determined by:

i Using readings from the backup meter (taking potential transmission losses into consideration), unless a test by either party reveals it is inaccurate;

ii If the backup system is not within acceptable limits of accuracy or performed improperly, the proposed project owner and the Grid Company shall, based on mutual agreement, determine the amount of supplied electricity to the grid during the period of the occurred distortion or malfunction of backup meters by means of referring to voltage and current data in accordance with relevant rules; and

iii If the proposed project owner and the Grid Company fail to reach an agreement concerning the amount of supplied electricity to the grid during the period of the occurred distortion or malfunction of backup meter, then the matter will be submitted for arbitration according to agreed procedures.

The meter readings will be readily accessible for the DOE. Calibration test records will be maintained for verification.

Calibration

The verification and calibration of electricity meters will be carried out periodically according to relevant national electric industry standards and regulations. After verification and calibration, meters will be sealed. All meters will be jointly inspected and sealed on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

All the meters installed will be tested by the qualified metrical organization co-authorized by the project owner and the Grid Company within 10 days after:

i The detection of a difference larger than the allowable tolerance in the readings of the main meter and/or the backup meters;

ii Repair to the faulty meter caused by improper operation.

Data Management

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM. In addition, a hard copy printout will be archived.

The project owner will also collect sales receipts for the power delivered to the grid as a crosscheck. At the end of each crediting year, a monitoring report will be compiled detailing the metering results backed up by sales receipts.

Physical documentation will be collected and stored by the project owner in a central place, together with the monitoring plan. In order to facilitate the auditor’s reference, monitoring results will be indexed. All data records will be kept for a period of 2 years following the end of the crediting period.

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

Name of persons determining the baseline and monitoring methodology:

Mr. Leon Wang, South Pole Carbon Asset Management Ltd.
Technoparkstrasse 1
8005 Zurich, Switzerland
Phone: +41 44 633 78 70
Fax: +41 44 633 14 23
l.wang@southpolecarbon.com

Mr. Marco Hirsbrunner, South Pole Carbon Asset Management Ltd.

Technoparkstrasse 1
8005 Zurich, Switzerland
Phone: +41 44 633 78 70
Fax: +41 44 633 14 23
m.hirsbrunner@southpolecarbon.com

Mr. Patrick Bürgi, South Pole Carbon Asset Management Ltd.
Technoparkstrasse 1
8005 Zurich, Switzerland
Phone: +41 44 633 78 70
Fax: +41 44 633 14 23
p.burgi@southpolecarbon.com

Please refer to Annex 1 for detailed contact information.
Date of completion of baseline study and monitoring plan: 15th January 2008

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:

20th October 2007

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:

1st July 2008

C.2.1.2. Length of the first crediting period:

7 years, 0 month

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

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

According to the relevant environmental law and regulations, an Environmental Impact Assessment Form has been prepared on November 2006, which has been approved by the Hebei EPA on 9th October 2007. The main assessment conclusions are provided below:

1. Impact on the air quality

The dust generated during the construction period will effectively controlled through effective onsite management and related bylaws which will have less impact on the environment. After the project put into operation, the project activity will not generation any additional pollution to the baseline scenario. The same as baseline scenario, there will be a few of SO2 and NOx in tail gas. By venting through a flue at height of over 60 meters, Emission Limits of Atmospheric Pollutants (DB44/27-2001) will be met. The limits by this standard are SO2≤100mg/l and NOx≤400mg/l. Inert cooling gas for CDQ facility are recycled in process loop, hence no additional emissions will occur. Considering that in absence of the project activity all hot tail gas would have been directly vented into atmosphere and cause heat pollution, the implementation of the project will improve the regional air quality significantly.

2. Noise impact

The major noise resources during the construction period are the operating equipments, the transportation and so on, and the noise impacts the builders and the residents nearby. In order to minimize the noise impacts, few measures are carried out, such as constructing under Noise Limits for Construction Site (GB 12523-90 1991-03-01) strictly, enforcing the onsite management and establishing related bylaws. The noise during the construction period has locality and temporality characteristic; it will disappear when the construction work finished. After the project is put into operation, the major resource of noise pollution is from running of the turbines, generator and valves. The muffler is installed to avoid the noise impact on the local citizens and employees.

3. Impact on the aquatic environment

In power generation facility, steam are cooled and recycled; In CDQ facility, water resource are saved greatly by replacing the original Coke Wet Quenching system.

4. Impact of solid waste on the environment

There is no additional solid waste generated to baseline scenario. The coke powder from the Project can be collected and used as fuels; hence the impacts would be minimal.

5. Impact on water and soil loss

Construction of the project will not lead to any water and soil loss.

6. Impact on the ecological environment

All construction activity will take place on vacant factory land. Therefore, the project has little impact on the local eco-environment.

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:

Environmental impacts are considered to be insignificant. Enough consideration has been given to possible impacts on the environment of the Project. The project participants have an environment friendly plan for the implementation of the Project.

SECTION E. Stakeholders' comments

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

In concern of the interests of the local stakeholders, the project owner collected opinions from them in various occasions and forms.

Public Consultation in EIA

EIA Law of China requires public consultation process during EIA. Public consultation was conducted as per *"2006 Temporary Method of Public Consultation in EIA"*. Participants invited for the consultation were mainly habitants around the plant. They were peasants from Dongzhaixi, Xizhaixi, Lancun, Pianshancun and Tushan town. Potential environment impacts and countermeasures were made public since 14th November 2006. Public opinions were collected through questionnaires and public hearing. The hearing was held on 25th November 2006.

Initial Stakeholder Consultation for CDM

The initial stakeholder consultation was started on 13th Feb 2008. South Pole Carbon Asset Management Co., Ltd. Invited international stakeholders through emails. Recipients of invitation included Gold Standard, local supporters of Gold Standard, Greenpeace and WWF in China. Meanwhile, plant owner invited representatives of local habitants, plant employees, policy makers and local media. Public hearing was held on 28th Jan 2008, introduction of the project was made and comments were collected.

Internet Stakeholder Consultation

South Pole Carbon Asset Management Co., Ltd. Made public the non-technical descriptions of the project design document and potential environmental impacts through the website of "*http://www.southpolecarbon.com/goldstandard_consultations.htm*". Comments from stakeholders on the Internet were invited.

E.2. Summary of the comments received:

Public Consultation in EIA

The public hearing was held on 25th November 2006 in the meeting room of Tongbao Coking Co. Ltd. 19 people from villages, local government, designing institute and construction company attended the meeting. Summary of the questionnaires showed that 68% of the attendants cared about the environment and 32% of them cared the environment very much; 34% thought the project will improve local air quality and 66% thought there would not be significant difference in air quality; 46% knew the project comprehensively and 54% merely knew the project; 100% of the participants thought the project will boost local economy development; 100% thought the advantages were more than the disadvantages; 100% thought the location of the project was appropriate.

Initial Stakeholder Consultation for CDM

Hearing of the initial stakeholder consultation for the project applying for a CDM project was conducted on 28th February 2008. 17 pieces of questionnaires were collected and no negative comments and opinions were found from them. A local peasant expressed his opinions that the positive impacts of the project can be summarized in five tiers: it will generate additional demand for local labors; it will boost local economy development; it will improve local environment; it will provide additional power supply to local grid. He hoped that the project would get support from local government. A plant employee said that the project would utilize waste heat for power generation without generating additional pollution. He said that the project would profit the plant as well as global environment. A local policy maker said that Tongbao Coking is the first and only plant utilizing QRD clean-type coke ovens. The government will support the project as much as they can.

Internet Stakeholder Consultation
No negative comment has been received from internet.

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

No negative comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

Organization:	Wu'an Tongbao Coking Co., Ltd.
Street/P.O.Box:	Dongzhaizi Village, Xitushan Town, Wu'an
Building:	/
City:	Handan
State/Region:	Hebei Province
Postfix/ZIP:	056300
Country:	China
Telephone:	+86 0310 5698299
FAX:	+86 0310 5698599
E-Mail:	N/A
URL:	N/A
Represented by:	Sun Xuebing; Li Ji
Title:	Chairman
Salutation:	Mr.
Last Name:	Sun
Middle Name:	N/A
First Name:	Xuebing
Department:	Office
Mobile:	13931001878; 13832019029
Direct FAX:	+86 0310 5698599
Direct tel:	+86 0310 5698299
Personal E-Mail:	tbyanglu@sina.com

The Buyer

Organization:	South Pole Carbon Asset Management Ltd.
Street/P.O.Box:	Technoparkstr. 1
Building:	/
City:	Zurich
State/Region:	Zurich
Postfix/ZIP:	8005
Country:	Switzerland
Telephone:	+41 44 633 78 70
FAX:	+41 44 633 14 23
E-Mail:	info@southpolecarbon.com
URL:	www.southpolecarbon.com
Represented by:	Renat Heuberger
Title:	/
Salutation:	Mr.
Last Name:	Heuberger
Middle Name:	/
First Name:	Renat
Department:	/
Mobile:	/
Direct FAX:	+41 44 633 14 23
Direct tel:	+41 44 633 78 70
Personal E-Mail:	r.heuberger@southpolecarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I countries involved in the project activity.

Annex 3

BASELINE INFORMATION

Table 1–Power Supply data for the North China Power Grid, 2001-2005

	2001	2002	2003	2004	2005
Electricity Generation of Thermal power plant (MWh)	358,070,000	403,920,000	457,680,000	526,810,000	603,230,000
Total Electricity Generation of the North China Power Grid (MWh)	361,113,000	407,550,000	461,660,000	530,820,000	607,780,000
The ratio of power generated by hydro-power and other low cost/compulsory resources (%)	0.85%	0.89%	0.86%	0.75%	0.76%

Data Source: China Electric Power Yearbook 2002-2006.
State Power Information Network: http://www.sp.com.cn

Table 2–Power Supply data for the North China Power Grid, 2003 (not including low operating cost and must-run power plants)

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal Power Generation (MWh)	18,608,000	32,191,000	108,261,000	93,962,000	65,106,000	139,547,000
Rate of Electricity Consumption of the Power Plant (%)	7.52	6.79	6.5	7.69	7.66	6.79
Power Supplied to the Grid (MWh)	17,208,678.4	30,005,231.1	101,224,035	86,736,322.2	60,118,880.4	130,071,75.7
Total Supplied to Grid of the Thermal Power (MWh)	425,364,906					
Net import Power from the Northeast China Grid (MWh)	4,244,380					
The total Power for the North China Power Grid (MWh)	429,609,286					

Data Source: China Electric Power Yearbook 2004;
State Power Information Network: http://www.sp.com.cn

Table 3–Power Supply data for the North China Power Grid, 2004 (not including low operating cost and must-run power plants)

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal Power Generation (MWh)	18,579,000	33,952,000	124,970,000	104,926,000	80,427,000	163,918,000
Rate of Electricity Consumption of the Power Plant (%)	7.94	6.35	6.5	7.7	7.17	7.32
Power Supplied to the Grid (MWh)	17,103,827	31,796,048	106,846,950	96,846,698	74,660,384	151,919,202
Total Supplied to Grid of the Thermal Power (MWh)	489,173,110					
Net import Power from the Northeast China Grid (MWh)	4,514,550					

The total Power for the North China Power Grid (MWh)	493,687,660

Data Source: China Electric Power Yearbook 2005;
State Power Information Network: http://www.sp.com.cn

Table 4–Power Supply data for the North China Power Grid, 2005 (not including low operating cost and must-run power plants)

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal Power Generation (MWh)	20,880,000	36,993,000	134,348,000	128,785,000	92,345,000	189,880,000
Rate of Electricity Consumption of the Power Plant (%)	7.73	6.63	6.57	7.42	7.01	7.14
Power Supplied to the Grid (MWh)	19,265,976	34,540,364	125,521,366	119,299,153	85,871,616	176,322,568
Total Supplied to Grid of the Thermal Power (MWh)	560,751,013					
Net import Power from the Northeast China Grid (MWh)	423,423,000					
The total Power for the North China Power Grid (MWh)	584,174,013					

Data Source: China Electric Power Yearbook 2006;
State Power Information Network: http://www.sp.com.cn

Table 5– Calculation of average emission factor for the Northeast China Grid in 2003-2005

	2003	2004	2005
Total CO_2 emission of the Northeast China Grid (tCO_2e)	174,151,899	199,754,431	207,282,748
The total power supplied to the Northeast China Grid (MWh)	153,227,363	170,132,885	179,031,567
Average emission factor (tCO_2e/ MWh)	1.13656	1.174108	1.1578

Table 6–Energy Consumption Statistics of Power Generation of the North China Power Grid in 2003

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Subtotal =A+B+C+D+E+F
Raw coal	Ten thousand Tons	714.73	1052.74	5482.64	4528.51	3949.32	6808	22535.94
Clean coal	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	9.41	9.41
Other washed coal	Ten thousand Tons	6.31	0.00	67.28	208.21	0.00	450.9	732.7
Coke	Ten thousand Tons	0.00	0.00	0.00	0.00	2.8	0.00	2.8
Coke oven gas	10^8 Cubic meter	0.24	1.71	0.00	0.9	0.21	0.02	3.08
Other gas	10^8 Cubic meter	19.92	0.00	10.63	0.00	10.32	1.56	39.43
Crude oil	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00	29.68	29.68
Gasoline	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diesel oil	Ten thousand Tons	0.29	1.35	4.00	0.00	2.91	5.4	13.95
Fuel oil	Ten thousand Tons	13.95	0.02	1.11	0.00	0.65	10.07	25.8
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	0.00	0.00	0.27	0.00	0.00	0.83	1.1
Natural gas	10^8Cubic meter	0.00	0.5	0.00	0.00	0.00	1.08	1.58
Other petroleum products	Ten thousand	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Tons							
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tons (standard coal)	9.83	0.00	0.00	0.00	0.00	39.21	49.04

Data Source: China Energy Statistical Yearbook 2004.

Table 7- The Operation Margin Emission Factor Calculation of the North China Power Grid in 2003

Fuel	Unit	Fuel Consumption in the NCPG (E)	Emission Factor (tC/TJ) (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000（in mass）
Raw coal	Ten thousand Tons	22535.94	25.8	100	20908	445737636.11
Clean coal	Ten thousand Tons	9.41	25.8	100	26344	234510.60
Other washed coal	Ten thousand Tons	732.7	25.8	100	8363	5796681.31
Coke	Ten thousand Tons	2.8	25.8	100	28435	75318.63
Coke oven gas	10^8 Cubic meter	3.08	12.1	100	16726	228559.67
Other gas	10^8 Cubic meter	39.43	12.1	100	5227	914399.71
Crude oil	Ten thousand Tons	29.68	20	100	41816	910139.18
Gasoline	Ten thousand Tons	0.01	18.9	100	43070	298.48
Diesel oil	Ten thousand Tons	13.95	20.2	100	42652	440693.26
Fuel oil	Ten thousand Tons	25.8	21.1	100	41816	834672.45
LPG	10^8Cubic meter	0.00	17.2	100	50179	0.00
Refinery gas	10^8Cubic meter	1.1	18.2	100	46055	33807.44
Natural gas	10^8Cubic meter	1.58	15.3	100	38931	345076.60
Other petroleum products	Ten thousand Tons	0.00	20	100	38369	0.00
Other coking products	Ten thousand Tons	0.00	25.8	100	28435	0.00

Other E (standard coal)	Ten thousand Tons	49.04	0	100	0	0.00
CO_2 emission of power import from NECPG	1.13656×4,244,380= 482,333tCO_2e					
Total emission (Q)	460,375,781tCO_2e					
Supply to NCPG (P)	429,609,286MWh					
OM Emission Factor (=Q/P)	1.071615tCO_2e/MWh					

Data sources: China Energy Statistical Yearbook 2006 ; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 7–Energy Consumption Statistics of Power Generation of the North China Power Grid in 2004

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Subtotal =A+B+C+D+E+F
Raw coal	Ten thousand Tons	823.09	1410	6299.8	5213.2	4932.2	8550	27228.29
Clean coal	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	40	40
Other washed coal	Ten thousand Tons	6.48	0.00	101.04	354.17	0.00	284.22	745.91
Coke	Ten thousand Tons	0.00	0.00	0.00	0.00	0.22	0.00	0.22
Coke oven gas	10^8 Cubic meter	0.55	0.00	0.54	5.32	0.4	8.73	15.54
Other gas	10^8 Cubic meter	17.74	0.00	24.25	8.2	16.47	1.41	68.07
Crude oil	10^8 Cubic meter	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gasoline	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diesel oil	Ten thousand Tons	0.39	0.84	4.66	0.00	0.00	0.00	5.89
Fuel oil	Ten thousand Tons	14.66	0.00	0.16	0.00	0.00	0.00	14.82
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	0.00	0.55	1.42	0.00	0.00	0.00	1.97
Natural gas	10^8Cubic meter	0.00	0.37	0.00	0.19	0.00	0.00	0.56
Other petroleum products	Ten thousand	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Tons							
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tons (standard coal)	9.41	0.00	34.64	109.73	4.48	0.00	158.26

Data Source: China Energy Statistical Yearbook 2005.

Table 9- The Operation Margin Emission Factor Calculation of the North China Power Grid in 2004

Fuel	Unit	Fuel Consumption in the NCPG (E)	Emission Factor (tC/TJ) (F)	Oxidation Rate (%) G	Average NCV ($MJ/t,km^3$) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000 (in mass)
Raw coal	Ten thousand Tons	27228.29	25.8	100	20908	538547476.6
Clean coal	Ten thousand Tons	40	25.8	100	26344	996856.96
Other washed coal	Ten thousand Tons	745.91	25.8	100	8363	5901190.882
Coke	Ten thousand Tons	0.22	25.8	100	28435	5917.8922
Coke oven gas	10^8 Cubic meter	15.54	12.1	100	16726	1153187.451
Other gas	10^8 Cubic meter	68.07	12.1	100	5227	1578574.385
Crude oil	Ten thousand Tons	0.00	20	100	41816	0
Gasoline	Ten thousand Tons	0.00	18.9	100	43070	0
Diesel oil	Ten thousand Tons	5.89	20.2	100	42652	186070.4874
Fuel oil	Ten thousand Tons	14.82	21.1	100	41816	479451.3838
LPG	10^8Cubic meter	0.00	17.2	100	50179	0
Refinery gas	10^8Cubic meter	1.97	18.2	100	46055	60546.05223
Natural gas	10^8Cubic meter	0.56	15.3	100	38931	122305.6296
Other petroleum products	Ten thousand Tons	0.00	20	100	38369	0
Other coking products	Ten thousand Tons	0.00	25.8	100	28435	0

Other E (standard coal)	Ten thousand Tce	158.26	0	100	0	0
CO_2 emission of power import from NECPG		1.174108×4,514,550=5,300,569.27tCO_2e				
Total emission (Q)		554,332,148tCO_2e				
Supply to SCPG (P)		493,687,660MWh				
OM Emission Factor (=Q/P)		1.12284tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006 ；2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 8–Energy Consumption Statistics of Power Generation of the North China Power Grid in 2005

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Subtotal =A+B+C+D+E+F
Raw coal	Ten thousand Tons	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	32158.53
Clean coal	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	42.18	42.18
Other washed coal	Ten thousand Tons	6.57	0.00	167.45	373.65	0.00	108.69	656.36
Coke	Ten thousand Tons	0.00	0.00	0.00	0.00	0.21	0.11	0.32
Coke oven gas	10^8 Cubic meter	0.64	0.75	0.62	21.08	0.39	0.00	23.48
Other gas	10^8 Cubic meter	16.09	7.86	38.83	9.88	18.37	0.00	91.03
Crude oil	Ten thousand Tons	0.00	0.00	0.00	0.00	0.73	0.00	0.73
Gasoline	Ten thousand Tons	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Diesel oil	Ten thousand Tons	0.48	0.00	3.54	0.00	0.12	0.00	4.14
Fuel oil	Ten thousand Tons	12.25	0.00	0.23	0.00	0.06	0.00	12.54
LPG	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	Ten thousand Tons	0.00	0.00	9.02	0.00	0.00	0.00	9.02
Natural gas	10^8Cubic meter	0.28	0.08	0.00	2.76	0.00	0.00	3.12
Other petroleum products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	Ten thousand Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	Ten thousand Tons (standard coal)	8.58	0.00	32.35	69.31	7.27	118.9	236.41

Data Source: China Energy Statistical Yearbook 2006.

Table 11– The Operation Margin Emission Factor Calculation of the North China Power Grid in 2005

Fuel	Unit	Fuel Consumption in the SCPG (E)	Emission Factor (tC/TJ) (F)	Oxidation Rate (%) G	Average NCV (MJ/t,km^3) H	CO_2Emission (tCO_2e) I=G*H*F*E*44/12/10000 (in mass)
Raw coal	Ten thousand Tons	32158.53	25.8	100	20908	636062535.8
Clean coal	Ten thousand Tons	42.18	25.8	100	26344	1051185.664
Other washed coal	Ten thousand Tons	656.36	25.8	100	8363	5192725.191
Coke	Ten thousand Tons	0.32	25.8	100	28435	8607.8432
Coke oven gas	10^8 Cubic meter	23.48	12.1	100	16726	1742396.483
Other gas	10^8 Cubic meter	91.03	12.1	100	5227	2111027.27
Crude oil	Ten thousand Tons	0.73	20	100	41816	22385.49867
Gasline	Ten thousand Tons	0.01	18.9	100	43070	298.4751
Diesel oil	Ten thousand Tons	4.14	20.2	100	42652	130786.3867
Fuel oil	Ten thousand Tons	12.54	21.1	100	41816	405689.6325
LPG	Ten thousand Tons	0.00	17.2	100	50179	0
Refinery gas	Ten thousand Tons	9.02	18.2	100	46055	277221.0107
Natural gas	10^8 Cubic meter	3.12	15.3	100	38931	681417.0792
Other petroleum products	Ten thousand Tons	0.00	20	100	38369	0
Other coking products	Ten thousand Tons	0.00	25.8	100	28435	0
Other Energy	Ten thousand Tce	236.41	0	100	0	0
Emission of electricity from the Central China Grid		1.1578×23,423,000=27,119,149.4tCO_2e				
Total Emission (Q)		647,805,425tCO_2e				
Thermal Power supplied to the Central China Grid (P)		584,174,013MWh				
OM Emission Factor [=Q/P]		1.155145tCO_2e/MWh				

Data sources: China Energy Statistical Yearbook 2006 ; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24

Table 12- Calculation of average emission factor for the North China Power Grid in recent 3 years

Years	2003	2004	2005
Total CO_2 Emission (tCO_2e)	460,375,781	554,332,148	647,805,425
Total supply （MWh）	429,609,286	493,687,660	584,174,013
Full-weighted average OM	= (460,375,781+554,332,148+647,805,425) / (429,609,286 +493,687,660 +584,174,013) = 1.1208tCO_2e/MWh		

Table 13–Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission

	Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	NCV kJ/kg kJ/m^3 H	Emission Factor I	Oxidation Rate J(%)	CO_2 emission (tCO_2e)	λ_{Coal}, λ_{Oil} λ_{Gas}
Solid	Raw coal	10^4 Tons	897.75	1,675.2	6,726.5	6,176.45	6,277.23	10,405.4	32,158.53	20,908	25.80	100	636,062,536	-
	Clean coal	10^4 Tons	0.00	0.00	0.00	0.00	0.00	42.18	42.18	26,344	25.80	100	1,051,786	-
	Other washed coal	10^4 Tons	6.57	0.00	167.45	373.65	108.69	0.00	656.36	8,363	25.80	100	5,192,725	-
	Coke	10^4 Tons	0.00	0.00	0.00	0.00	0.21	0.11	0.32	28,435	25.80	100	8,608	-
	Subtotal	-	-	-	-	-				-	-	-	642,315,054	99.17%
Liquid	Crude oil	10^4 Tons	0.00	0.00	0.00	0.00	0.73	0.00	0.73	41,816	20.00	100	22,385	-
	Gasoline	10^4 Tons	0.00	0.00	0.01	0.00	0.00	0.00	0.01	43,070	18.90	100	298	-
	Coal oil	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43,070	19.60	100	0.00	-
	Diesel oil	10^4 Tons	0.48	0.00	3.54	1.81	0.12	40.00	4.14	42,652	20.20	100	130,786	-
	Fuel oil	10^4 Tons	12.25	0.00	0.23	0.00	0.06	0.00	12.54	41,816	21.10	100	405,690	-
	Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38,369	20.00	100	0.00	-
	Subtotal	-	-	-	-	-				-	-	-	559,160	0.08%
Gas	Natural gas	10^7 m^3	2.8	0.8	0.00	27.6	0.00	0.00	31.2	38,931	15.30	100	1,742,396	-
	Coke oven gas	10^7 m^3	6.4	7.5	6.2	210.8	183.7	0.00	910.3	16,726	12.10	100	58,624	-
	Other gas	10^7	160.9	78.6	388.3	98.8	183.7	0.00	910.3	5,227	12.10	100	2,111,027	-

		m^3												
	LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50,179	17.20	100	0.00	-
	Refinery gas	10^4 Tons	0.00	0.00	9.02	0.00	0.00	0.00	9.02	46,055	18.20	100	277,221	-
	Subtotal	-	-	-	-	-	-	-	-	-	-	-	4,812,062	0.74%
	Total	-	-	-	-	-	-	-	-	-	-	-	647,686,276	100%

Table 14–Calculation of the Emission Factor for Coal-fired, oil-fired and Gas-fired Power

	Variable	Supply Efficiency J	Emission Factor of fuel (tc/Tj) F	Oxidation Rate (%) G	Emission Factor (tCO_2e/MWh) =3.6/J/1000*F*G*44/12
Coal-fired	$EF_{Coal,Adv}$	35.82%	25.80	100	0.9508
Gas-fired	$EF_{Gas,Adv}$	47.67%	15.30	100	0.4237
Oil-fired	$EF_{Oil,Adv}$	47.67%	21.10	100	0.5843

The emission factor of thermal power is:

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

Table 15–The Installed Capacity of the North China Power Grid 2003

Installed Capacity	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal
Thermal power (MW)	3,347.5	6,008.5	17,698.7	15,035.8	11,421.7	30,494.4	84,006.6
Hydro power (MW)	1,058.1	5	764.3	795.7	592.1	50.8	3,266
Nuclear power (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wind power and other (MW)	0.00	0.00	13.5	0.00	76.6	0.00	90.1
Total (MW)	4,405.6	6,013.5	18,476.5	15,831.5	12,090.4	30,545.2	87,362.7

Data Source: China Energy Statistical Yearbook 2004.

Table 16–The Installed Capacity of the North China Power Grid 2004

Installed Capacity	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal
Thermal power (MW)	3,458.5	6,008.5	19,932.7	17,693.3	13,641.5	30,494.4	84,006.6
Hydro power (MW)	1,055.9	5	783.8	787.3	567.9	50.8	3,266
Nuclear power (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wind power and other (MW)	0.00	0.00	13.5	0.00	111.7	0.00	90.1
Total (MW)	4,514.4	6,013.5	20,730	18,480.6	14,321.2	30,545.2	87,362.7

Data Source: China Energy Statistical Yearbook 2005.

Table17–The Installed Capacity of the North China Power Grid 2005

Installed Capacity	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal
Thermal power (MW)	3,833.5	6,149.9	22,333.2	22,246.8	19,173.3	37,332	111,068.7
Hydro power (MW)	1,025	5	784.5	783	567.9	50.8	3,216.2
Nuclear power (MW)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wind power and other (MW)	24	24	48	0.00	208.9	30.6	335.5
Total (MW)	4,882.5	6,178.9	23,165.7	23,029.8	19,950.2	37,413.4	114,620.5

Data Source: China Energy Statistical Yearbook 2006.

Table18–The Calculation of BM Emission Factor for the Southern China Power Grid

	2003	2004	2005	New addition 2003-2005	The Ratio in new addition
Thermal power (MW)	84,006.6	93,594.9	111,068.7	27,062.1	99.28%
Hydro power (MW)	3,266.0	3,250.7	3,216.2	-49.8	-0.18%
Nuclear power (MW)	0.00	0.00	0.00	0.00	0.00%
Wind power (MW)	90.1	137.5	335.5	245.4	0.90%
Total (MW)	87,362.7	96,983.1	114,620.4	27,257.7	100.00%
Ratio of installed capacity in 2005	76.22%	84.61%	100.00%	-	-

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

The OM is calculated as 1.10285tCO_2e/MWh, the BM is calculated as 0.9397 tCO_2e/MWh. And the baseline emission factor equal to the combined margin with equally weighted average of the operating margin emission factor and the build margin emission factor.

According to "Tool to calculate the emission factor of an electricity system"(Version 1), the default weight of hydropower is:

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

So the Baseline Emissions Factor (EF_y in tCO_2e/MWh) is 1.021275tCO_2e/M

Annex 4

MONITORING INFORMA TION

- - - - -