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:

Hebei Huafeng Coking Gas Recovery for Power Generation Project
Version: 06
Date: 26/03/2012

A.2. Description of the Project activity:

The Hebei Huafeng Coking Gas Recovery for Power Generation Project (hereafter referred to as the "Project") developed by Hebei Huafeng Coal Chemistry and Electricity Co., Ltd (hereafter referred to as the "Project Developer") is a greenfield waste gas utilisation power generation project based on existing coke ovens in Hebei Province in China (hereafter referred to as the "Host Country").

The Project located inside Huafeng Coking Plant owned by the same Project Developer in Cishan Town, Wu'an City, Hebei Province. The existing coke ovens[1] with an annual coke production of 800,000 t generate waste coking oven gas (COG) during the coking process. Besides the COG recovery for coke ovens, there is about 1.84×10^8 Nm^3 left. The Project activity will utilize the excess COG from the coking plant for power generation. Prior to the start of the implementation of the Project, the waste COG was flared to the atmosphere and the equivalent electricity generated by this Project was sourced from the North China Power Grid (NCPG), which is the same as the baseline scenario to the Project activity.

The total installed capacity of the Project will be 30 MW, consisting of two 15 MW generators. The Project was expected to generate 1.80×10^5 MWh per annum, the expected operation hours are 6,000hrs, and the expected auxiliary electricity use rate was 10%, thus the predicted electricity supply to the grid was 1.62×10^5 MWh per annum. The electricity currently generated by the North China Power Grid (hereafter abbreviated as NCPG) is relatively carbon intensive, with an operating margin emission factor of 1.1208tCO_2/MWh and a build margin emission factor of 0.9397tCO_2/MWh. The project is therefore expected to reduce emissions of greenhouse gases by avoiding CO_2 emission from equivalent power generation in coal-dominated NCPG by an estimated 160,834 tCO_2e per year during the crediting period.

The project is contributing to sustainable development of the Host Country. Specifically, the project:

- Increases employment opportunities in the area where the project is located (128 people will be permanently employed for the project operation and the construction of the projects secures jobs in the construction sector) and thereby contributes to poverty alleviation
- Enhances the local investment environment and therefore improves the local economy
- Diversifies the sources of electricity generation, important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation
- Promote the utilisation of waste COG technology for power generation

A.3. Project participants:

Name of Party involved (*)	Private and/or public entity(ies)	Kindly indicate if the Party

[1] The coke ovens started business operation since May 2007 which is early than the date (17/08/2008) of the proposed project activity is submitted for validation.

((host) indicates a host Party)	project participants (*) (as applicable)	involved wishes to be considered as project participant (Yes/No)
Host Country: People's Republic of China*	Hebei Huafeng Coal Chemistry and Electricity Co.,Ltd.	No
United Kingdom	EcoSecurities International Limited	No

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the Project activity:

A.4.1. Location of the Project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

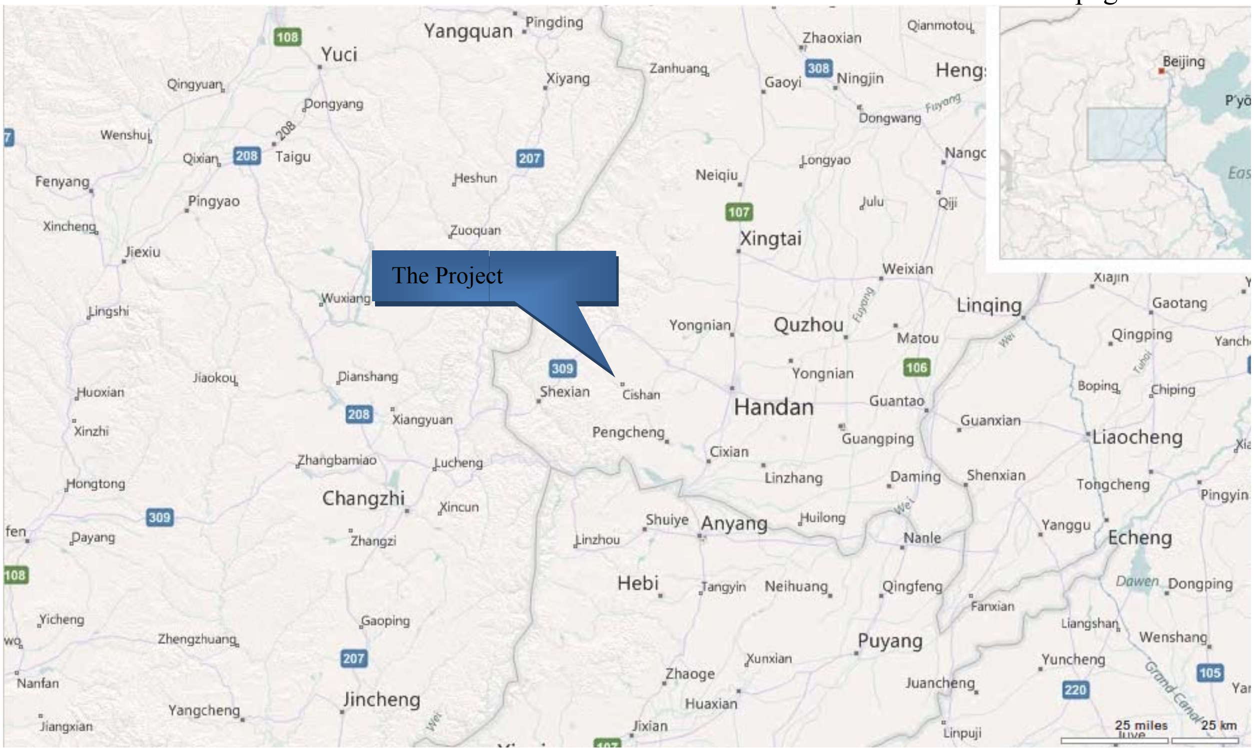
Hebei Province

A.4.1.3. City/Town/Community etc:

Cishan Town, Wu'an City

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

The exact location of the Project is defined using GPS coordinates, East 114°05′42″ and North 36°35′09″. The maps below show the location of the project activity.



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

The Project activity falls under Scope Number 1-Energy Industries (renewable/non-renewable sources) and Scope Number 4: Manufacturing industries.

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

The Project will use the waste energy contained in the excess COG of 1.84×10^{8} Nm^{3} from the existing coke ovens in the coking plant for power generation. The Project was expected to generate 1.80×10^{5} MWh per annum and the predicted electricity supply to the grid would be 1.62×10^{5} MWh per annum. And its process is illustrated in the figure below.

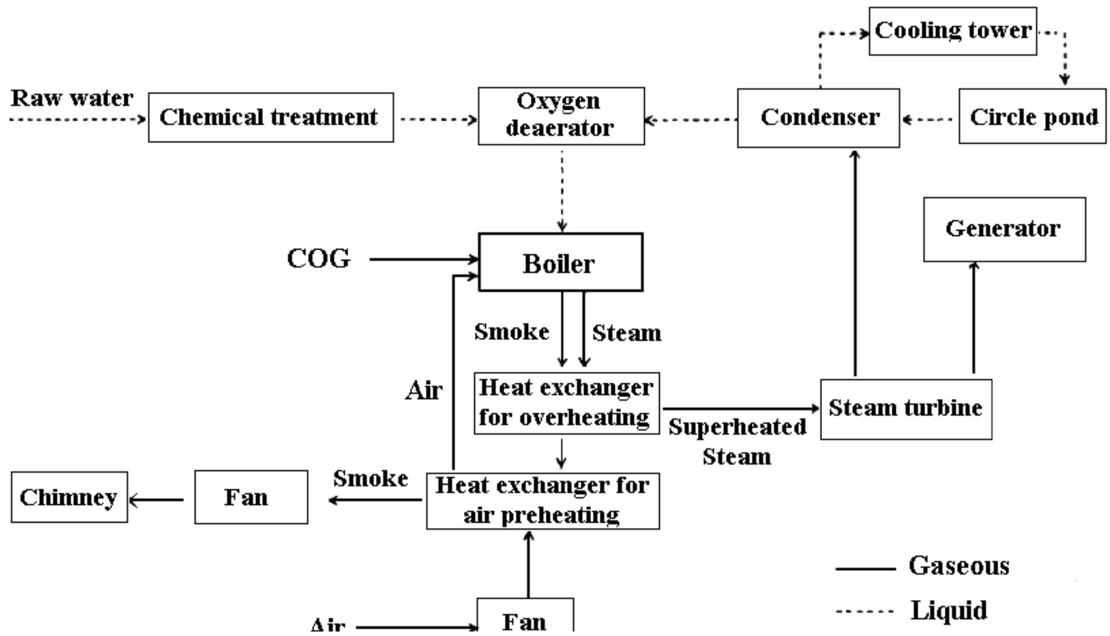


Fig. A.1 COG power generation process

Prior to the start of the implementation of the Project, the excess COG was flared to the atmosphere through a tall flare stack and the equivalent electricity generated by this Project was sourced from the coal-dominated NCPG that generates much of greenhouse gas CO_2 emission. The baseline scenario to the Project activity is the same as the scenario existing prior to the start of implementation of the Project activity. The flow chart of the Project activity can be seen as Fig A.2 shows.

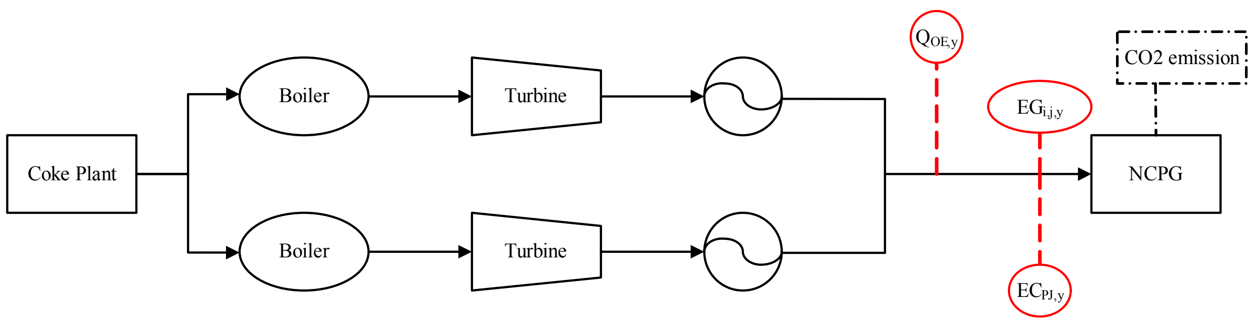


Fig. A.2 The flow chart of the Project activity

The Project activity consists of two gas-fired boilers (75t/h), two steam turbines (15MW) and two associated generators (15MW). All these equipments will not lead to greenhouse gas CO_2 emission and their technical specifications are as follows:

Table A.1. Main technical parameters of the Project

Steam Turbine: N15-3.43 (0.981)	
Quantity	2

Rated power	15MW
Rated input steam pressure	3.43Mpa
Rated input steam temperature	435℃
Technical lifetime	15 years
Supplier	Qingdao Jieneng Steam Turbine Co., Ltd.
Generator: QF-15-2	
Quantity	2
Rated power	15MW
Rated voltage	6300V
Rated frequency	50HZ
Technical lifetime	15 years
Supplier	Jinan Power Equipment Factory
Boilers: JG75-3.82/450-Q	
Quantity	2
Rated evaporation	75t/h
Rated steam pressure	3.82MPa
Rated steam temperature	450℃
Vented smoke temperature	155℃
Rated efficiency	≥86%
Technical lifetime	15 years
Supplier	Jiangxi Jianglian Energy Environment Co., Ltd.

The Project started construction in April 2007 after CDM was taken into account in April 2006[2]. In the monitoring process, electricity meters will be installed to measure the power generation, the auxiliary power consumption and the net electricity exported to the Grid separately.

The Project will use state-of-the-art but recognised technology in electricity generation and transmission. The project developer is experienced in handling and operating this kind of equipment.

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

The Project activity chooses the fixed crediting period and the crediting period of the Project activity is from 01/07/2012 to 30/04/2022. The estimation of the emission reductions in crediting period is presented in table A.2.

Table A.2 The estimation of the emission reductions in the first crediting period

Year	The estimation of annual emission reductions (tCO2e)
01/07/2012-31/12/2012	80,417
2013	160,834
2014	160,834
2015	160,834
2016	160,834
2017	160,834
2018	160,834

[2] The Economic Assessment Report was finalized by an accredited and independent third party - the Handan Huabei Smelting Construction Design Co. Ltd. on 25 April 2006, and was audited and approved by the local government - the Development and Reform Commission of Hebei Province on 20 May 2006

2019	160,834
2020	160,834
2021	160,834
01/01/2022-30/04/2022	53,611
The estimation of total emission reductions in the crediting period	1,581,534
Total number of crediting years	9 years and 10 months
The estimation of annual average emission reductions in the first crediting period	160,834

A.4.5. Public funding of the Project activity:

The project will not receive any public funding from Parties included in Annex I of the UNFCCC.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline methodology applied to the Project activity:

The Project activity uses the approved baseline methodology ACM0012 (Version 04.0.0) "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"
This methodology also refers to "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), "Tool for the demonstration and assessment of additionality" (Version 5.2.1) and "Tool to determine the remaining lifetime of equipment (version 01)".

More information about the methodology can be obtained at:
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 ACM0012 (version 04.0.0) is applicable to the proposed project due to following reasons summarized in Table B.2.1 below:

Table B.2.1 Applicability check

Methodology applicability conditions	Project activity conditions	Applicability
The consolidated methodology is applicable to project activities implemented in an existing or Greenfield facility converting waste energy carried in identified WECM stream(s) into useful energy. The WECM stream may be an energy source for: • Generation of electricity; • Cogeneration; • Direct use as process heat source; • Generation of heat in element process; • Generation of mechanical energy; or • Supply of heat of reaction with or without process heating.	The medium carrying the waste energy in form of heat, chemical energy or pressure in the proposed project is waste COG and the proposed project is implemented at an existing facility converting waste energy in waste COG, and will use waste gas for generation of electricity.	Applicable
In the absence of the project activity, the WECM stream: (a) Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility; or (b) Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.	In the absence of the project activity, the waste gas is not recovered and is flared into atmosphere.	Applicable
Project activities improving the WECM recovery may (i) capture and utilize a larger quantity of WECM stream as compared to the historical situation in existing facility, or capture	The proposed project is not to improve the WECM recovery.	N/A

and utilise a larger quantity of WECM stream as compared to a "reference waste energy generating facility"; and/or (ii) apply more energy efficient equipment to replace /modify /expand waste energy recovery equipment, or implement a more energy efficient equipment than the "reference waste energy generating facility".		
For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable;	The project is not to recover waste pressure.	N/A
Regulations do not require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity	There are no regulations which require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity.	Applicable
The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a Greenfield facility;	The Project only included the existing coke ovens with an annual coke production of 800,000 t. No capacity expansion was planned, and any capacity expansion shall be treated as a Greenfield facility.	Applicable
Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the project facility shall not be included in the emission reduction calculations.	Under abnormal operation, the waste COG will be flared to the atmosphere just as the baseline scenario. And the time span will be recorded. These emissions will not be accounted for.	Applicable
If multiple waste gas streams are available in the project facility and can be used interchangeably for various applications as part of the energy sources in the facility, the recovery of any waste gas stream, which would be totally or partially recovered in the absence of the project activity, shall not be reduced due to the implementation of CDM project activity. For such situations, the guidance provided in Annex 3 shall be followed.	Recovered waste COG is the only gas stream for the project and there is no waste gas is used in the absence of the project activity.	N/ A
The methodology is **not** applicable to the cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	Waste COG is not recovered absolutely in the absence of the project activity.	N/ A
This methodology is also **not** applicable to project activities where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel	The project is a COG steam turbine power plant but not a single cycle power plant.	N/ A

generator) to generate power. However, the projects recovering waste energy from single cycle and/or combined cycle power plants for the purpose of generation of heat only can apply this methodology		
The emission reduction credits can be claimed up to the end of the lifetime of the waste energy generation equipment. The remaining lifetime of the equipment should be determined using the latest version of the "Tool to determine the remaining lifetime of equipment"	The remaining lifetime of the waste energy generation equipment (coke oven) is estimated by "Tool to determine the remaining lifetime of equipment". The technical lifetime of coke oven production line is 15 years, and it has operated since May 2007, so the end of its lifetime should be May 2022. Therefore, The credits period can be claimed till the end of Apr. 2022.	Applicable
The extent of use of waste energy from the waste energy generation facilities in the absence of the CDM project activity will be determined in accordance with the procedures provided in Annex 1 (for Greenfield project facilities) and in Annex 2 (for existing project facilities) to this methodology.	The waste energy generation facility is existing project facility, so the proposed project applies Annex 2 guidelines to prove the extent of use of waste energy in the absence of the waste energy generation facilities. The DOE performed an on-site check on 21/10/2008 prior to project implementation to confirm that no equipment for waste energy recovery and utilisation had been installed on the waste COG prior to the implementation of the CDM project activity. The Method 2 in Annex 2 refers to 'Providing an energy balance of the relevant sections of the relevant sections of the facility to prove the waste energy was not a source of energy before the implementation of the project activity'. According to the energy balance of the project facility provided by its designer, only a part of COG generated in coking process is sent back to coke ovens and reused for heating stuff (coal), which accounts for about 48% of energy content of total COG while the remaining COG accounts for about 52% (1.84×10^8 Nm^3/a) which was wasted and released after flaring without utilization. From above all, there is no waste	Applicable

	energy recovery and utilization equipment in the streams of WECM prior to the implementation of the CDM project activity.	
The applicability conditions included in the tools referred to above apply.	The applicability conditions included in the tools are applicable to the project, as follows: “Tool for the demonstration and assessment of additionality” is included in the applied methodology ACM0012 (version 04.0.0), so its application in the project PDD is mandatory. “Tool to calculate the emission factor for an electricity system (version 02.2.1)” is applicable to the project since the project displace electricity generation by power plant n an electricity System (NCPG), and the NCPG is all located in China, which is not an Annex I country. “Tool to determine the remaining lifetime of equipment (version 01)” is applied by the project because the project include existing facility, i.e., coke oven, and new facilities, i.e., boils and steam turbine generator sets.	Applicable

Thus it is appropriate to use ACM0012 for this project.

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

As per ACM0012, the geographical extent project boundary shall include the relevant WECM stream(s), equipment and energy distribution system in the following facilities:

(1) The “project facility”;

(2) The “recipient facility(ies)”, which may be the same as the “project facility”.

The spatial extent of the grid is as defined in the “Tool to calculate the emission factor for an electricity system”.

The relevant equipment and energy distribution system cover:

• In a project facility, the WECM stream(s), waste energy recovery and useful energy generation equipment, and distribution system(s) for useful project energy;

• In a recipient facility, the equipment which receive useful energy supplied by the project, and distribution system(s) for useful project energy.

For the proposed project, the boundary includes:

- The industrial facilities where waste energy is generated. The waste energy contained in the waste

COG is generated from the existing coke ovens.

- The facilities where electricity is generated, including the gas-fired boiler, the electricity generation facilities such as the steam turbine, the generator and other auxiliary devices.
- The facilities where electricity is exported. The electricity generated by the Project activity is merged into NCPG, so all the power plants physically connected to NCPG will be included. According to "Notification on Determining Baseline Emission Factor of China's Grid " announced by Office of National Coordination Committee on Climate Change , National Development and Reform Commission (NDRC) of China (DNA of China) on 9th Aug. 2007[3], NCPG is a regional grid in China, including Beijing, Tianjin, Hebei, Shanxi, Shandong and Inner-Mongolia autonomous region.

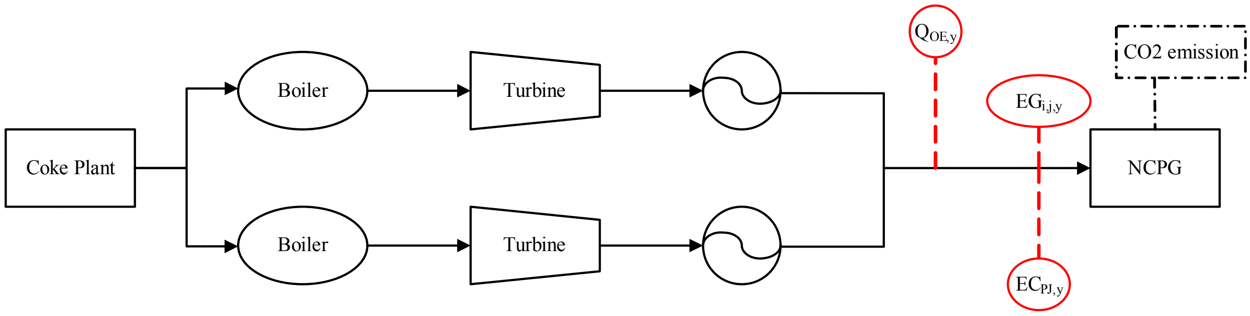


Fig. B.3.1 The flow chart of the Project activity

The following table summarizes the details of the GHG emissions included for the Project activity.

Table B.3.1 Description of How the Sources and Gases Included in the Project Boundary

	Source	**Gas**	**Included?**	**Justification/Explanation**
Baseline	Electricity generation, grid or captive source	CO_2	Included	Main emission source, from NCPG electricity generation
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Fossil fuel consumption in element process for thermal energy	CO_2	Excluded	Main emission source, but there is no fossil fuel consumption in element process for thermal energy as to the project.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Fossil fuel consumption in cogeneration plant	CO_2	Excluded	Main emission source, but there is no cogeneration plant in the baseline scenario as to the project.
		CH_4	Excluded	Excluded for simplification. This is

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

				conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Generation of steam used in the flaring process, if any	CO_2	Excluded	Main emission source, but there is no steam used in the flaring process as to the project.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project activity	Fossil fuel consumption for supply of process heat and/or reaction heat	CO_2	Excluded	Main emission source, but no fossil fuel consumption for supply of process heat and/or reaction heat for this project
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Supplemental fossil fuel consumption at the project plant	CO_2	Excluded	Main emission source, but no supplemental fossil fuel consumption at the project plant
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Supplemental electricity consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Electricity import to replace captive electricity, which was generated using waste energy in absence of project activity	CO_2	Excluded	There is no captive electricity in the baseline replaced by import electricity
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Energy consumption for gas cleaning	CO_2	Included	Main emission source, but has been included in the supplemental electricity consumption by the project
		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 energy use in the absence of the project activity;
- Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility;
- Heat generation (process heat and/or heat of reaction) in the absence of the project activity, or each recipient facility if the project activity involves generation of useful heat for that recipient facility; and
- Mechanical energy generation in the absence of the project activity, for each recipient facility if the

project activity involves generation of useful mechanical energy for that recipient facility.

The baseline methodology ACM0012 (Version 04.0.0) prescribes that the determination of the baseline scenario shall take 3 steps：

- Step 1: Define the most plausible baseline scenario for the generation of electricity using the following baseline options and combinations.
- Step 2 Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenarios by eliminating nonfeasible options
- STEP 3: 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.

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

Since the Project is to utilize the energy of the waste gas for electricity generation only and there is no heat generation or mechanical energy generation, the alternatives for heat and mechanical energy generation in the absence of the Project will not be considered.

Table B.4.1 The realistic and credible alternative(s) – for the use of waste energy

	Baseline Scenario	Comments
W1	WECM is directly vented to atmosphere without incineration	"Emission Standard of Air Pollutants for Coke Oven (GB16171-1996)" stipulates that the excess COG must be flared to the atmosphere and no direct discharge is allowed. Therefore, it is not a part of baseline scenario.
W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;	According to EB 22 Annex 3[4], the national policy, NDRC 2005 40th notification which encourages COG use, released in 2 December 2005 which has been implemented after "The adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001)" therefore, it does not need to be taken into account in developing a baseline scenario. Furthermore, the common method to deal with waste COG is to flare into atmosphere[5]. Prior to the start of the implementation of the Project, the waste COG was flared to the atmosphere. So W2 is the scenario prior to the implementation of the project and it is a part of possible baseline scenario.
W3	Waste COG is sold as an energy source	To sell the waste COG as an energy source is not a viable option. The COG might be sold as energy source for the residential or industrial users. But due to the location of Project activity which is far away (at least 40 km) from the residential area of population concentration or industrial energy consumers and the huge investment on gas pipeline for COG supply to these areas, it is not feasible for project developer to implement that.[6]

[4] http://cdm.unfccc.int/EB/022/eb22_repan3.pdf

[5] Survey of Coke Industry Association, http://hzs.ndrc.gov.cn/newhjyzyjb/t20060907_83477.htm

[6] Clarification letter issued by Wu'an City Government on 5 June 2007.

		So, it is not viable to sell the waste COG as energy source. Hence it is not a part of baseline scenario.
W4	Waste energy is used for meeting energy demand at the recipient facility	Since there is no potential use of waste gas for thermal energy around the project site, as for the project owner, this scenario means that waste COG is used for power generation (meeting energy demand of NCPG) without the support of CDM. It is technically feasible, and complies with the national laws and regulations. So, it is a part of possible baseline scenario.
W5	A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilised	Considering the fact that there is no semi-coke oven gas used for captive electricity generation in the region due to low financial viability of utilizing semi-coke oven gas (the coke plant doesn't consume much electricity for self use) and all the projects currently under planning are seeking for CDM revenue to overcome investment barrier[7] [8], so it is not financially attractive to capture a portion of the waste gas produced at the facility and used for captive electricity generation. Hence it is not a credible scenario.
W6	All the waste energy produced at the facility is captured and used for export electricity generation or steam	This option is interpreted as the Project activity not undertaken as a CDM project activity, which is similar to the W4 in the Project. It is the same as W4. So, it is a part of possible baseline scenario.

B.4.2 the realistic and credible alternative(s) --for power generation

	Baseline Scenario	Comments
P1	Proposed Project activity not undertaken as a CDM Project activity	The project owner will utilize waste COG for power generation. It is in compliance with all applicable legal and regulatory requirements, and it is technically feasible .Hence it is part of possible baseline scenario.
P2	On-site or off-site existing fossil fuel fired cogeneration plant	The Project activity is generation of electricity only, so this alternative is not applicable and should be excluded from the baseline scenarios.
P3	On-site or off-site Greenfield fossil fuel fired cogeneration plant	The analysis & comment is same with P2.
P4	On-site or off-site existing renewable energy based cogeneration plant	The analysis & comment is same with P2.
P5	On-site or off-site Greenfield renewable energy based cogeneration plant	The analysis & comment is same with P2.

[7] Clarification letter issued by Wu'an DRC on 15 October 2008 to prove that the waste COG was flared to the atmosphere prior to the start of the implementation of the Project and there were investment or technical barriers preventing the utilization of the waste COG without the financial support of CDM.

[8] http://cdm.unfccc.int/Projects/Validation/DB/AJ65QPOQ6S86H2VSPWUYV42MHQM0BE/view.html

http://cdm.unfccc.int/Projects/Validation/DB/DRP4C80Y1SN4BYDF00ER8312V40509/view.html

http://cdm.unfccc.int/Projects/Validation/DB/XTEXSDPV138YJXRYJJM97U8S0HTDM9/view.html

http://cdm.unfccc.int/Projects/Validation/DB/23RVICOG0RWX1JIJW4Y5RE6X0YXHX7/view.html

P6	On-site or off-site existing fossil fuel based existing identified captive power plant	There is no existing fossil fuel fired identified captive power plant on-site or off-site. So this option is excluded from a baseline scenario.
P7	On-site or off-site existing renewable energy or other waste energy based captive power plant;	There is no renewable energy or other waste energy based captive power plant on-site or off-site. So this option is excluded from a baseline scenario.
P8	On-site or off-site Greenfield fossil fuel based captive plant	According to regulations regarding power production in China, it is forbidden to build a thermal power station with an installed capacity lower than 135MW[9]. The install capacity of Project is 30MW, so this alternative is not in accordance with national policy. Hence this option is not a part of baseline scenario.
P9	On-site or off-site Greenfield renewable energy or other waste energy based captive plant;	There is not enough water or wind resource in Wu'an to supply the equivalent annual power generation by the specific project[10]. In addition, the technology of biomass plant[11] is mostly relies on technology transfer from abroad. The construction of biomass plant faces a serious of obstacles as the financial obstacles, technological obstacles, and it is also necessary to apply for CDM project to guarantee the normal implementation and operation. The technology for solar energy is not mature in China, the cost for power generation is very high. Hence this option is not a part of baseline scenario.
P10	Sourced from Grid connected power plants	In the absence of the Project activity, the power would be generated by the coal-dominated NCPG. So it is a part of possible baseline scenario.
P11	Existing Captive Electricity generation using waste energy (if project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency or lower recovery than the project activity.)	There is no existing Captive Electricity generating equipment using waste energy at the project site or within the Hebei Huafeng Coking Plant. So, it can be excluded from the baseline scenarios.
P12	Existing Cogeneration using waste energy, but at a lower efficiency or lower recovery.	The analysis & comment is same with P2.

From the above analysis, it can be concluded that there are two combinations of baseline scenarios applicable to this Project activity:

Scenario	Baseline options		Description of situation
	Waste energy	Power	

[9] See the announcement which strictly forbids the construction of thermal power stations with an installed capacity lower than 135WM published by the State Council office, Guo Ban Fa Ming Dian[2002] No.6

[10] There are rare small hydropower plants and none windfarm in the south area of Hebei Province, http://www.hd.cn/zwgk/jhgh/hygh/200706/t20070619_116239.shtml

[11] http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm

1	W2	P10	The surplus COG is released to the atmosphere after incineration and the equivalent electricity is sourced from Grid-connected power plants.
2	W4/W6	P1	The waste energy contained in the waste COG is used for meeting energy demand at the recipient facility (NCPG) and the Project activity is not undertaken as a CDM Project activity.

Step 2. Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenarios by eliminating nonfeasible options

As detailed in the Step 2 of Section B.5 below, the equity IRR of the Scenario 1 "The waste energy contained in the waste COG is used for meeting energy demand at the recipient facility (NCPG) and the Project activity is not undertaken as a CDM Project activity" is 8.04%, which is lower than the benchmark of 10%, so Scenario 2 is not attractive from the financial point that making it practically prohibitive. Hence Scenario 1 is not a part of the baseline scenarios.

The Scenario 1: "The surplus COG is released to the atmosphere after incineration and the equivalent electricity is sourced from Grid-connected power plants" doesn't face any other barriers. So it is the credible baseline scenario.

STEP 3: 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.

After the steps taken above, there is only one credible and plausible alternative scenario remains, so this step is not necessary.

From the above analysis, it can be concluded that the combination of W2 and P10 (the surplus COG is released to the atmosphere after incineration and the equivalent electricity is sourced from Grid-connected power plants. It is also the Baseline scenario-1 determined in the applied methodology.) is found to be the most realistic and economically attractive option available to Hebei Huafeng Coal Chemistry and Electricity Co., Ltd. in the absence of the Project activity, and therefore, as per the methodology ACM0012, this alternatives combination is the baseline scenario.

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):

In the Economic Assessment Report finished on 25 April 2006, the Project was considered to have obvious social and environmental benefits, but was not financially feasible. Thus, it was suggested in the Economic Assessment Report that the Project Developer should apply for CDM financing for this Project. In the following day, the Board of the Project Developer held a meeting and all the board of directors then reached consensus on the development of the Project and the introduction of CDM to ensure the successful construction and operation of the Project on 26 April 2006. Thus the Project Developer subsequently signed a CDM development contract with Uniufa Energy Technology Co. Ltd., a local CDM consultancy company on 22 May 2006. The local CDM consultancy acted as an intermediary to find a PDD developer and a CER buyer for the Project Developer. As such, it put the Project Developer and EcoSecurities in touch. The Project Developer and EcoSecurities started negotiating an ERPA and signed it on 25 July 2007. This started off the work on the PDD. The Project Developer received the grid connected permission of the Project on 11 September 2006 and the construction finally started on 28 April 2007. In October 2007 the Host Country Approval was requested and the Letter of Approval from NDRC was received in January 2008. The PDD was submitted to validation on 17 August 2008.

The milestones of the Project are summarised in Table B.5.1.

Table B.5.1. Project milestones

Economic Assessment Report completion [12]	25 April 2006
Decision for CDM development [13]	26 April 2006
Signature of a CDM development contract between the Project Developer and Uniufa Energy Technology Co. Ltd., a local CDM consultancy company [14]	22 May 2006
The grid connected permission received	11 September 2006
Bank loan contract signature[15]	27 April 2007
Construction Approval[16]	28 April 2007
Earliest construction contract	2 May 2007
Steam turbine purchase agreement	23 May 2007
Generator purchase agreement	25 May 2007
Boiler purchase agreement	29 May 2007
ERPA signature between the Project Developer and EcoSecurities[17]	25 July 2007
Application for Host Nation Approval [18]	October 2007
The Letter of Approval from China NDRC received	January 2008
Submission of the PDD for validation[19]	17 August 2008
Start of operation	January 2009

In accordance with ACM0012, the additionality of this project is to be demonstrated and assessed by the latest version of "Tool for the Demonstration and Assessment of Additionality (Version 05.2)" agreed by CDM Executive Board and available on the UNFCCC website.

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[12] The Economic Assessment Report was finalized by an accredited and independent third party - the Handan Huabei Smelting Construction Design Co. Ltd. on 25 April 2006, and was audited and approved by the local government - the Development and Reform Commission of Hebei Province on 20 May 2006

[13] The Board Meeting Minutes of Hebei Huafeng Coal Chemistry and Electricity Co., Ltd. on the development of Hebei Huafeng Coking Gas Recovery for Power Generation Project on 26 April 2006

[14] The CDM Development Contract between Hebei Huafeng Coal Chemistry and Electricity Co., Ltd. and Uniufa Energy Technology Co. Ltd.

[15] The loan contract signed between Hebei Huafeng Coal Chemistry and Electricity Co., Ltd. and Shijiazhuang Branch of Huaxia Bank on 27 April 2007.

[16] The Approval of the construction by Handan Hongda Engineering Construction Supervision Co. Ltd.

[17] The CDM Emission Reductions Purchase Agreement relating to the Hebei Huafeng Coking Gas Recovery for Power Generation Project on by and between Hebei Huafeng Coal Chemistry and Electricity Co., Ltd. and EcoSecurities Group PLC

[18] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1538.pdf

[19] http://cdm.unfccc.int/Projects/Validation/DB/W0A5LSE3CUBB9MFMUM71IJ0EMQTKP8/view.html

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 shown in B.4 above, a full list of alternatives to the Project activity, that is, W1 to W6 for the use of waste energy contained in the surplus COG and alternatives P1 to P11 for power generation were identified. After an analysis taking in B.4, the possible alternative scenarios to the project activity include:
Scenario 1 (W2 and P6): The surplus COG is released to the atmosphere after incineration and the equivalent electricity is sourced from Grid-connected power plants.
Scenario 2 (W4 and P1): The waste energy contained in the waste COG is used for power generation and the Project activity is not undertaken as a CDM project activity.

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

Referring to Section B.4, the alternative Scenarios 1 does not comply with the national policy, NDRC 2005 40th notification which encourages COG use, released in Dec 2nd 2005. However, according to EB 22 Annex 3, that national policy does not need to be taken into account.
Therefore, both Scenarios 1 and 2 are realistic and credible alternative scenario(s) to the Project activity that are in compliance with mandatory legislation and regulations.

Step 2. Investment Analysis

The purpose of investment analysis is to determine whether the Project activity is not：
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

The investment analysis was done in the following steps:

Sub-step 2a. Determine appropriate analysis method

According to the "Tool for the demonstration and assessment of additionality (version 05.2)", three options can be applied to conduct the investment analysis. These are the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III).

Since the Project will generate financial/economic benefits other than CDM related income, through the sale of generated electricity, Option I (Simple Cost Analysis) is not applicable.

According to the Additionality Tool, if the alternative to the CDM Project activity does not include investments of comparable scale to the project, then Option III must be used.

Given that the project developer does not have alternative and comparable investment choices, benchmark analysis (Option III) is more appropriate than investment comparison analysis (Option II) for assessing the financial attractiveness of the Project activity.

Sub-step 2b. Option III – Application of benchmark analysis

The indicator to be used for financial analysis is the Internal Rate of Return (IRR). As the power generated by this project activity is exported to the NCPG and not used for captive purpose, so under EB's guidance on the suitability of benchmark, the IRR benchmark of Chinese power industry should be chosen to prove the additionality of this project activity. The benchmark of IRR of Chinese power industry (equity & after income tax) is 10% in accordance with the "*Interim Rules on Economic Assessment of Electrical Engineering for Retrofit Projects*[20]. This benchmark is government official approved benchmark in China and serves as the sectoral benchmark rate on equity for grid connected Power Generation Projects.

On the basis of above benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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

Table B.5.2 below shows the financial analysis for the Project activity with and without CDM financing. As shown, the equity IRR without CDM (8.04%) is lower than the 10% benchmark rate applicable to the project. This therefore indicates that in comparison to other alternative investments, the project is not financially/economically attractive in the absence of CDM financing.

Table B.5.2. Summary of project's financial analysis without and with CDM financing

Equity IRR without CDM	8.04%
Equity IRR with CDM	11.82%

Table B.5.3. Main parameters used in the investment analysis

Name	**Value**	**Source**
Installed capacity (MW)	30MW	EAR*, pp. 3
Expected power supplied to the grid (MWh)	1.62×10^5MWh	EAR*, pp. 3
Income tax (%)	33	EAR*, pp. 10
VAT (%)	17	EAR*, pp. 10
Tariff, including VAT (RMB/MWh)	350	EAR*, pp. 10
Total static investment (RMB)	126,930,100	EAR*, pp. 8
Equity (RMB)	96,930,100	EAR*, pp. 8
Loan (RMB)	30,000,000	EAR*, pp. 8
Loan interest rate (%)	9.585	EAR*, pp. 8
Annual operating and maintains costs (RMB)	27,598,516	EAR*, pp. 20
Urban maintenance and construction tax rate	7%	EAR*, pp. 10
Education additional tax rate	3%	EAR*, pp. 10
Depreciation rate	5%	EAR*, pp. 9
Residue value rate	25%	EAR*, pp. 9
Price of Carbon (RMB/tCO2e)	80	Estimated

* The Economic Assessment Report was written by an accredited and independent third party - the Handan Huabei Smelting Construction Design Co. Ltd. on 25 April 2006, and was audited and approved by the local government - the Development and Reform Commission of Hebei Province on 20 May 2006

Sub-step 2d: Sensitivity analysis

[20] State Power Corporation of China. Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press, 2003.

A sensitivity analysis was conducted using assumptions that are conservative from the point of view of analysing additionality, i.e. the 'best-case' conditions for the Equity IRR were assumed by altering the following parameters:

- Operating and maintains costs
- Equity costs
- Electricity tariff
- Expected power supplied to the grid

Variations of ±10% have been considered for the critical assumptions. Table B.5.4 summarize the results of the sensitivity analysis.

Table B.5.4. Results of the sensitivity analysis (±10%)

	-10%	0	+10%
Operating and maintains costs	8.79%	8.04%	5.13%
Equity costs	8.43%	8.04%	5.81%
Electricity tariff	2.95%	8.04%	9.77%
Expected power supplied to the grid	2.95%	8.04%	9.77%

It can be found from Table B.5.4 that when Operating and maintains costs, Equity costs, Electricity tariff and Expected power supplied to the grid supplied fluctuate within the range of –10% to +10% (without CERs revenue), the equity IRR varies to different extent. However, the equity IRR is always lower than benchmark IRR of 10% whatever the critical assumptions vary.

Table B.5.5 summarize the results of the sensitivity analysis, showing the variation of each parameter needed to reach the 10% benchmark.

Table B.5.5. Results of the sensitivity analysis

	Variation of the parameter needed to reach the 10% benchmark
Operating and maintains costs	-17.2%
Equity costs	-19.4%
Electricity tariff	+10.8%
Expected power supplied to the grid	+10.8%

These variations do not reflect a realistic range of assumptions for the input parameters of the financial analysis:

- **Operating and maintains costs:** The price of the raw materials (like chemical products) is constantly increasing in China[21], as well as the cost of human resources[22]. As a result, a 17.2% of decrease in operating costs is very unlikely to happen and that the IRR is not likely to reach the 10% benchmark.

Table B.5.6. Breakdown list of annual operating and maintains cost

Annual operating and maintains cost	Amount (RMB)

[21] The price of petrochemical and chemical products keeps rising. http://www.chinanews.com/ny/news/2010/03-10/2160575.shtml

[22] Statistical Communiqué on Labor and Social Security Undertakings in 2006. 24/05/2007; National Bureau of Statistics of China: http://www.stats.gov.cn/english/newsandcomingevents/t20070524_402406436.htm

Repairing	3,173,253
Salary and welfare	5,355,264
Insurance	3,173,253
Management	8,032,896
Material fee	2,910,230
Water	4,896,000

- **Equity costs:** The price of the raw materials (like steel and concrete) is constantly increasing in China[23]. Furthermore the fixed assets were assessed by a third party of an accredited accounting firm on 15/01/2009 as 144,455,061RMB which is 13.8% higher than the estimation in the EAR. Considering the actual loan was the same as the amount estimated in the EAR, thus the actual equity cost was 17,524,961higher than the estimation in the EAR. As a result, 19.4% of decrease in investment costs can't happen. This shows that a decrease in investment costs is extremely unrealistic and that the IRR is not likely to reach the 10% benchmark.

- **Electricity tariff:** According to the Tariff Regulation by the National Development and Reform Committee in 2006, the electricity tariff given by the NCPG to new projects with desulfurization is settled at 0.35 RMB/kWh[24]. In addition, according to the approval from Hebei Price Control Bureau on 27 March 2008, the fixed electricity tariff of the Project was 0.35 RMB/kWh[25]. Therefore, the electricity tariff of the Project was unlikely to be increased by 10.8% and the 10% benchmark unlikely to be reached.

- **Expected power supplied to the grid:** The expected power supplied to the grid of the Project indicated in the EAR were calculated based on the waste COG generation when the coke plant reach its peak production volume (800,000 t coke/year). As the coke plant production volume cannot be changed and the actual coke production in 2010 is 785,450 t which is less than the peak production volume, the fuel for the power generation is capped by that. Furthermore, the actual electricity supplied to the grid in 2010 was 1.02×10^5MWh which is much lower than the estimation in the EAR. Therefore the assuming a 10.8% of increase in annual expected power supplied to the grid is illogical, and that the IRR is not likely to reach the 10% benchmark.

These results show that only with unrealistic circumstances would it be possible to reach the equity IRR benchmark. In reality, circumstances are typically more unfavourable than projected and the IRR would decrease even further away from the benchmark. We can conclude that the IRR was lower than the benchmark for a realistic range of assumptions for the input parameters of the sensitivity analysis, and therefore that the Project was not financially/economically attractive. This demonstrates that the Project activity would not be implemented without the CDM.

In conclusion the CDM helps alleviate the economic and financial hurdles faced by the project. CDM revenues will help to mitigate the project's financial unattractiveness by providing additional cash flow and improving the IRR. Furthermore, CDM financing brings many other attendant benefits including international participation in the project, greater investor confidence, and an enhanced sustainability image and profile for the project developer.

[23] Barboza, David. "Costs rising, China to export inflation." *International Herald Tribune.* 01/02/2008; http://www.supplychain.cn/en/art/2258/

[24] FagaiJiage [2006] NO.1228, Notice on the electricity tariff adjustment in NCPG issued by NDRC in Year 2006

[25] Jijiaguanzi[2009]No.31

Step 3. Barrier Analysis

Not applicable.

Step 4. Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the Project activity:

In Hebei Province, there is no similar project (power plant using waste COG with an installed capacity no less than 15 MW before the implementation of the Project in Jan. 2009), with installed capacity more than 15 MW, according to the statistic of Hebei Coke Industry Association[26].

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

As there is no similar project in Hebei Province, the Project is not a common practice.

Based on the above steps, it may be satisfactorily concluded that this Project activity is not a baseline scenario and is clearly additional.

In conclusion, the proposed CDM Project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

1. Baseline emission

In accordance with the requirement and the flow chart for determination of baseline emissions in methodology ACM0012, the approach in Case 1 in Sec.1.1.1 was followed to calculated the baseline emissions:

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

Where:

BE_y = Total baseline emissions during the year y in tons of CO_2

$BE_{En,y}$ = Baseline emissions from energy generated by Project activity during the year y in tons of CO_2

$BE_{flst,y}$ = 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 (tCO_2e per year)

It needs no complementary fossil fuel to flare waste COG in the absence of the Project activity, so the baseline emission from the generation of steam ($BE_{flst,y}$) is zero. The calculation of baseline emissions from energy generated by the Project activity during the year y in tons of CO_2 ($BE_{En,y}$) depends on the identified baseline scenario. The methodology recognizes two different scenarios, depending on the baseline options for the utilization of the waste COG and power supply. As discussed in Section B.4 and B.5, the baseline options for the Project activity are W2 and P6 which in the methodology is labelled in Scenario 1. Thus we have identified Scenario 1 as the applicable scenario for the calculation of baseline emissions as electricity is generated by the coal-dominated NCPG. According to the requirement of methodology ACM0012, $BE_{En,y}$ can be calculated according to the following equation:

[26] Survey of Coke Industry Association issued on 12/03/2008.

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad (2)$$

Where:
$BE_{Elec,y}$ = Baseline emissions from electricity during the year y in tons of CO_2
$BE_{Ther,y}$ = Baseline emissions from thermal energy (due to heat generation by element process) during the year y in tons of CO_2

The Project activity is generation of electricity only, therefore, $BE_{Ther,y}$ is equal to zero.
The Project is categorized as Type-1 project

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

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_{j} \sum_{i} (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad (3)$$

Where:
$BE_{Elec,y}$ Baseline emissions due to displacement of electricity during the year *y* in tons of CO_2
$EG_{i,j,y}$ 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;
$EF_{Elec,i,j,y}$ CO_2 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 of CO_2e/MWh;
f_{wcm} Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 for the proposed project since the electricity generation is purely from use of waste energy
f_{cap} Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than that generated in base year.

Capping of baseline emissions

As an introduction to the element of conservativeness, this methodology requires that baseline emissions should be capped irrespective of planned/unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuel type and quantity resulting in an increase in generation of waste energy. In case of planned expansion a separate CDM project should be registered for additional capacity. There are three methods for estimating the cap. Project proponents shall use Method-1 to estimate the cap if data is available. In case of project activities implemented in a new facility, or in facilities where three-year data on production is unavailable, Method-2 shall be used. In case the project proponents demonstrate technical limitations in direct monitoring of waste heat / pressure of waste energy carrying medium (WECM), then Method-3 is used.
In case of the project activity implemented in an existing facility, the monitoring of energy of waste COG is very complex[27] due to following reasons. 1) Heat content of waste COG, i.e. gas compositions and temperature as well as gas volume, shall be determined by installing sophisticated analysis devices for gas composition during project activity; 2) Waste COG are aggressive and would easily damage the

[27] www.cmsi.org.cn/yj02/200907070119_1_0.doc

instruments; 3) Complicated thermodynamic functions shall be employed to evaluate heat contents of gas mixtures that multiple gas species are involved.

Reflecting all the situations mentioned above it shall be concluded that the Method-1 and Method-2 may not be applicable to the Project. Only Method-3 seems to be applicable to the Project activity where Case 1 would meet the situation of the Project.

Case-1: The energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases f_{cap} should be the ratio of maximum energy that could be recovered (MER) by the waste heat recovery equipment implemented under the CDM project activity and the actual energy recovered under the project activity (using direct measurement). The MER should be based on information on the characteristics of the key product/by product.

Following equations should be used to estimate f_{cap}:

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}} \tag{4}$$

Where:

$Q_{OE,BL}$ = Output energy that can be theoretically produced (in MWh), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity.

$Q_{OE,y}$ = Quantity of actual output energy during year y (in MWh)

The value of f_{cap} is assumed to be 1 for ex-ante calculation in the PDD, and which will be determined by actual measurement for each crediting year, f_{cap} is set to 1 in case the calculated value of f_{cap} is higher than 1, while f_{cap} will be less than 1 if the actual measured electricity output ($Q_{OE,y}$) is greater than the value $Q_{OE,BL}$ (i.e. 1.80×10^5 MWh, which is the theoretically produced output energy estimated in the EAR of the Project. This value was also cross checked with the energy balance sheet of the Project.) in baseline.

Emission Factor of the North China Power Grid

The displaced electricity for recipient plant is supplied by North China Grid, the CO2 emission factor of the electricity $EF_{elec,gr,i,y}$ shall be determined following the guidance provided in the “Tool to calculate the emission factor for an electricity system”.

The Project therefore applies the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

This PDD uses the calculations for the year of 2008[28] and published by the DNA[29] of P. R. China on 18 July 2008 to determine the Operating Margin (OM) emission factor[30] and the Build Margin (BM)

[28] See http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239

[29] National Coordination Committee on Climate Change – National Development and Reform Commission (NDRC)

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

emission factor[31] using the most recent data available at the time of the PDD submitted for validation on 17/08/2008.

The description below follows the steps of the latest version of the "Tool to calculate the emission factor for an electricity system" and focuses on the key process of the calculation of the emission factors. Please see Annex 3 for the baseline data underlying the calculations.

Step 1. Identify the relevant electric power system

P. R. China is divided into regional electricity systems which are defined by the DNA of P. R. China[32]. The Project is located in Wu'an City, Hebei Province, which belongs to NCPG. Therefore, the relevant electric power system is identified as the NCPG. And the connected electricity system is Northeast China Power Grid (NEPG) and Central China Power Grid (CCPG).

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:
0 tCO2/MWh, or

(a) The weighted average operating margin (OM) emission rate of the exporting grid; or
(b) The simple operating margin emission rate of the exporting grid; or
(c) The simple adjusted operating margin emission rate of the exporting grid.

And for this calculation, option (b) was used.

Step 2 Choose whether to include off-grid power plants in the project electricity system (optional)
Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.
In this case, Option I is chosen.

Step 3. Select an operating margin (OM) method

The "Tool to calculate the emission factor for an electricity system" offers four methods to calculate the OM emission factor ($EF_{grid,OM,y}$):

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or
d) Average OM.

Of these procedures, Option (a) (Simple OM) is applied. This is because low-cost / must run resources constitute less than 50% of total grid generation in average of the five most recent years. From 2002 to 2006 respectively, 0.89%, 0.86%, 0.70%, 0.75%, 0.79% of the electricity generated in the NCPG came from low-cost / must run resources[33].

[31] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf

[32] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/200887164119674.pdf

[33] China Electric Power Yearbooks 2003-2007; see Annex 3 for detailed calculation.

Power plants registered as CDM project activities are included in the sample group that is used to calculate the OM as long as the criteria for including the power sources in the sample group apply.

The "Tool to calculate the emission factor for an electricity system" offers the choice between two data vintages calculate the Simple OM emission factor ($EF_{grid,OMsimple,y}$):

- *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.
- *Ex-post* option: The year in which the Project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

$EF_{grid,OMsimple,y}$ is calculated *ex-ante* using the data from 2004 to 2006, available in the China Energy Statistics Yearbooks 2005-2007 and the China Electric Power Yearbooks 2005-2007. This data vintage remains fixed during the crediting period.

Step 4. Calculate OM emission factor according to the selected method

The "Tool to calculate the emission factor for an electricity system" offers three options to calculate $EF_{grid,OMsimple,y}$:

- *Option A*: Based on the net electricity generation and a CO2 emission factor of each power unit
- *Option B*: Based 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

Detailed data on the individual power plants connected to the NCPG necessary for applying option A is not available; therefore, options A cannot be used. Since only nuclear and renewable power generation are considered as low-cost / must-run power sources and since the quantity of electricity supplied to the grid by these sources is known, option B is applicable and used to calculate the Simple OM emission factor.

$EF_{grid,OMsimple,y}$, using option B is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{y,grid}} \qquad \textbf{(5)}$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit) (country-specific values are used)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{y,grid}$[34]	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)

[34] $EG_{y,grid}$ = GEN x (1-rate of internal use by the power station). See Annex 3 and section B.6.2. for details.

i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
y	=	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

$EF_{grid,OMsimple,y} = 1.1169\ tCO_2/MWh$

For detailed information, please see Annex 3.

Step 5. Calculate the build margin emission factor

According to the "Tool to calculate the emission factor for an electricity system", 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, due to the fact that data on electricity generation of each power plant / unit in the grid is currently not available in P. R. China (see Step 3), EB guidance on the estimation of the build margin in P.R. China can be applied for the purpose of defining the sample group[35]. In accordance with the guidance, the build margin consists of the set of power capacity additions in the electricity system that comprises 20% of the system generation capacity (in MW) and that have been built most recently. Therefore, the set of power capacity additions included in the build margin is determined as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \qquad \textbf{(6)}$$

$\sum_j CAP_{j,y-n}$	=	The aggregate incrementally installed power capacity of all kinds of power generation sources j (MW) in year y-n
$\sum_j CAP_{j,y}$	=	The aggregate incrementally installed power capacity of all kinds of power generation sources j (MW) in year y
n	=	The number of years (y-1, y-2, …, y-n) which have to be considered to comprise 20% of the system generation capacity (in MW) and that have been built most recently

In the period from 2005 to 2006 (2006 being the most recent year for which data is available), the amount of power capacity additions made up over 20% of the total NCPG generation capacity in 2006. Therefore $n = 1$.

Since data on the electricity generation of each individual power plant / unit in the grid is not available in P. R. China, power plants registered as CDM project activities cannot be isolated and are taken into account in the build margin.

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[35] See: EB guidance on estimating the build margin for AM0005, consolidated in ACM0002 which refers to the Tool to calculate the emission factor for an electricity system
http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM and
http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

The "Tool to calculate the emission factor for an electricity system" offers the choice between two data vintages to calculate the BM:

- *Option 1*. For the first crediting period, the build margin emission factor is calculated *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.
- *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

The BM emission factor ($EF_{grid,BM,y}$) is calculated *ex-ante* using the data from 2004 to 2006, available in the China Energy Statistics Yearbook 2007 and the China Electric Power Yearbooks 2005-2007. This data vintage remains fixed during the first crediting period and will be updated for the second crediting period.

According to the "Tool to calculate the emission factor for an electricity system", $EF_{grid,BM,y}$ is the generation-weighted average emission factor of all power units *m* during the most recent year *y* for which power generation data is available. However, due to the fact that data on both electricity generation and emission factor of each power plant / unit in the grid is currently not available in P. R. China (see Step 3), EB guidance on the estimation of the build margin in P.R. China can also be applied for the purpose of estimating the BM emission factor[36] and $EF_{grid,BM,y}$ is calculated as follows:

$$EF_{grid,BM,y} = \frac{CAP_{thermal,y-n,y}}{\sum_j CAP_{j,y-n,y}} \times EF_{thermal,adv} \qquad \textbf{(7)}$$

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$CAP_{thermal,y-n,y}$	=	The incrementally installed power capacity of thermal power generation sources (MW) in the NCPG in year *y* compared to that of year *y-n*
$\sum_j CAP_{j,y-n,y}$	=	the aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in the NCPG in year *y-n* compared to that of year *y-n*
$EF_{thermal,adv}$	=	The emission factor of thermal power generation sources of the NCPG with the efficiency level of the best commercially available technology in P. R. China, for *y* the most recent historical year for which power generation data is available

$EF_{Thermal,Adv}$ is calculated as follows:

$$EF_{Thermal,Adv} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad \textbf{(8)}$$

Where:

$EF_{i,Adv}$	=	The CO_2 emission factor of fuel *i* (tCO_2/MWh) using the best commercially available technology in P. R. China and taking into account the carbon content and the oxidation factor of fuel *i*[37]
Coal, Oil	=	Solid fuel, liquid fuel and gaseous fuel respectively

[36] See: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM and http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

[37] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf

and *Gas*

λ_i = The weight of CO_2 emissions from fuel *i* fired power plants in the total CO_2 emissions from thermal power, using the most recent available data

And

$$\lambda_{Coal} = \frac{\sum_{i=Coal} FC_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,y} \times EF_{CO2,i,y}} \qquad \textbf{(9)}$$

$$\lambda_{Oil} = \frac{\sum_{i=Oil} FC_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,y} \times EF_{CO2,i,y}} \qquad \textbf{(10)}$$

$$\lambda_{Gas} = \frac{\sum_{i=Gas} FC_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,y} \times EF_{CO2,i,y}} \qquad \textbf{(11)}$$

Where $FC_{i,y}$ and $EF_{CO2,i,y}$ are defined as in equation 1.

$EF_{grid,BM,y}$ = 0.8687 tCO_2/MWh

For detailed information, please see Annex 3.

Step 6. Calculate the combined margin (CM) emission factor

The combined margin (CM) emissions factor ($EF_{grid,CM,y}$) is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad \textbf{(12)}$$

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emissions factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor, which is 0.5 by default
w_{BM} = Weighting of build margin emissions factor, which is 0.5 by default

$EF_{grid,CM,y}$=0.5*1.1169+0.5*0.8687 = 0.9928 tCO_2/MWh

For detailed information, please see Annex 3.

2. Project emissions

Project Emissions include emissions due to (1) combustion of auxiliary fuel to supplement waste gas/heat and (2) electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption.

$$PE_y = PE_{AF,y} + PE_{EL,y}$$

Where:

PE_y	=	Project emissions due to the project activity (tCO_2)
$PE_{AF,y}$	=	Project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or co-generation plant(s) if they are used as supplementary fuels due to non-availability of waste energy to the project activity or due to any other reason (tCO_2)
$PE_{EL,y}$	=	Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption (tCO_2) (as per Table 1: Summary of gases and sources included in the project boundary)

(1) Project emissions due to auxiliary fossil fuel combusted to supplement waste energy in the project activity

These project emissions should be calculated only in two situations: (1) when the auxiliary fossil fuel is used to supplement the waste energy directly in the waste heat recovery combustion systems, where the energy output cannot be apportioned between fossil fuels and the waste energy, and (2) when the calculation of F_{wcm} using equation 31, 32 and 34 is practically not possible due to technical constraints (e.g. gas measurement and its quality). In all other cases, if the calculation of F_{wcm} has accounted for the use of the auxiliary fossil fuels, then the calculation of the project emissions for the auxiliary fossil fuels is not required.

These emissions are calculated by using latest approved tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

For this proposed project, no auxiliary fuel is introduced in the Project activity, there is no project emission of auxiliary fuel.

(2) Project emissions due to electricity consumption of gas cleaning equipment or other supplementary electricity consumption

These project emissions are calculated by using latest approved tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

For this proposed project, project emission from consumption of additional electricity (for cleaning of gas before being used for generation of energy or other supplementary electricity consumption) by the project is treated as 0 for the estimation in the PDD and will be monitored ex-post.

$$PE_y = EC_{PJ,y} \times EF_{grid,CM,y} \quad (13)$$

3. Leakage

No leakage is considered, according to ACM0012.

4. Emission Reductions

Emission reductions due to the Project activity during the year y are calculated as follows:

$$ER_y = BE_y - PE_y \quad (14)$$

Where:

ER_y are the total emissions reductions during the year y in tons of CO_2

PE_y are the emissions from the Project activity during the year y in tons of CO_2

BE_y are the baseline emissions for the Project activity during the year y in tons of CO_2

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

Data / Parameter:	***Installed Capacity of the Project activity***
Data unit:	**MW**
Description:	The installed capacity of the Project activity
Source of data used:	Economic Assessment Report
Value applied:	30
Justification of the choice of data or description of measurement methods and procedures actually applied :	Economic Assessment Report
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	**t, m^3**
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
Source of data used:	China Energy Statistics Yearbooks (2005-2007)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$NCV_{i,,y}$
Data unit:	**MJ/t, kJ/m^3**
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	China Energy Statistics Yearbook 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	**tCO_2/TJ**
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*

Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	***$GEN_{j,y}$***
Data unit:	**MWh**
Description:	The electricity generation by source *j* in year *y* of each province connected to the NCPG
Source of data used:	China Electric Power Yearbooks (2003-2007)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	***Rate of internal use by the power station***
Data unit:	**%**
Description:	The rate of internal use of power source *j* in each province connected to the NCPG.
Source of data used:	China Electric Power Yearbooks (2005-2007)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	***$CAP_{j,y}$***
Data unit:	**MW**
Description:	The aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in the NCPG in year *y*
Source of data used:	China Electric Power Yearbooks (2005-2007)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source

Any comment:	

Data / Parameter:	$CAP_{thermal,y-n,y}$
Data unit:	**MW**
Description:	The aggregate incrementally installed power capacity of thermal power generation sources (MW) in the NCPG in year *y* compared to that of year *y-n*
Source of data used:	China Electric Power Yearbooks (2005-2007)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$Q_{OE,BL}$
Data unit:	MWh
Description:	Output energy (i.e. electricity) that can be theoretically produced (in MWh), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released in the absence of CDM project activity.
Source of data used:	Economic Assessment Report carried out by independent qualified/certified external process experts
Value applied:	1.80×10^5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value has been cross checked with the energy balance sheet of the Project.
Any comment:	

Data / Parameter:	f_{WCM}
Data unit:	%
Description:	Fraction of total energy generated by the project activity using waste energy. This fraction is 1 if the energy generation is purely from use of waste energy in the project generation unit.
Source of data used:	Project design document and actual implementation
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	If the generation unit uses steam from both waste and fossil fuels afterwards, this factor shall be adjusted.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

1. The calculation of baseline emission

As it is mentioned above, the baseline emissions of the project can be calculated as follows

$BE_y = BE_{En,y} + BE_{flst,y} = BE_{En,y} + 0 = BE_{En,y}$

$BE_{Elec,\ y} = f_{cap} * f_{wcm} * \Sigma\Sigma(EG_{i,\ j,\ y} * EF_{Elec,\ i,\ j,\ y}) = 1*1*1.62\times10^5 MWh*0.9928\ tCO_2e/MWh = 160{,}834\ tCO2e$

So, $BE_y = BE_{En,y} = BE_{Elec,y} = 160{,}834\ tCO_2e$

2. The calculation of project emission

There is no combustion of auxiliary fuel to supplement waste gas and the Project emission from consumption of additional electricity by the project (for cleaning of gas before being used for generation of energy or other supplementary electricity consumption) is treated as 0 for the estimation in the PDD, so $PE_y = 0\ tCO_2e$

3. The calculation leakage

According to the methodology, the leakage is zero, i.e., $L_y = 0$

4. The calculation of emission reduction

$ER_y = BE_y - PE_y = 160{,}834\ tCO_2e$

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

Year	Estimation of Project activity Emission (tonnes of CO2e)	Estimation of baseline emission (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2e)	Estimation of Emission reductions (tonnes of CO2e)
01/07/2012-31/12/2012	0	80,417	0	80,417
2013	0	160,834	0	160,834
2014	0	160,834	0	160,834
2015	0	160,834	0	160,834
2016	0	160,834	0	160,834
2017	0	160,834	0	160,834
2018	0	160,834	0	160,834
2019	0	160,834	0	160,834
2020	0	160,834	0	160,834
2021	0	160,834	0	160,834
01/01/2022-30/04/2022	0	53,611	0	53,611
Total (tCO2e)	0	1,581,534	0	1,581,534

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{i,,j,y}$
Data unit:	MWh
Description:	Quantity of electricity supplied to the recipient *j* (*j* is grid) by generator, which in the absence of the project activity would have sourced from i^{th} source (*i* is grid) during the year *y* in MWh, for this project $EG_{i,j,y}$ is the electricity supplied to NCPG by the Project activity

Source of data to be used:	The data is monitored by meters installed at the outlet of the plant continuously, and the quantity of electricity will be recorded every month, and archived after two years by the end of the Project activity. The accuracy of meter(s) would meet the relevant national standards.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.62×10^5
Description of measurement methods and procedures to be applied:	Continuously measured by two-way meters and recorded monthly.
QA/QC procedures to be applied:	Data shall be measured at the grid side and at the plant site for cross check.The energy meters with an accuracy degree of 0.5 or above will undergo maintenance / calibration to the national / industrial standards. Electricity meters will be calibrated by qualified institution annually. Sales records or purchase receipts are used to ensure the consistency.
Any comment:	

Data / Parameter:	$Q_{OE,y}$
Data unit:	MWh
Description:	Quantity of actual output energy during year *y*
Source of data to be used:	The data is monitored by meters installed at the output of the generators continuously, and the quantity of electricity will be recorded every month, and archived after two years by the end of the Project activity. The accuracy of meters would meet the relevant national standards.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.80×10^5
Description of measurement methods and procedures to be applied:	Continuously measured and recorded on a monthly basis.
QA/QC procedures to be applied:	The energy meters with an accuracy degree of 0.5 or above will undergo maintenance / calibration to the national / industrial standards. Electricity meters will be calibrated by qualified institution annually.
Any comment:	

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Additional electricity consumed in year *y*, for gas cleaning equipment, or any other project related equipment, as a result of the implementation of the project activity
Source of data to be	The data is monitored by meters installed at the outlet of the plant continuously,

used:	and the quantity of electricity will be recorded every month, and archived after two years by the end of the Project activity. The accuracy of meter(s) would meet the relevant national standards.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Continuously measured and recorded on a monthly basis.
QA/QC procedures to be applied:	The energy meters with an accuracy degree of 0.5 or above will undergo maintenance / calibration to the national / industrial standards. Electricity meters will be calibrated by qualified institution annually. Sales records or purchase receipts are used to ensure the consistency.
Any comment:	

B.7.2 Description of the monitoring plan:

According to the requirement of ACM0012 (Version 03.2), all the monitoring data and parameters will be detailed recorded. All the data should be recorded so as to be rechecked. Data record will be archived until 2 years after the credit period.

1. Monitoring organisation

Roles and responsibilities will be defined for the relevant staff involved in CDM monitoring, and the prospect of nominating a CDM Manager will be considered. If appointed, the CDM Manager will have the overall responsibility for the monitoring system on this project.

A CDM Manager, or an appropriate senior manager, will manage the process of training new monitoring staff, ensuring trained monitoring staff perform the monitoring duties and that where trained monitoring staff are absent, the integrity of the monitoring system is maintained by other trained staff.

Staff involved in the CDM Project monitoring will receive relevant training from either EcoSecurities, a contracted consultant, or the relevant Chinese authority. Records of trained CDM monitoring staff will be retained by the Project Developer.

2. Monitoring data

The data need to be monitored for the Project activity can be seen as follows:
$EG_{i,j,y:}$ Electricity supplied to NCPG by the Project activity
$Q_{OE,y}$: Quantity of actual output energy during year y
$EC_{PJ,y}$: Additional electricity consumed in year y, for gas cleaning equipment, or any other project related equipment, as a result of the implementation of the project activity

3. Monitoring equipment and installation

Electricity supplied to the Grid will be metered according to the Methodology. The meters, installed at the outlet of the plant, which can measure the electricity supplied to NCPG by the Project activity ($EG_{i,j,y}$), hereafter known as the "main meters", and will be the meter of primary concern for this project. And the quantity of actual output energy during year *y* ($Q_{OE,y}$) will be measured by the meters installed at the output of the generators. The additional electricity consumed in year y ($EC_{PJ,y}$), as a result of the implementation of the project activity, will be measured by the meters installed at the input of auxiliary line.
In the event of erroneous meter readings (where there are either data gaps, or data outliers present), data can be cross-checked against other invoices, power generation statements, or other meters.
Electricity meters should meet the relevant local standards at the time of installation. Records of the meter (type, make, model and calibration documentation) will be retained in the quality control system.

4. Data collection, management and archiving

The monitoring procedure for the net electricity supplied to NCPG is as follows:
(1) The electricity will be monitored continuously and recorded monthly through the relevant meters.
(2) The Project Developer and the Grid Company confirm the electricity transaction.
(3) The records of meter(s) readings and copies of sales receipts will be obtained.
(4) The project developer archives the data electronically until two years after the end of the crediting period.

5. Quality Assurance and Quality Control

The quality of data generated by this project will be maintained through the development of an overarching monitoring system. This system may include procedures used to double check data, for staff training, meter calibration, accreditation of the facility completing calibration, and the adherence to the relevant standards.

All the meters will be installed in line with the national or national standards. The metering equipments will be calibrated according to relevant requirements, and the calibration reports will be issued by the party who calibrate the meters.

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

The baseline study and the monitoring methodology was concluded on 07 August, 2008 by Mr Tian, Haijiang from Uniufa Energy Technology Co., Ltd. (Not a project participant) and supervised by Mr. Zhou, Jiangbo from EcoSecurities International Ltd.

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Detailed baseline information is attached in Annex 3.

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:

27/04/2007 (Bank loan contract signature date)

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

15 years and 0 month

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

C.2.1. Renewable crediting period

Not applicable

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2012

C.2.2.2. Length:

9 years and 10 months

SECTION D. Environmental impacts

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

Article12 of the Kyoto Protocol requires that A CDM Project activity contribute to the sustainable development of the host county. Assessing the project's positive and negative impacts on the local environment and on society is thus a key element for each CDM project.

The Project activity has developed and passed full Environmental Impact Assessments (EIA) in line with the requirements of the Chinese Government. Therefore the EIA of the whole project has been approved by Hebei Environmental Protection Bureau in January, 2006. [38]

Where impacts of the project were identified, mitigation measures were suggested and defined. The EIA highlights the following with regards to the Project, as shown in the table below.

Identified environmental impacts	Measures taken
Air pollution	
SO2 during COG combustion	The COG generated from the coke plant will be purified before its combustion to meet the requirement of national
Water pollution	
Chemical waster water	Neutral treatment tank
Wastewater from the staff	Septic tank
Noise pollution	
Blower and coal gas compression machine	Muffler
Pump	Reduce the noise by utilisation of the space of the plant

Conclusion

As a whole, there exist basically beneficial impacts to environment in the Project activity and the net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored.

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:

Not applicable, since the construction and operation of the Project have no significant environmental impacts.

[38] See the approval of the EIA from Hebei Environmental Protection Bureau in January 2006

SECTION E. Stakeholders' comments

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

The stakeholder consultation for the Project activity took place in August 2007. The local stakeholders that would be impacted by the Project were invited to submit comments on the Project activity by filling in a questionnaire sent out by the project developer. The invitation notices were posted on the notice boards in the villages centre nearby for ten days to ensure the time for comments.

The questions asked in the questionnaires were as follows:

- What impacts do you think the CDM Project activity will have on the local environment?
- What impacts do you think the CDM Project activity will have on employment and social welfare in the local area?
- What impacts do you think the CDM Project activity will have on your livelihood?
- What impacts do you think the CDM Project activity will have on the local economic development?
- What is your overall attitude towards the construction of the CDM Project?
- Do you support the construction of the CDM Project?

The stakeholders identified with the project include local residents (44), government representatives (2), local environment protection bureau (2), and local power company (2).

50 questionnaires were sent to local stakeholders by the project developer. A full list of stakeholders consulted is available from the project developer.

E.2. Summary of the comments received:

The survey received 100% participation (50 questionnaires returned out of 50). After collecting the questionnaires, the following are the key findings:

- What impacts do you think the CDM Project activity will have on the local environment? 84% think it will have positive impacts and 16% think it will have no impacts.
- What impacts do you think the CDM Project activity will have on employment and social welfare in the local area? 100% think it will have positive impacts.
- What impacts do you think the CDM Project activity will have on your livelihood? 94% think it will have positive impacts and 6% think it will have no impacts.
- What impacts do you think the CDM Project activity will have on the local economic development? 100% think it will have positive impacts.
- What is your overall attitude towards the construction of the CDM Project? 96% think it will have positive impacts and 4% think it will have no impacts.
- Do you support the construction of the CDM Project? 100% support.

The survey shows the all the stakeholders believe that the proposed CDM Project activity will have positive impacts on the local environmental, employment and social life. All stakeholders expressed their support for the Project. A full list of the filled-in questionnaires is available from the project developer.

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

The Project Entity has carried out relevant measures to solve the concerns of the stakeholders whom were interviewed during the investigation for the Project activity, including suggestion in EIA. Regarding to the mitigation measures suggested in EIA, the project developer will ensure to implement to achieve harmonization of environmental, social and economical benefits.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public fund involved in the Project.

Annex 3

BASELINE INFORMATION

Calculation of the Operating Margin Emission Factor of the North China Power Grid

Table A1 CO_2 emissions from thermal power plants of the North China Power Grid (2004)

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia	Subtotal	EF (tC/TJ)	NCV	CO2 emissions (tCO2e)
										(MJ/t, kJ/m3)	J= I*H*G*44/(12*100) (mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J= I*H*G*44/(12*10) (volume unit)
Raw coal	10^4 Tons	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	20908	538,547,477
Clean coal	10^4 Tons						40	**40**	25.8	26344	996,857
Other washed coal	10^4 Tons	6.48		101.04	354.17		284.22	**745.91**	25.8	8363	5,901,191
Coke	10^4 Tons					0.22		**0.22**	29.2	28435	6,698
Coke oven gas	10^4 Tons	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	16726	1,153,187
Other gas	10^8 m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	5227	1,578,574
Crude oil	10^8 m^3							**0**	20	41816	0
Gasoline	10^4 Tons								18.9	43070	0
Diesel	10^4 Tons	0.39	0.84	4.66				**5.89**	20.2	42652	186,070
Fuel oil	10^4 Tons	14.66		0.16				**14.82**	21.1	41816	479,451
LPG	10^4 Tons							**0**	17.2	50179	0
Refinery gas	10^4 Tons		0.55	1.42				**1.97**	15.7	46055	52,229
Natural gas	10^4 Tons		0.37		0.19			**0.56**	15.3	38931	122,306
Other petroleum products	10^8 m^3							**0**	20	38369	0
Other coking products	10^4 Tons							**0**	25.8	28435	0
Other E (standard coal)	10^4 Tons	9.41		34.64	109.73	4.48		**158.26**	0	0	0
Total										Total	549,024,041

Data source: China Energy Statistics Yearbook 2005

Table A2 Electricity Generation of North China Power Grid (2004)

Province	Thermal Power generation (MWh)	Losses (%)	Thermal power supply (MWh)
Beijing	18579000	7.94	17,103,827
Tianjin	33952000	6.35	31,796,048
Hebei	124970000	6.5	116,846,950
Shanxi	104926000	7.7	96,846,698
Inner Mongolia	80427000	7.17	74,660,384
Shandong	163918000	7.32	151,919,202
Total			489,173,110

Data source: China Electric Power Yearbook 2005

Table A3 Electricity import to NCPG and emission factor calculation in 2004

Imported from Northeast China Grid MWh	4514550
EF of Northeast China Grid tCO_2e/MWh	1.1738371
Total emissions tCO_2	554323387.3
Total power output	493687659.9
EF tCO_2e/MWh	1.122822044

Data source: China Electric Power Yearbook 2005

Table A4 CO_2 emissions from thermal power plants of the North China Power Grid (2005)

Fuel Type	**Unit**	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Shandong**	**Inner Mongolia**	**Subtotal**	**EF (tC/TJ)**	**NCV**	**CO_2 emissions (tCO_2e)**
										(MJ/t, kJ/m^3)	**J= I*H*G*44/(12*100)(mass unit)**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J= I*H*G*44/(12*10) (volume unit)**
Raw coal	10^4 Tons	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	**32158.53**	25.8	20908	636,062,536
Clean coal	10^4 Tons						42.18	**42.18**	25.8	26344	1,051,186
Other washed coal	10^4 Tons	6.57		167.45	373.65		108.69	**656.36**	25.8	8363	5,192,725
Coke	10^4 Tons					0.21	0.11	**0.32**	29.2	28435	9,742
Coke oven gas	10^4 Tons	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	16726	1,742,396
Other gas	10^8 m^3	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	5227	2,111,027
Crude oil	10^8 m^3					0.73		**0.73**	20	41816	22,385
Gasoline	10^4 Tons			0.01				**0.01**	18.9	43070	298
Diesel	10^4 Tons	0.48		3.54		0.12		**4.14**	20.2	42652	130,786
Fuel oil	10^4 Tons	12.25		0.23		0.06		**12.54**	21.1	41816	405,690
LPG	10^4 Tons							**0**	17.2	50179	0
Refinery gas	10^4 Tons			9.02				**9.02**	15.7	46055	239,141
Natural gas	10^4 Tons	0.28	0.08		2.76			**3.12**	15.3	38931	681,417
Other petroleum products	10^8 m^3							**0**	20	38369	0
Other coking products	10^4 Tons							**0**	25.8	28435	0
Other E (standard coal)	10^4 Tons	8.58		32.35	69.31	7.27	118.9	**236.41**	0	0	0
Total										Total	647,649,331

Data source: China Energy Statistics Yearbook 2006

Table A5 Electricity Generation of North China Power Grid (2005)

Province	Thermal Power generation (MWh)	Losses (%)	Thermal power supply (MWh)
Beijing	20880000	7.73	19,265,976
Tianjin	36993000	6.63	34,540,364
Hebei	134348000	6.57	125,521,336
Shanxi	128785000	7.42	119,229,153
Inner Mongolia	92345000	7.01	85,871,616
Shandong	189880000	7.14	176,322,568
Total	603231000		560,751,013

Data source: China Electric Power Yearbook 2006

Table A6 Electricity import to NCPG and emission factor calculation in 2005

Imported from Northeast China Grid MWh	3929000
EF of Northeast China Grid tCO_2e/MWh	1.1578
Total emissions tCO_2	652198327.1
Total power output	564680013
EF tCO_2e/MWh	1.154987448

Data source: China Electric Power Yearbook 2006

Table A7 CO_2 emissions from thermal power plants of the North China Power Grid (2006)

Fuel Type	**Unit**	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Subtotal**	**EF (tC/TJ)**	**NCV (MJ/t, kJ/m^3)**	**CO_2 emissions (tCO_2e) J=I*H*G *44/(12*100) (mass unit)**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**K=G*H*I*J*44/(12*10) (volume unit)**
Raw coal	10^4 Tons	96.63	639.2	6867.99	6968.88	8404.05	10930.66	**35607.41**	25.8	20908	704,277,823
Clean coal	10^4 Tons						39.77	**39.77**	25.8	26344	991,125
Other washed coal	10^4 Tons	6.36		214.13	371.14	61.77	544.6	**1198**	25.8	8363	9,477,855
Briquette	10^4 Tons	7.97					27.77	**35.74**	26.6	20908	728,820
Coke	10^4 Tons						3.23	**3.23**	29.2	28435	98,335
Coke oven gas	10^8 Tons	0.38	0.63	5.8	22.32	0.64	5.79	**35.56**	12.1	16726	2,638,825
Other gas	10^8 m^3	20.66	6.58	69.72	13.79	22.76	7.22	**140.73**	12.1	5227	3,263,593
Crude oil	10^4 m^3					0.74		**0.74**	20	41816	22,692
Gasoline	10^4 Tons			0.01				**0.01**	18.9	43070	298
Diesel	10^4 Tons	0.21		3.01		0.07	6.32	**9.61**	20.2	42652	303,589
Fuel oil	10^4 Tons	6.38		0.08			4.1	**10.56**	21.1	41816	341,633
LPG	10^4 Tons						0.01	**0.01**	17.2	50179	316
Refinery gas	10^4 Tons			2.43			2.32	**4.75**	15.7	46055	125,934
Natural gas	10^8 Tons	3.41	0.73		0.53			**4.67**	15.3	38931	1,019,942
Other petroleum products	10^4 m^3						0.28	**0.28**	20	38369	7,878
Other coking products	10^4 Tons							**0**	25.8	28435	0
Other E (standard coal)	10^4 Tons	6.83		47.11	230.76	12.51	132.29	**429.5**	0	0	0
Total											723,298,659

Data source: China Energy Statistics Yearbook 2007

Table A8 Electricity Generation of North China Power Grid (2006)

Province	Thermal Power generation (MWh)	Losses (%)	Thermal power supply (MWh)
Beijing	20705000	7.51	19,150,055
Tianjin	35924000	6.86	33,459,614
Hebei	143888000	6.63	134,348,226
Shanxi	150250000	7.45	139,056,375
Inner Mongolia	139593000	7.58	129,011,851
Shandong	230922000	7.12	214,480,354
Total	721282000		669,506,473

Data source: China Electric Power Yearbook 2007

Table A9 Electricity import to NCPG and emission factor calculation in 2006

Imported from Northeast China Grid MWh	2,618,060
EF of Northeast China Grid tCO_2e/MWh	1.16687886
Imported from Central China Power Grid MWh	497,060
EF of Central China Grid tCO_2e/MWh	0.87599
Total emissions tCO_2	726,789,037
Total power output	672,621,593
EF tCO_2e/MWh	1.080531825

Data source: China Electric Power Yearbook 2007

Table A10 Operating Margin Emission Factor of the North China Power Grid

	OM	Electricity generated(MWh)
OM2004	1.12282	493,687,660
OM2005	1.15499	564,680,013
OM2006	1.08053	672,621,593
Average EF_{OM} (tCO_2/MWh)	1.1169	

Calculation of the Build Margin Emission Factor of North China Power Grid

Table A11 Calculation of CO_2 Emission of Solid, Liquid and Gas Fuel for Power Grid

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	EF (tC/TJ)	NCV	CO_2 emissions (tCO_2e)
										(MJ/t, kJ/m^3)	J=I*H*G *44/(12*100) (mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+ F	H	I	K=G*H*I*J*44/(12 *10) (volume unit)
Raw coal	10^4 Tons	796.63	1639.2	6867.99	6968.88	10930.66	8404.05	35607.41	20908	25.8	704,277,823
Clean coal	10^4 Tons	0	0	0	0	39.77	0	39.77	26344	25.8	991,125
Other washed coal	10^4 Tons	6.36	0	214.13	371.14	544.6	61.77	1198	8363	25.8	9,477,855
Briquette	10^4 Tons	7.97	0	0	0	27.77	0	35.74	20908	26.6	728,820
Coke	10^4 Tons	0	0	0	0	3.23	0	3.23	28435	29.2	98,335
Coal total	10^4 Tons										715,573,958
Crude oil	10^4 Tons	0	0	0	0	0	0.74	0.74	41816	20	22,692
Gasoline	10^4 Tons	0	0	0.01	0	0	0	0.01	43070	18.9	298
Coke oil	10^4 Tons	0	0	0	0	0	0	0	43070	19.6	0
Diesel	10^4 Tons	0.21	0	3.01	0	6.32	0.07	9.61	42652	20.2	303,589
Fuel oil	10^4 Tons	6.38	0	0.08	0	4.1	0	10.56	41816	21.1	341,633
Other petroleum products	10^4 Tons	0	0	0	0	0.28	0	0.28	38369	20	7,878
Other coking products	10^4 Tons	0	0	0	0	0	0	0	28435	25.8	0
Oil total	10^4 Tons										676,091
Natural gas	10^8 m^3	34.1	7.3	0	5.3	0	0	46.7	38931	15.3	1019942
Coke oven gas	10^8 m^3	3.8	6.3	58	223.2	57.9	6.4	355.6	16726	12.1	2638825
Other gas	10^8 m^3	206.6	65.8	697.2	137.9	72.2	227.6	1407.3	5227	12.1	3263593
LPG	10^4 Tons	0	0	0	0	0.01	0	0.01	50179	17.2	316
Refinery gas	10^4 Tons	0	0	2.43	0	2.32	0	4.75	46055	15.7	125934
Gas Total											7,048,610

Total											**723,298,659**

Data Source: China energy statistical yearbook 2007

Table A12 Emission factor of coal-fired plants, gas-fired plants and oil-fired plants in the North China Power Grid

	Efficiency A	**Carbon content (tC/TJ)** B	**Emission factor (tCO_2/MWh)** C=3.6/A/1000*B*44/12
EF $_{coal,Adv}$	37.28%	25.8	0.9135
EF $_{gas,Adv}$	48.81%	15.3	0.4138
EF $_{oil,Adv}$	48.81%	21.1	0.5706
Source	Statistics by the State Electricity Regulatory Commission (SERC) on newly built thermal plants in the 10th "Five-Year Plan" period 2000-2005, and Data from the NDRC (http://cdm.ccchina.gov.cn/)	2007 IPCC Guidelines for National Greenhouse Gas Inventories	

Table A.13. Share of different fossil fuels in the total CO_2 emissions from thermal power plants of the North China Power Grid

Item	**Value**
λcoal	98.93%
λoil	0.09%
λgas	0.98%

Therefore,

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9083 tCO_2e / MWh$$

Table A14 Installed capacities of North China Power Grid (2006)

Power type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3984	6512	26087	26661	28899	49395	141538
Hydropower	MW	1053	5	785	790	818	553	4004
Nuclear	MW	0	0	0	0	0	0	0
Others	MW	24	24	218	0	565	106	937
Total	MW	5061	6541	27090	27451	30282	50054	146479

Data source: China electricity statistical yearbook 2007

Table A15 Installed capacities of North China Power Grid (2005)

Power type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydropower	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear	MW							0
Others	MW	24	24	48		208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.1	37413.4	114620.5

Data source: China electricity statistical yearbook 2006

Table A16 Installed capacities of North China Power Grid (2004)

Power type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydropower	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear	MW	0	0	0	0	0	0	0
Others	MW	0	0	13.5	0	111.7	12.3	137.5
Total	MW	4514.4	6013.5	20730	18480.6	14321.2	32923.5	96983.2

Data source: China electricity statistical yearbook 2005

Table A17 Incremental installed capacity from 2004-2006

Table A3	A	B	C	D	E
	Installed Capacity 2004	Installed Capacity 2005	Installed Capacity 2006	Installed Capacity 2006-2004	Ratio of Thermal Capacity Additions to Total Capacity Additions
	MW	MW	MW	MW	%
Hydro	93594.9	111068.7	141538	30469.3	95.64%
Coal	3250.7	3216.2	4004	787.8	2.47%
Nuclear	0	0	0	0	0.00%
Other(wind)	137.5	335.5	937	601.5	1.89%
Total	**96983.1**	**114620.4**	**146479**	31858.6	100.00%
Percentage of Installed Capacity to 2005 Capacity	66.21%	78.25%	100%		

$EF_{grid,BM,y}$=0.9083*95.64%=0.8687tCO_2/MWh

Table A18 Baseline Emission Factor of the North China Power Grid (tCO2/MWh)

A	Operating Margin Emission Factor	1.1169
B	Build Margin Emission Factor	0.8687
C	Combined Emission Factor (C=0.5*A+0.5*B)	0.9928

Data of low-cost/must-run resources

Table A19 Installed capacity and generation of North China Grid in 2002

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total in China North China Grid
	A	B	C	D	E	F	G=A+B+C+D+E+F
Thermal generation(GWh)	17,886	27,263	100,970	82,256	51,382	124,162	403,919
Hydro generation(GWh)	466	12	410	1,878	674	15	3,455
Generation from other sources(GWh)	0	0	36	0	134	0	170
Total generation in province(GWh)	18,352	27,275	101,416	84,134	52,190	124,177	407,544

Percentage of thermal generation in 2002	99.11%
Percentage of all other resources in 2002	0.89%

Data source: China Electric Power Yearbook 2003

Table A20 Installed capacity and generation of North China Grid in 2003

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total in China North China Grid
	A	B	C	D	E	F	G=A+B+C+D+E+F
Thermal generation(GWh)	18,608	32,191	108,261	93,962	65,106	139,547	457,675
Hydro generation(GWh)	679	9	504	1,890	697	19	3,798
Generation from other sources(GWh)	0	0	37	0	144	0	181
Total generation(GWh)	19,287	32,200	108,802	95,852	65,947	139,566	461,654

Percentage of thermal generation in 2003	99.14%
Percentage of all other resources in 2003	0.86%

Data source: China Electric Power Yearbook 2004

Table A21 Installed capacity and generation of North China Grid in 2004

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total in China North China Grid
	A	B	C	D	E	F	G=A+B+C+D+E+F
Thermal generation(GWh)	20,006	33,952	124,970	104,920	21,213	163,940	469,001
Hydro generation(GWh)	397	0	525	2,028	21	41	3,012
Generation from other sources(GWh)	145	0	40	0	88	16	289
Total generation(GWh)	20,548	33,952	125,535	106,948	21,322	163,997	472,302

Percentage of thermal generation in 2004	99.30%
Percentage of all other resources in 2004	0.70%

Data source: China Electric Power Yearbook 2005

Table A22 Installed capacity and generation of North China Grid in 2005

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total in China North China Grid
	A	B	C	D	E	F	G=A+B+C+D+E+F
Thermal generation(GWh)	20,880	36,993	134,348	128,785	92,345	189,880	603,231
Hydro generation(GWh)	452	0	310	2,150	1,181	0	4,093
Generation from other sources (GWh)	149	7	25	0	157	120	458
Total generation(GWh)	21,481	37,000	134,683	130,935	93,683	190,000	607,782

Percentage of thermal generation in 2005	99.25%
Percentage of all other resources in 2005	0.75%

Data source: China Electric Power Yearbook 2006

Table A23 Installed capacity and generation of North China Grid in 2006

	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total in China North China Grid
	A	B	C	D	E	F	G=A+B+C+D+E+F
Thermal generation(GWh)	20,570	36,173	145,117	150,254	26,104	226,949	605,167
Hydro generation(GWh)	437	13	617	2,387	252	154	3,860
Generation from other sources (GWh)	125	90	364	0	208	157	944
Total generation(GWh)	21,132	36,276	146,098	152,641	26,564	227,260	609,971

Percentage of thermal generation in 2006	99.21%
Percentage of all other resources in 2006	0.79%

Data source: China Electric Power Yearbook 2007

Annex 4

MONITORING INFORMATION

Please refer to Section B.7.2

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