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:

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Hebei Wasted Gas based Captive Power Plant Project in Longgang Group
Version number of the document: 4.0
Date: 09/04/2009
History:

Version 1	10/12/2007	First version, prepared for validation and GSP
Version 2	10/07/2008	Second version, revised based on corrective action requests in the draft validation protocol from DOE
Version 3	20/12/2008	revised before developing final validation report
Version 3.1	23/02/2009	
Version 4.0	09/04/2009	

A.2. Description of the project activity:

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Hebei Wasted Gas based Captive Power Plant Project was initiated by Xingtai Longhai Steel Group Co., Ltd (hereafter referred to as Longgang Group). The project activity is to build a Wasted Gas based Captive Power Plant with total capacity of 30MW. The objectives of the project are to generate electricity by recovering the waste energy in iron-and-steel-making process in Longgang Group, which otherwise would have been let off to the atmosphere in absence of the project activity. The electricity generated by the project will be supplied to Longgang Group and displace an equivalent amount of power purchasing from grid, thus avoiding CO_2 emissions due to the consumption of electricity derived from the fossil fuel dominantly North China Power Grid (NCPG).

The project involves the utilization of waste gases and waste pressure:

1) A gas-fueled power plant including two sets of steam turbine generator with a capacity of 12 MW and two gas-fueled boilers with a capacity of 75 t/h, which utilize waste Blast Furnace Gas (hereafter referred to as BFG) and waste Converter Gas (hereafter referred to as LDG) simultaneously as fuel for power generation. The annual electricity supplied by gas-fueled power plant is 162,000MWh, which is estimated on the assumption of capacity of 24 MW, the annual operation hours of 7200h and the power consumption rate of 6.3%.

2) A Top Recovery Turbine (TRT) power plant including separately two TRT units with a capacity of 3 MW, which utilize the waste pressure of BFG from 2 sets of Blast furnace with the volume of 450 m^3. The annual electricity supplied by two TRT units is 34,200MWh, which is estimated on the assumption of 3 MW for each TRT unit, the annual operation hours of 6000h and the power consumption rate of 5%.

Currently about 68000 Nm^3/h waste blast furnace gas (BFG) and 25576 Nm^3/h waste Converter Gas (LDG) is vented to the atmosphere after being flared in Longgang Group, the energy of waste gases is released without utilization. Moreover new blast furnaces are planed and the waste gas of which is going to also be vented after flared unless the proposed project is carried out. In addition, BFG on the top of two blast furnaces with a volume of 450 m^3 (No. 3# and 4#) has provided with pressure of around 0.10~0.15MPa. Prior to installation of TRT unit, the pressure would be decreased by 8~10kPa by the relief valves, by which the waste pressure can not be used. The proposed project will utilize these waste gas and waste pressure to power generation.

Till 2006, the electricity demand of Longgang Group has come to about 52 MW and is entirely provided via local grid that belongs to NCPG. Considering 30MW capacity of the proposed project, all amount of electricity supplied by the project will meet the demand of Longgang Group, no surplus will be sent to the grid. After being put into operation, the proposed project is able to deliver electricity of totally 196.2 GWh per year replacing equivalent amount of electricity purchasing from NCPG, simultaneously will realize GHG emission reduction of 202,103 tCO_2e.

The contributions of the proposed project to sustainable development are summarized as follows:

- Save coal and other fossil fuels used in the power sector, and correspondingly reduce SO_2 and NOx emissions;
- Reduces GHG emissions compared to a business-as-usual scenario;
- Improve the energy consumption per unit of output in steel sector in China;
- The construction and operation of the project will provide 93 new job opportunities for the local people.

A.3. Project participants:

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Participants to the project activity are the following:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Xingtai Longhai Steel Group Co., Ltd. (Project owner)	No
Japan (buyer's country)	PEAR Carbon Offset Initiative, Ltd. (buyer)	No

More detailed contact information on the 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):

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The Host Country is the People's Republic of China.

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

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Hebei Province

A.4.1.3. City/Town/Community etc:

>>
Neiqiu County, Xingtai City

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

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The project activity is located within the Xingtai Longhai Steel Group Co., Ltd, where is in economic development area in Neiqiu County, Xingtai City, Hebei Province, China. The project's geographical coordinates are longitude of 114°32 '14" and latitude 37°15'50".

Figure 1 is a map showing the location of the Project in Xingtai City, Hebei Province, China.

Figure 1. Map showing the location of the Project

Project location in Neiqiu Country in Hebei Province

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

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This category would fall within sectoral scope 1: Energy industries; 4: Manufacturing industries

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

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The Project will recover the surplus BFG produced by blast furnaces mixed LDG produced by convectors and utilize the waste pressure of BFG for electricity generation. No.3 & No.4 blast furnaces and No.1 & No.2 converters are existing facilities. A new blast furnace was planned to construct in 2008, and No.3 converter are under construction and will be put into operation in 2008. The Project is comprised of two components:

1) A gas-fueled power plant, where will install two sets of condensing steam turbine generator with a capacity of 12 MW and two sub-high pressure and temperature gas-fueled boilers with capacity of 75 t/h, which utilize waste BFG mixed with LDG as fuel for power generation. It is designed to deliver power 162 GWh to the facilities in iron and steel making process of Longgang Group every year.

2) A Top Recovery Turbine (TRT) power plant, where will install separately two TRT units with a capacity of 3 MW, will deliver power 34.2 GWh to the facilities in iron and steel making process of Longgang Group per year. It is designed to utilize the waste pressure of BFG about 100~150 kPa, totally 237,600 Nm^3/h, from 2 sets of Blast furnace with the volume of 450 m^3.

The total capacity of the project activity is 30MW and estimated net electricity generation provided to

Longgang Group will reach 196.2 GWh every year when the project activity is fully put into operation. The entire process of the proposed project is illustrated in the following diagram.

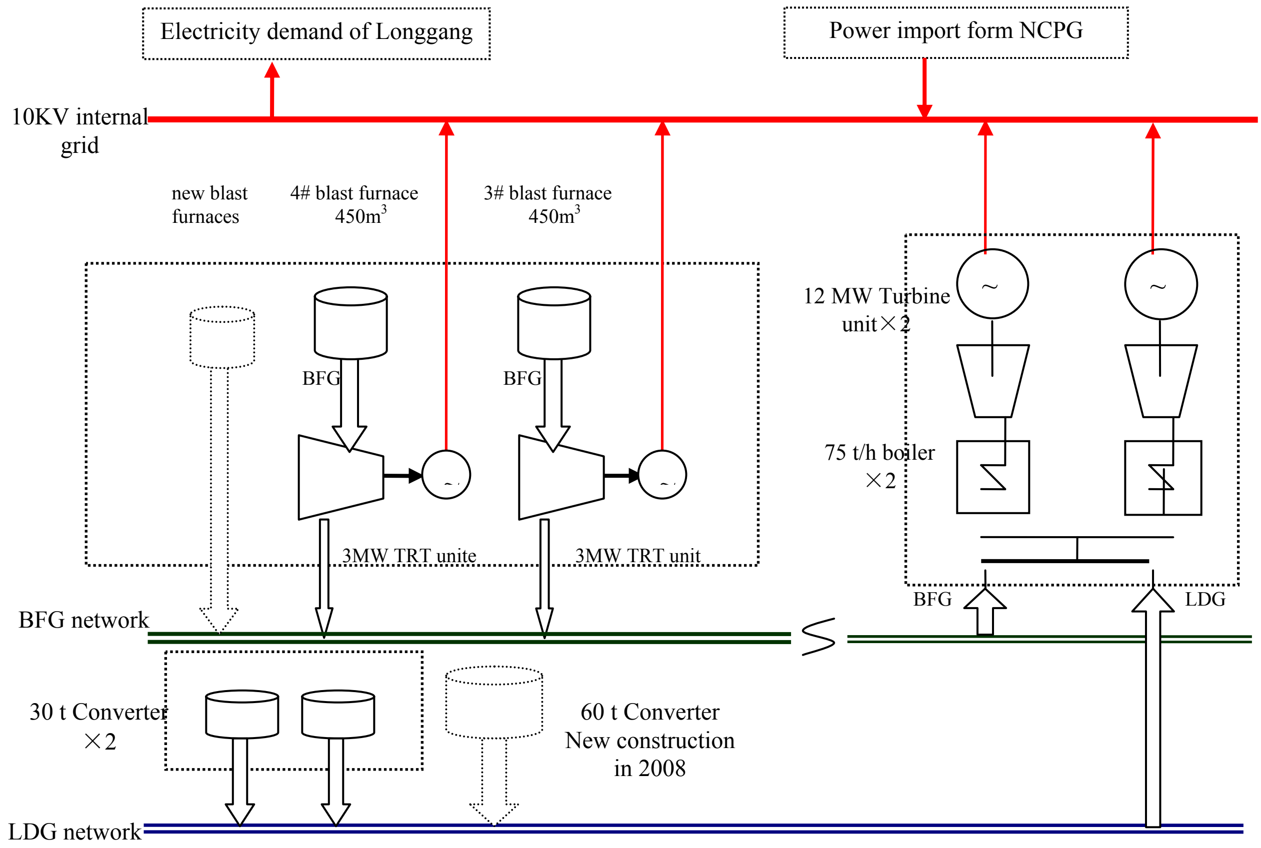

Figure 2. Flow chart of the waste gases based power generation system

The performance characteristics of the main equipment employed by project activity can be seen in Table 1

Table 1 Key Characteristics of Major Technology Employed by project activity

Gas-fuelled power Generation System:	
Gas Boiler	Steam Turbine Generator Unit
Model: UG75-5.3/485-Q Number: 2 sets Rated output: 75 t/h Rated steam pressure: 5.29Mpa Rated steam temperature: 485^{0}C Designed boiler efficiency: ≥89% Operational lifetime: 20 years	Condensing Steam Turbine Model: N12-4.9 Number: 2 sets Rated Power: 12MW Pressure of input: 4.9 MPa Temperature of input: 470 ℃
	Generator Model: QF-12-2 Number: 2 sets Rated Power: 12 MW Max Power: 15MW

	Rated voltage: 10.5kV Operational lifetime: 20 years
TRT Power Generation System:	
Turbine unit	Generator Unit
Model: MPG3.4-220/145 Number: 2 sets Rated/ Maximum power: 3 / 4.5MW Input Gas Temperature: 30~250^{0}C Rated Speed: 3000 r/min Operational lifetime: 20 years	Model: QFW-3.0-2 Number: 2 sets Rated Power: 3MW Rated voltage: 10.5kV Power Factor： 0.8 Rated Speed: 3000r/min Operational lifetime: 20 years

All the equipment adopted by the proposed project is manufactured domestically in China, no direct technology transferring from ANNEX I Parties involved.

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

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It is expected that the project activities will generate emission reductions within the North China Power Grid for about 202,103 tCO_2e per year over a 10-years fixed crediting period from 01/07/2009 to 30/06/2019.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
01/07/2009~31/12/2009	101,052
2010	202,103
2011	202,103
2012	202,103
2013	202,103
2014	202,103
2015	202,103
2016	202,103
2017	202,103
2018	202,103
01/01/2019~30/06/2019	101,051
Total estimated reductions (tonnes of CO_2e)	2,021,030
Total number of crediting years	10 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	202,103

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for this Project.

SECTION B. Application of a baseline and monitoring methodology:

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

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ACM0012 (version 02) – "Consolidated baseline methodology for GHG emission reductions for waste gas or waste heat or waste pressure based energy system".
(http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_0Y7SNKXDFIUDGWXRUD6M7Y4TRNWJ3E)

Reference:

ACM0012 (version 03.1)[1] – "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"
(http://cdm.unfccc.int/UserManagement/FileStorage/FI2PAALEOP8XPVOS2NVDFSQ8RVMUBS)

The *Tool to calculate the emission factor for an electricity system* (version 1)
(http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf)

The *Tool for the Demonstration and Assessment of Additionality* (version 05.2).
(http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf)

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

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The consolidated methodology ACM0012 (version 2) is for project activities that utilize waste gas and/or waste heat (henceforth referred to as waste gas/heat) as an energy source for:
- Cogeneration; or
- Generation of electricity; or
- Direct use as process heat source; or
- For generation of heat in element process (e.g. steam, hot water, hot oil, hot air);

The consolidated methodology ACM0012 is also applicable to project activities that use waste pressure to generate electricity.

The objective of the proposed project activity is to utilize waste gas and waste pressure as an energy source for electricity generation. Thus it could primarily be considered that the methodology is applicable to the proposed project activity.

In accordance with the items of applicability condition of methodology ACM0012, the description of relevant situation of the proposed project and corresponding conclusions are showing as follow:

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[1] ACM0012 ver03.1 is applied for the calculation of f_{cap}.

No.	**According to the consolidated methodology ACM0012, it is applicable under the following conditions:**	**The relevant situation of the proposed project activity, which describe whether the item is applicable.**	**Conclusion**
1	• If project activity is use of waste pressure to generate electricity, electricity generated using waste gas pressure should be measurable.	• As to the component of using waste pressure to generate electricity, the electricity generated by the TRT units is measurable. The corresponding detail information of monitoring is available in B.7.	**Applicable**
2	• Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility;	• The electricity generated by the project activity is used to meet the electricity demand of iron and steel making process in Longgang Group.	**Applicable**
3	• The electricity generated in the project activity may be exported to the grid;	• The electricity generated by the project activity is going to be used within Longgang Group, not planned to export to the grid.	**Applicable**
4	• Energy in the project activity can be generated by the owner of the industrial facility producing the waste gas/heat or by a third party (e.g. ESCO) within the industrial facility.	• The energy in the project activity is generated by the owner of the industrial facility i.e. the Longgang Group.	**Applicable**
5	• Regulations do not constrain the industrial facility generating waste gas from using the fossil fuels being used prior to the implementation of the project activity.	• There is no regulation that constrains the industrial facility generating waste gas from using the fossil fuels being used prior to the implementation of the project activity.	**Applicable**
6	• The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	• The waste gas and pressure used in the proposed project activity is partly from existing No.3 & No.4 blast furnaces and No.1 & No.2 converters, other part from new ones in Longgang Group.	**Applicable**
7	• The waste gas/pressure utilized in the project activity was flared or released into the atmosphere in the absence of the project activity at existing facility. This shall be proven by either one of the following: ● By **direct measurements** of energy content and amount of the waste gas for at least *three years* prior to the start of the project activity.	• The waste gas utilized in the project activity was flared and the waste pressure was released into the atmosphere in the absence of the project activity at existing facility. This could be proven by the below method: ● **Energy balance** of the iron and steel making sections of Longgang to prove that the waste gas and pressure were not sources of energy before the implementation of the project	**Applicable**

	• **Energy balance** of relevant sections of the plant to prove that the waste gas/heat was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance must demonstrate that the waste gas/heat was not used and also provide conservative estimations of the energy content and amount of waste gas/heat released. • **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities. • **Process plant** manufacturer's original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat produced for rated plant capacity/per unit of product produced. • On site checks by DOE prior to project implementation can check that no equipment for waste gas recovery and use has been installed prior to the implementation of the CDM project activity.	activity. The energy balance could provide transparent estimations of the energy content and amount of waste gas and pressure released.	

8	• The credits are claimed by the generator of energy using waste gas/heat/pressure. ● In case the energy is exported to other facilities an agreement is signed by the owner's of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source.	• The power plant using waste gas and pressure, the generator, belongs to Longgang. Simultaneously, the electricity generated by the project activity is delivered to meet the energy demand of iron and steel making in Longgang. Therefore, the credits are claimed by Longgang, the generator.	**Applicable**
9	• For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: ● The remaining lifetime of equipments currently being used; and ● Credit period.	• The blast furnace and converter system was built in 2005 and 2006 respectively, and the designed life span is at least 20 years of both of them. The credits can be claimed for Credit period that is the lower one.	**Applicable**
10	• Waste gas/ pressure that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for.	• In the proposed project activity the waste gas or pressure is kept being released as a normal operation, instead of what is released under abnormal operation (emergencies, shut down) of the plant.	**Applicable**
11	• Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation.	• Cogeneration of energy is from combined heat and power. In this case, the proposed project activity generates electricity only.	**Applicable**
Conclusion: Clearly the project activity is in line with all the applicability criteria and the consolidated baseline methodology ACM0012 is applicable.			

According to the consolidated methodology ACM0012, the consolidated baseline methodology ACM0012 is applied in compliance with the consolidated monitoring methodology ACM0012, and the emission factor of baseline grid electricity displaced by net electricity supply of the Project is calculated as per the *Tool to calculate the emission factor for an electricity system* (version 1) , the additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* (version 05.2) approved by CDM EB.

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

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According to ACM0012， the table below shows gases and sources included in the project boundary.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation, grid or captive source	CO_2	Included	Main emission sources.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Fossil fuel consumption in boiler for thermal energy	CO_2	Excluded	Excluded for the project activity is utilizing waste gas and waste pressure to generate electricity only.
		CH_4	Excluded	
		N_2O	Excluded	
	Fossil fuel consumption in cogeneration plant	CO_2	Excluded	Excluded for the project activity is utilizing waste gas and waste pressure to generate electricity only.
		CH_4	Excluded	
		N_2O	Excluded	
	Baseline emissions from generation of steam used in the flaring process, if any	CO_2	Excluded	Excluded for there is no steam requirement during the flaring process.
		CH_4	Excluded	
		N_2O	Excluded	
Project Activity	Supplemental fossil fuel consumption at the project plant	CO_2	Included	Main emission source. Only supplemental fossil fuel consumption in the project activity is a few of acetylene (C_2H_2) supplied as liquefied bottle which will be used to ignite the waste gas during the start-up of boiler. After the start-up, the bottle of liquefied C_2H_2 will be removed from the ignition equipment and completely separated from the combusting system due to safety consideration.
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Supplemental electricity consumption.	CO_2	Included	During the start-up or repair period, any electricity consumption by the power plant equipments is accounted as supplemental electricity consumption.

		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Project emissions from cleaning of gas	CO_2	Included	Only in case waste gas cleaning is required and leads to emissions related to the energy requirement of the cleaning Because the cleaning gas equipment consumes electricity both in baseline and project activity, project emission due to electricity consumption for gas cleaning can be ignored.
		CH_4	Excluded	
		N_2O	Excluded	

According to ACM0012, the geographical extent project boundary includes the following:

1) **Industrial facilities where waste energy are generated:** blast furnaces No.3, No.4, where waste BFG and waste pressure are generated; three converters No.1, No.2 and No.3 where waste LDG is generated. In addition, a planned blast furnace is involved where waste gas is planned to use in the project activity as fuel.
2) **Equipments where generate electricity from waste energy:** two sets of 12MW condensing steam turbine generator with two sets of 75t/h gas boiler, and two sets of 3MW TRT generator .
3) **Recipient plant:** The iron and steel process of Longgang Group where receive the electricity generated by project activity and NCPG where relevant grid power demand is displaced. As defined in the *Tool to calculate the emission factor for an electricity system (version 1)*, the spatial extent of the grid in this PDD comprises all the power plants connected physically to the North China Power Grid, which covers Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia.

   Overview of the geographical extent is showing in figure 2.

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

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According to the methodology ACM0012, the most plausible baseline scenario will be selected via following procedure:

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

Sub-step1 Identification of the plausible baseline scenario for use of waste gas

For the use of waste gas, the realistic and credible alternative(s) may include, *inter alia*:

W1 Waste gas is directly vented to atmosphere without incineration;
W2 Waste gas is released to the atmosphere after incineration or waste heat is released to the atmosphere (waste pressure energy is not utilized);
W3 Waste gas/heat is sold as an energy source;
W4 Waste gas/heat/pressure is used for meeting energy demand.

For W1(Waste gas is directly vented to atmosphere without incineration):

Directly venting waste gas to atmosphere without incineration is conflict with relevant item in *Gas Security Regulation for Industry Enterprise GB6222-2005,* which requires the surplus gas was flared before being vented.
The waste gas in the Project consists of BFG and LDG, which are both high toxicity and easy explosion. Being a common practice in iron and steel industry, the waste gas is flared by specified incineration facility. In absence of the proposed activity, the waste gas is released to the atmosphere after incineration, and the waste pressure of BFG is released to the atmosphere directly.
Thus W1 is excluded from further consideration.

For W2 (Waste gas is released to the atmosphere after incineration or waste heat is released to the atmosphere (waste pressure energy is not utilized)):
The current practice of the waste gas is released to the atmosphere after incineration and the waste pressure energy is released without any use. Hence W2 is a plausible baseline scenario for use of waste gas or waste pressure.

For W3 (Waste gas/heat is sold as an energy source):
For the waste gases in absence of proposed project, according to the gas balance of Longgang Group, the combustible gas generated from the iron and steel making facilities are partly being used within the production process as fuel. However about 68,000 Nm^3/h of BFG and 25,576 Nm^3/h of LDG are remaining surplus, which is flared and released to the atmosphere. For the high toxicity, easy explosion and low caloric value of the waste gas, there is no other appropriate user nearby and they are also not fit for a long distance transport. So, waste gas can not be sold as an energy source.

For the waste pressure, the only way for utilization currently is to install TRT units for power generation, so selling the waste pressure as energy source is not a realistic alternative.

Thus waste gas/pressure being sold as an energy source is not feasible.

For W4 (Waste gas/heat/pressure is used for meeting energy demand):
Since utilizing the waste gases and waste pressure as energy demand to power generation is included in the proposed project activity, just assume W4 is a plausible alternative for waste gases and pressure and it will be further discussed after.

As the outcome of this sub-step, alternatives W2 and W4 are remained as plausible ones for further analysis.

Sub-step2 Identification of the plausible baseline scenario for power generation

For power generation, the realistic and credible alternative(s) may include, *inter alia*

P1 Proposed project activity not undertaken as a CDM project activity;
P2 On-site or off-site existing/new fossil fuel fired cogeneration plant;
P3 On-site or off-site existing/new renewable energy based cogeneration plant;
P4 On-site or off-site existing/new fossil fuel based existing captive or identified plant;
P5 On-site or off-site existing/new renewable energy based existing captive or identified plant;
P6 Sourced Grid-connected power plants;
P7 Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity.);
P8 Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity).

For P1 (Proposed project activity not undertaken as a CDM project activity):
Assuming P1 is a plausible alternative for power generation in this step and it will be further discussed after.

For P2(On-site or off-site existing/new fossil fuel fired cogeneration plant), P3(On-site or off-site existing/new renewable energy based cogeneration plant):
Due to no appropriate heat demand, the output of the proposed project activity is only electricity. The alternative of on-site or off-site existing/new fossil fuel fired cogeneration plant is not realistic and credible. In addition of the same reason, the alternative of on-site or off-site existing/new renewable energy based cogeneration plant is not feasible also because there is no appropriate renewable energy resource such as hydro-power or wind-power.
Therefore, P2, P3 is either not a realistic and creditable alternative, and cannot be considered as the baseline scenario.

For P4(On-site or off-site existing/new fossil fuel based existing captive or identified plant):
As to the alternative of new captive fuel-fired power plant, considering the same annual electricity generation, the alternative scenario for the proposed project should be a fuel-fired power plant with installed capacity of 30 MW or lower. However, according to China's regulations, construction of coal-fired power plants with capacity of less than 135 MW are prohibited in the areas which can be covered by large grids such as provincial grids[2], and the fossil fuel-fired power units with capacity of less than 100 MW is strictly limited for installation[3]. For these reasons, the possible alternative baseline scenario of building a 30 MW fossil fuel-fired power plant conflicts with China's current regulations.

For P5 (On-site or off-site existing/new renewable energy based existing captive or identified plant):
For the reason of lack of appropriate renewable energy resource such as hydro-power or wind-power on-site of the project region, there is no renewable energy based captive or identified plant, and consequently it is not possible to build such a new plant.
In addition, the objective of the proposed project is to meet part of electricity demand from Longgang Group which was previously supplied by the grid. Due to the unstable supply of electricity generated by hydro and wind resources, the project owner will not construct hydropower or wind farm projects since they are not able to meet the electricity requirements from production. For the similar reason as well as the situation that biomass material supply usually can not be guaranteed in China, construction of biomass fired captive power plant or cogeneration plant is not feasible either.
Therefore, P5 is not a realistic and creditable alternative, and cannot be considered as the baseline scenario.

For P6 (Sourced Grid-connected power plants):
Currently the power demand is met by the electricity delivered form local grid which belongs to North China Power Grid.
Thus P6 is a plausible baseline for power generation in absence of the proposed project activity.

For P7 (Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity.)):
The objectives of the project are to recovery the waste resource to generating lower-emission electricity that displaces the purchased grid power. Therefore the owner shall choose the appropriate technology with best performance unless the owner can not afford it.
Therefore, P7 is not a creditable alternative in the view point of the owner, and cannot be considered as

2 *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.
3 *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators* (issued in Aug., 1997).

the baseline scenario.

For P8 Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity):
Due to no appropriate heat demand, the output of the proposed project activity is only electricity. The alternative of cogeneration plant is not realistic and credible. Therefore P8 is excluded form the further discuss on baseline scenario.

For heat generation, because the output of the proposed project includes power generation only, thus the relevant alternatives are excluded form consideration.

As the outcome of this sub-step, alternatives P1 and P6 are remained as plausible ones for further analysis.

Based on the outcomes of above sub-steps, the plausible baseline scenario combinations are respectively W2/P6 and W4/P1, which is illuminated in Table 2.

Table 2 the plausible baseline scenario combinations of the proposed project

Power generation / Waste gas	P1	P6
W2	W2/P1 dose not match. Due to in P1 the waste gas is used for power generation, it conflict with W2 where the waste gas is vented after flaring.	W2/P6 is matching. It is considered as a plausible baseline scenario combination.
W4	W4/P1 is matching. It is the proposed project activity not undertaken as a CDM project activity	W4/P6 dose not match. Due to in W4 the waste gas is used for power generation that displaces equal electricity purchase from grid, it conflict with P6 where this amount of power is purchased from local grid.

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

The energy source in the plausible baseline scenario combination identified in step 1 is sourced Grid-connected power plants. Therefore the fuel for the baseline of energy source shall be determined by the real condition of NCPG, of which detail is illuminated in B.6.1.

STEP 3: Step 2 and/or step 3 of the latest approved version of the "Tool for demonstration and assessment of additionality" shall be used to assess which of these alternatives should be excluded from further consideration (e.g. alternatives facing prohibitive barriers or those clearly economically unattractive).

The alternative combination W4/P1 is not feasible because it would be prevent from implementation by the barriers identified in section B.5.

This step is referred to section B.5.

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

Based on the analysis above, most of the alternatives are excluded and only the combination W2/P6 is remained, which shall be considered as the most likely combination of baseline scenario. Table 2 is showing that baseline scenario matrix.

Table 3. Combinations of baseline options and scenarios applicable to the proposed project activity.

Baseline options		Description of situation
Waste gas	**Power**	
W2	**P6**	The electricity is obtained from and from the grid

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

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As a necessary illumination of the background and consideration of CDM of the proposed project, the milestones during the implement process are showing in Table 4.

Table 4 The Timeline of Hebei Wasted Gas based Captive Power Plant Project in Longgang Group

Time	Events	Remarks
April 2005	Develop the Project Proposal	
Aug 2005	Develop the EIA	
Sep 5, 2005	Receive Approval of EIA	
Aug 16, 2005	Hold a meeting on which the decision of applying CDM for the project was made.	The benefits of the CDM were seriously considered prior to the state date of project
Aug 18, 2005	Longgang Group sign a contact of CDM project development with KOE Environment Consultancy, Inc. (Japan)	
Mar 24, 2006	Receive the letter of approval	The planned construction period is from Jan 2006 to Dec 2006
Jul 2006	Finish the *Feasibility Study Report* *(used for investment decision-making and apply for a time extension)*	In part 2 of FSR, the concept of CDM has been explained and the owner has been suggested to participate in the CDM.
Aug 17, 2006	Rejection for the application of the project loan from Agricultural Bank of China	It was difficult to get commercial loan in domestic capital market for the private steel company

Aug 20, 2006	Rejection for the application of the project loan from China Construction Bank	
Oct 31, 2006	Longgang Group and other three investors agree to invest in the project by funding a stock company "Xingtai Longhai Steel Group Electricity Generation Co., Ltd" to operate the project.	The contributive proportion is: • Xingtai Xingli Group Co., Ltd, 31% of the equity • Xingtai Longhai Steel Group Co., Ltd (Longgang Group), 30% of the equity • Neiqiu country Heng'an Power Co., Ltd, 24% of the equity • Handan city Wanxing industrial Co., Ltd, 15% of the equity **In the agreement, the revenue of CERs is required to distribute according to the contributive proportion.**
Dec, 2006	Apply to for the postponement of the construction period and be approved	
Jan 7, 2007	Sign order contact of generator ***(can be regarded as landmark of actually starting date)***	Order one set of steam turbine generator, type: QF-12-2
Jan 9, 2007	Sign order contact of steam turbine; Sign order contact of gas boiler	Order one set of condensing steam turbine, type: N-12-4.9/0.49 (470℃) Order one set of gas boiler, type: UG75-5.3-485-Q
Jan 10, 2007	Sign total construction contract of Wasted Gas based Captive Power Plant Project in Longgang Group	The construction period is from Jan 10, 2007 to Oct 21, 2007.
Jan 20, 2007	Hold the board of directors of Xingtai Longhai Steel Group Electricity Generation Co., Ltd and a proxy on CDM representative has also been signed on the board.	It was stated on the board that the stockholders could not afford so huge sum of investment that the whole project had to be completed step by step. The main project of 24MW gas based power station would be firstly complete, then the construction of 6MW TRT and the installation of 80,000m^3 gas storage tank. Longgang Group has been appointed as CDM representative to cope with all the matters related to CDM on the behalf of the project participant.
Jun 2007	Writing PDD according to ACM0004	
Dec 2007	Updating PDD according to ACM0012, version 2	
Dec 29, 2007	No.1 generator has been put into operation since Dec 29, 2007.	The operation date is described in *Summary Report of Supervision of Xingtai Longhai 12MW Gas Based Power Station*
Jan 20, 2008	Sign ERPA with buyer	

NOTE: The project in the sheet means the Wasted Gas based Captive Power Plant Project in Longgang Group.

From the timeline, it is aware that CDM was not only considered before the investment decision, but also play an important role across the implementation of the project.

The additionality of the Project is demonstrated by using the *Tool for the Demonstration and Assessment of Additionality (version 05.2)* approved by CDM EB.

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

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

According to the methodology ACM0012 and the analysis in B.4, only two realistic and credible alternative combinations remained as follows:

- The proposed project activity undertaken without being registered as a CDM project activity:

W4 (Waste gas/heat/pressure is used for meeting energy demand)/ P1 (Proposed project activity not undertaken as a CDM project activity);

- The continuation of the current situation:

W2 (Waste gas is released to the atmosphere after incineration or waste pressure energy is not utilized)/P6 (Sourced Grid-connected power plants);

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

Both of the alternative combinations W4/P1 and W2/P6 are consistency with current mandatory laws and regulations. Therefore, both them are remained for further steps.

Step 2. Investment Analysis

This step is bypassed and barrier analysis is used to demonstrate the additionality of the project.

Step 3. Barrier analysis

Investment Barrier

The investment barriers can be summarized as following aspects:

- ***Lack of affordability of equity investment for the implementing of proposed project.***
  As a private iron and steel enterprise, it is not affordable to complete the investment of the proposed project, a non-core business project, by its own equity only. Particularly while facing the increasingly fierce competition and the fall in interest rate of traditional product, the finite equity capital is subjected to preferentially invest on the retrofitting and enhancement of the core business, iron and steel product, which is the most significant to survival and develop for such a medium scale iron and steel company.

- ***Incapacitation of obtaining the financing support by commercial bank loan.***
  Under a strict industry financial policy, the participant, Longgang Group, is incapable to obtain loan from commercial bank to implement the proposed project, even if it is of significant benefit for local sustainable development.

- ***Unattractiveness for other private capital to support the carrying-out of proposed project.***

Without revenue of CDM, the proposed project with high risk hardly win the support of other private capital e.g. it is difficult to persuade other investor participate into the proposed project in a form of establishing a stock company, by whom raise the initial investment and afford the operational cost.

To illuminate the barriers above explicitly, further discussions are carried out as following:

- ***Lack of affordability of equity investment for the implementing of proposed project.***

As a policy circumstance, the macrostructure adjustment policy in iron and steel industry in China from 2005 stated that the laggard iron and steel production must be eliminated; simultaneously the reformation and combination among steel companies will be indirectly encouraged to enhance competition[4]. Consequently the iron and steel enterprises in Hebei Province are undergoing the industry upgrade scheme that will eliminate the laggard iron and steel production capacities of about 3,980,000 ton and 5,990,000 ton respectively till 2007[5]. This scheme also stimulates the steel enterprises, particularly the small-and-medium scale companies, in Hebei Province to rapidly expanding their scale and develop new steel product, in order to avoid the destiny of been restrained or even shut down.

In the aspect of market competition, on the one hand, iron and steel industry is inclined to promote their capacity of product with higher added-value e.g. flat steel, due to the pressure of raising cost as well as the impetus from profit actuation. In accordance to the investigation conducted by Mckinsey[6], China will keep a strong and fast rising demand for flat steel before 2010 and China is a net importing country for flat steel now. Simultaneously, the price of iron ore kept an increasing trend from 2004 to 2007, and the annual raising rate is from minimum 9.5% to maximum 71.9% during this period. Therefore the domestic steel plants recently have been prevailingly attempting to develop their capacity on this area, although it means large scale of initial investment.

On the other hand, the medium private steel companies like Longgang Group is enforced to concentrate their finite equity investment on their core-business development, in response to the strengthened completive pressure form other large scale groups in Hebei Province. As a result of the macrostructure adjustment policy, two large-scale steel groups dominated by state-owned companies is shaping gradually in Hebei province. One is in the south in which Handan Steel is the combination pivot and covering others steel companies in the regions of Shijiazhuang City, Xingtai City, Handan City and Cangzhou City. The other one is in the north in which Tangshan Steel is the combination pivot and covering the others steel companies in the regions of Chengde City, Xuanhua City and Tangshan City[7]. Furthermore, this trend has impose a large amount of pressure on the other steel enterprise not belong to the groups, and will make them situated in a disadvantageous status which is just the current situation of Longgang Group.

As a result of these series policy-originated pressure and marketing completion stress, Longgang Group had to accelerate its pace of development by the means of continuous investment on steel production capacity building. For example, two steel wire production lines were installed in 2006. Moreover, in accordance to their 5-years plan (2005~2010), Longgang Group is planning to invest 1.9 billion RMB within the 5 years to build new blast furnaces with aggregated volume of 1000 m^3, a shaft furnace with area of 10 m^2 as well as undertaking other technical betterments and new steel product development in

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4 Development Policy of Iron & Steel Industrial, No.35, issued by China Development and Reform Committee
5 http://zixun.goufang.com/HTML/2/296/2007090485912.html
6 http://www.mckinseyquarterly.com/The_China_factor_in_global_steel
7 General implement scheme of structure adjustment in Hebei Iron & Steel industrial, issued in 2005 http://www.steelhome.cn/blog/blogentry.php?entryid=4993

order to expand the iron and steel production output yearly up to 5 million tons respectively. As is clearly pointed out in the 5-years plan, expanding steel production capacity and improve the steel product level are their core missions.

That implies that the proposed Project is definitely suffering a weak precedence in equity investment compare with the other planned fixed asset investment projects during this period. Therefore, the proposed project has to give way to the other core-business project under the strategy of "Iron and steel production coming first".

- ***Incapacitation of obtaining the financing support by commercial bank loan.***

Whether being with the support of loan from banks or not then has a remarkably significant influence on the carrying-out of the proposed project, particularly in the relatively shortage of equity investment ability. However, since 2004, working conference on economic issues held by the central government and the No.47 standing conference of State Council have required that macro regulations be imposed on loans to industries such as steel industry[8]. China Banking Regulatory Commission organized inspections in 2004 and 2005 on loans made by banks to steel industry[9]. In addition, banks implement strict control on loans made to steel industry, and ICBC even withdrew loans previously made[10]. In the context of such tightening monetary policy, it is unlikely to obtain necessary loans from the bank in iron and steel industrial.

Other than the strict control loan policy in steel industry, acquiring loan from commercial bank is a prevailing barrier for the private enterprises in Hebei province[11]. Being a private steel enterprise in Hebei Province, Longgang Group is also hard to obtain commercial loan from bank. Although the proposed project is an environmental friendly project, the applications of loan for it were rejected by two commercial banks, Agricultural Bank of China[12] and China Construction Bank[13] due to colossal investment and high risk of the project itself. Due to the prohibitive financing barriers faced by the Project and accordingly hardness to raising fund, if without financing method or participant of other capital, it is impossible for Longgang Group to carry out the proposed project.

- ***Unattractiveness for other private capital to support the carrying-out of proposed project.***

Under the background without any commercial loans and impossibility of raising money from Chinese bond market due to strict and complex regulations[14], Longgang Group resorted to private capital market. Considering lack of experience of operation and management of the project, Longgang Group was inclined to cooperate with the companies which have much experience in these aspects[15]. In the negotiation process with the potential investors, they assert that there is a number of uncertainty and risk beyond the feasibility study of the project. As the prerequisites, they requested Longgang Group to take some measures to reduce risk, such as constructing a gas tank which would reduce the operational risk due

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8 http://www.hbcmm.com/pub/show_info.jsp?info_id=13366.
9 http://finance.sina.com.cn/roll/20040209/0800622561.shtml
10 http://finance.sina.com.cn/money/bank/bank_hydt/20060404/20372473902.shtml.
11 http://finance.sina.com.cn/bond/bondmarket/20051115/0536398054.shtml
12 Loan replay letter of the project from Agricultural Bank of China
13 Loan replay letter of the project from China Construction Bank

14 http://www.smelz.gov.cn/news/57514.htm

15 Invitation letter

to the fluctuation of the pressure and calorific value of the mixture of BFG and LDG[16]. However, Longgang Group could not afford the huge cost of constructing a gas tank, thus Longgang Group suggested to count on the CER revenue of more than 13 million RMB every year to compensate the loss bring about by the uncertainty of the project activity, e.g. the risk caused by operation without gas tank. Furthermore, two or three years later, the gas tank would be afforded with the CER revenue. Finally, the three potential investors accept this suggestion considering the CER revenues[17]. So in the process of seeking cooperator, obviously, CDM is a key factor to achieve a consensus with all of stock-holder[18].

In brief, the investment barriers would prevent the project activity from being carried out unless the project activity is registered as a CDM activity. As it is shown in Table 4 above, the timeline of the preparation and implement process could reflect the essential role that CDM has ever played and how the barriers is overcome by CDM.

Based on the analysis above, the proposed project with the low return and high risk of investment would be prevented by the investment barrier and CDM has made tremendous contribution to the implementation of the project activity.

Technological barriers

- ***Risk of disorder on the key components of TRT unit***

The TRT units in the project are installed in small scale blast furnace of volume 450m^3. (Blast furnaces can be classified into large-scale furnaces and small scale furnaces by the volume threshold of 1000m^3 and there is radical distinction between them on the energy content of top pressure.) The top pressure and the gas temperature of the small-scale blast furnace are much lower than the large-scale blast furnace. Furthermore, the capacity and steady operation of TRT installed in small-scale blast can not compared to which installed in large-scale. And even in 2006, there was governmental idea that furnace below 1000m3 is not eligible to install TRT unit due to usually the top pressure being lower than the threshold value of 0.15 MPa[19].
Moreover, manufacturers and institutes lack of technical experiences in power generation using low pressure energy. Blades of TRT equipment are running under poor conditions such as that with flue gas, corrosive gas, washing water and so on, and there exist the risk of serious accidents caused by the rupture of blades. According to some literature, serious accidents caused by the rupture of blades of TRT equipment with similar scale in some Chinese iron and steel companies have occurred. So, the maintenance and overhaul cost may largely exceed the previous expectation. As a conclusion of the accident analysis, it is necessary to import key automatic monitoring and control facilities to reduce the technology risks, therefore it need to increase extra investment [20]. Thus the income form CDM could financially assist the project participant overcome this barrier by means of upgrading and maintaining the TRT system with more sophisticated facilities.

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[16] According to the experience from operator, once quench of combustion will result in an extra cost about 120 thousands RMB for re-ignition

[17] A letter reply to the investment of the project
In the letter, applying CDM for the project is precondition of the investment
[18] Investment Agreement of Xingtai Longhai Steel Group Electricity Generation Co., Ltd, agree on among Xingtai Xingli Group Co, Ltd., Xingtai Longhai Steel Group Co., Ltd, Neiqiu country Heng'an Power Co., Ltd, and Handan city Wanxing industrial Co., Ltd,

[19] http://www.ndrc.gov.cn/xwfb/t20060630_74968.htm
[20] Fang Yong. Causes to damage of TRT blade and preventative measures. WISCO technology. 2001(4): 53~54.

Based on above analysis, the proposed project undertaken without registration as a CDM project would be not feasible considering the investment barriers and technical barriers.

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

The investment barriers and technical barriers just shown in sub-step 3a would prevent the implementation of alternative W4/P1, but not the alternative W2/P6

Step 4 Common practice analysis

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

Firstly, the region to conduct the analysis is defined as the Hebei Province due to the fact that Hebei Province has being the one with most steel enterprises and greatest steel production during the past 6 years[21], of which the steel sector scale is twice than the Jiangsu Province ranking in the second in China.

Secondly, among more than 180 steel enterprises in Hebei Province, the group of domestic private companies is selected to be study, which accounts for more than half of the total steel production in Hebei province[22]. Therefore, it is reasonable to investigate within the group for being typical and reflecting comparable financial circumstance, because the investment barrier in step 3 does not mean the same impact on the ones with state-capital or abroad capital support. Simultaneously, the effect time span to define similar project is form 2005 Jul (when the restricted loan policy for steel industry published) to 2008 Jan (when the proposed project is start validation).

Finally, the activities similar to the project, the waste gas based power projects and TRT projects invested by domestic private steel company in Hebei province are separately selected form the official publications[23]. The results of similar waste gas based power projects and TRT projects are show in Table and respectively.

Table 6. The similar waste gas fueled power projects in Hebei Province.

Project	Owner	Capacity per unit
Case1: 2*3MW Blast furnace gas power project	Fengfeng Diggings Runhe gas power Company Limited	3MW
Case2: 2*3MW Blast furnace gas power project	Kuancheng Zhaofeng Thermal Power Co., Ltd.	3MW

Table 7. The similar TRT projects in Hebei Province.

Project	Owner	remark
1260m^3 Top Gas Pressure Recovery Turbine (TRT) Electricity Generation Project	Handan Ruida Kinetic Energy Company Limited	The volume of blast furnace is over 1000m^3

Note: The table 6 and table 7 do not include 1 blast furnace gas power project and 4 TRT projects in

[21] http://www.chinanews.com.cn/cj/kong/news/2008/06-30/1297616.shtml
[22] http://www.tt91.com/overseas/wenzhang_detail.asp?ID=5187&sPage=3
[23] http://www.hb12369.net/template/dispmore01.asp?lmlb=Q&lmdm=90&tmxh=000505000000000005000000

following companies: Tangshan Xinfeng Thermal & Power Co., Ltd.[24],Hebei Wenfeng Iron and Steel Co,.Ltd[25], Tangshan Guofeng Iron and Steel Co., Ltd[26]., Shougang Qian'an Iron and Steel Co., Ltd[27] and Qian'an Liangang Yanshan Iron and Steel Co., Ltd[28], on account that these project has been in the pipeline of CDM registration.

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

As per the Case 1 and Case 2 in Table 6, there is essential distinction between them and the proposed project as their the installed capacity per unit is only 3 MW and the scale is too less to compare with the project.

For the TRT project in Table 7, considering blast furnaces can be classified into large-scale furnaces and small scale furnaces by the volume threshold of $1000m^3$ and there is radical distinction between them on the energy content of top pressure[29], the TRT units installed in large-scale furnaces have essential distinct economic condition compared to small-scale furnaces. The top pressure and the gas temperature of the small-scale blast furnace are much lower than the large-scale blast furnace, so applying TRT to small-scale blast furnace is difficult in technology and less financial attractive.[30] Therefore the case existing in Table 7 that installed in the blast furnace of $1260m^3$ does not contradict to the additionality of the proposed project.

Finally, there is no similar project identified and the fact supports the conclusion of step 2 and step 3 and further demonstrates the additionality of the Project.

To summarize, the Project satisfies additionality requirements of CDM because it is not economic feasible and also faces prohibitive barriers which can be alleviated by CDM.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

The consolidated methodology ACM0012, version 02, is applied in the context of the Project in the following steps:

·calculate the baseline GHG emissions;

·calculate the emission factor of grid;

·calculate the project GHG emissions;

·calculate the project leakage;

·calculate the emission reductions.

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24 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1204657231.1/view
25 http://cdm.unfccc.int/Projects/Validation/index.html
26 http://cdm.unfccc.int/Projects/Validat ion/DB/WNDLV18EO7SXUUIOXBOJEKFFXDI6/view.html
27 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1774.pdf
28 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1698.pdf
29 http://www.gov.cn/gzdt/2006-07/01/content_325173.htm
30 http://steel.icxo.com/htmlnews/2003/12/08/157222.htm

Note: the emission reduction is calculated according to ACM0012, version 02, except for the calculation of capping baseline emission (f_{cap}). The value of f_{cap} for TRT unit is calculated according to ACM0012, version 03.1.

Calculate the baseline GHG emissions

The baseline emissions for the year *y* shall be determined as follows:

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

BE_y	are total baseline emissions during the year *y* in tons of CO2
$BE_{En,y}$	are baseline emissions from energy generated by project activity during the year *y* in tons of CO2
$BE_{flst,y}$	Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year). This part of emission does not exist in the baseline scenario of the proposed project, thus it is not involved in baseline calculation any more.

The calculation of baseline emissions （BE_y）depends on the identified baseline scenario.

For the scenario represents the situation where the electricity is obtained from the grid:

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

$BE_{Elec,y}$	are baseline emissions from electricity during the year *y* in tons of CO_2
$BE_{Ther,y}$	are baseline emissions from thermal energy (due to heat generation by element process) during the year *y* in tons of CO_2. This part of emission does not exist in the baseline scenario of the proposed project, thus it is not involved in baseline calculation any more.

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

$$BE_{Elec,y} = f_{cap} * f_{wg} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(1-2)}$$

Where:

$EG_{i,j,y}$	the quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from ith source (i can be either grid or identified source) during the year y (MWh);
$EF_{Elec,i,j,y}$	the 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 (tCO_2e /MWh);
f_{wg}	Fraction of total electricity generated by the project activity using waste gas and waste pressure. This fraction is 1 if the electricity generation is purely from use of waste gas or waste pressure. Under normal conditions, the electricity generation is purely from use of waste gas and waste pressure in the project activity, that is $f_{wg} = 1$.
f_{cap}	Energy that would have been produced in proposed project year *y* using waste gas/heat /pressure generated in base year expressed as a fraction of total energy produced using waste gas in year y. The ratio is 1 if the waste gas/heat/pressure

generated in project year y is same or less then that generated in base year.

Because the proposed project can be divided into two components according to different type of generation technologies adopted: one is gases fueled power plant which recover the mixture of BFG generated from blast furnace and LDG generated from convertor, the other one is TRT power plant which utilized the pressure of BFG, so it is not suitable to use one capping of baseline emission of the proposed project. Two f_{cap} should be separately used for each component of the project, thus $BE_{Elec,y}$ should be the sum of baseline emission of each component of project. Under the consideration of that mentioned above and that the electricity supplied to recipient is from North China Power Grid in baseline, the equation (1-2) can be transferred to (1-3)

$$BE_{Elec,y} = (f_{cap,k=1} \times f_{wg} \times EG_{k=1,y} \times EF_{grid,y}) + (f_{cap,k=2} \times f_{wg} \times EG_{k=2,y} \times EF_{grid,y}) \quad \textbf{(1-3)}$$
$$= \sum_{k=1,2} (f_{cap,k} \times f_{wg} \times EG_{k,y} \times EF_{grid,y})$$

where

$EG_{k,y}$	is the quantity of net electricity supplied to the recipient by plant *k*, which in the absence of the project activity would have been sourced from grid during the year *y* in MWh
$EF_{grid,y}$	is the CO_2 emission factor for the electricity grid, displaced due to the project activity, during the year *y* in tons CO_2/MWh
k	Where, *k*=1 means gas fueled power plant, *k*=2 means TRT power plant
$f_{cap,k}$	Energy that would have been produced by power plant *k* in proposed project year *y* using waste gas/heat /pressure generated in base year expressed as a fraction of total energy produced using waste gas in year y. The ratio is 1 if the waste gas/heat/pressure generated in project year y is same or less then that generated in base year.

Capping of baseline emissions

As an introduction of 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 fuels type and quantity resulting into increase in waste gas generation. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using three methods described.

Due to the proposed project activity consist of two components where two type of generation technology is adopted: one is gases fueled power plant which recovers the mixture of BFG generated from blast furnace and LDG generated from convertor, the other one is TRT power plant which utilized the pressure of BFG, the cap should be calculated respectively.

- **For the gas fueled power plant, the three-year data is unavailable, so Method-2 of ACM0012, version 02 is adopted.**

Method-2: *The manufacturer's data for the industrial facility shall be used to estimate the amount of waste gas/heat/pressure the industrial facility generates per unit of product generated by the process that generates waste gas/heat/pressure (either product of departmental process or product of entire plant, whichever is more justifiable and accurate). In case any modification is carried out by project proponent or in case the manufacturer's data is not available for an assessment should be carried out by independent qualified/certified external process experts such as a chartered engineer on a conservative quantity of waste gas generated by plant per unit of product manufactured by the process generating waste heat. The value arrived based on above sources of data, shall be used to estimate the baseline cap (* f_{cap} *).*

$$f_{cap,k=1} = \frac{Q_{WG,BL}}{Q_{WG,y}} \quad (1\text{-}4)$$

$$Q_{WG,BL} = Q_{BL,product} \times q_{wg,product} \quad (1\text{-}5)$$

Where:

$Q_{WG,BL}$	Quantity of waste energy generated prior to the start of the project activity estimated using equation (1-6) (Nm^3)
$Q_{WG,y}$	Quantity of waste energy used for electricity generation during year y (TJ);
$Q_{BL,product}$	Production by process that most logically related to waste gas generation in baseline;
$q_{wg,product}$	Amount of waste gas the industrial facility generates per unit of product generated by the process that generates waste gas.

Because the gases fueled power plant recover the mixture of BFG generated from blast furnace and LDG generated from convertor, in order to calculate the quantity of waste energy generated in baseline more accurately the equation (1-5) can be transferred to (1-6) below:

$$Q_{WG,BL} = Q_{BL,BF} \times q_{wg,BFG} + Q_{BL,CO} \times q_{wg,LDG} \quad (1\text{-}6)$$

where

$Q_{BL,BF}$	Pig iron production associated with the relevant BFG generation as it occurs in baseline (ton);
$q_{wg,BFG}$	Amount of waste energy per unit of pig iron production generated in the blast furnace. (Nm^3/t)
$Q_{BL,CO}$	Raw steel production associated with the relevant LDG generation as it occurs in baseline (ton);
$q_{wg,LDG}$	Amount of waste energy per unit of raw steel production generated in the convertor. (Nm^3/t)

- **For the TRT power plant**, **it is difficult to monitoring the waste pressure directly, so Case 1, Method-3 of ACM0012, version 3.1 is adopted.**

Case-1: *The energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases fcap should be the ratio of actual energy recovered under the project activity (direct measurement) divided by the maximum theoretical energy recoverable using the project activity waste heat recovery equipment. For estimating the theoretical recoverable energy, manufacturer's specifications can be used. Alternatively, technical assessment can be conducted by independent qualified/certified external process experts such as chartered engineers.*

$$f_{cap,k=2} = \frac{Q_{OE,BL}}{Q_{OE,y}} \quad (1\text{-}7)$$

Where

$Q_{OE,BL}$	Output energy that can be theoretically produced (in MWh unit), 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.
$Q_{OE,y}$	Quantity of actual output energy during year y (in MWh unit) The meaning of parameter $Q_{OE,y}$ is the amount of electricity supplied by TRT power plant, so $Q_{OE,y}$ is the same as $EG_{k=2,y}$

Calculation of the CO_2 emission factor for the electricity of North China Power Grid

The calculation of the GHG emission reductions by the proposed project is followed the "Tool to calculate the emission factor for an electricity system" (EB35, annex 12).

The baseline emission factor ($EF_{grid,y}$) is calculated ex-ante as the simple average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$). In accordance with the "Tool to calculate the emission factor for an electricity system", the baseline emission factor can be calculated with the following steps described below.

Step 1. Identify the relevant electric power system

According to the "Tool to calculate the emission factor for an electricity system", the data published by the DNA of China is selected. Therefore, in accordance to the latest delineation published by DNA of China on August 9th of 2007, North China Power Grid (NCPG) is identified as the electric power system, from which would provide electricity in baseline scenario. The spatial extent of the NCPG comprises all the power plants connected physically to the North China Grid, which covers Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia.

Step 2. Select an operating margin (OM) method.

the Operating Margin Emission Factor ($EF_{grid,OM,y}$) based on one of the four following methods:

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

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Among the total electricity generations of the North China Power Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 0.81% in 2001, 0.89% in 2002, 0.76% in 2003, 0.78% in 2004 and 0.78% in 2005[31], all less than 50%. Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{grid,OM,y}$) for the Project.

For the simple OM, the emissions factor is selected to be calculated using either of the data vintages between any of: Ex ante option or Ex post. For this PDD Ex ante option is selected, which is a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,

Step 3. Calculate the Operating Margin emission factor ($EF_{grid,OM,y}$)

In accordance with the "Tool to calculate the emission factor for an electricity system" , the simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or

- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

According to the "Tool", Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. However, due to the necessary data, including the fuel consumption and net electricity generation of each power plant, is not available in China, Option C is adopted and accordingly only nuclear and renewable power generation are considered as low-cost/must-run power sources and data of the quantity of electricity supplied to the grid by these sources should be available.

As per Option C, the simple OM emission factor 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:

$$EF_{grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \cdot \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (2\text{-}1)$$

where:

$EF_{grid,OM,simple,y}$	is Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	is the amount of fuel i (in a mass or volume unit) consumed by project electricity system in year(s) y,
$NCV_{i,y}$	is Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
	$EF_{CO2,i,y}$ is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	is 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)
i	is All fossil fuel types combusted in power sources in the project electricity system in year y
y	is Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option), following the guidance on data vintage in step 2

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants / units delivering electricity to the grid, not including low-cost/must-run power plants / units, and including electricity imports to the grid. Electricity imports should be treated as one power plant m.

The simple OM is calculated with reference to the *Notification on Determining Baseline Emission Factor of China's Grid* issued by Chinese DNA (http://cdm.ccchina.gov.cn), (see Annex 3 for details).

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

The sample group of power units *m* used to calculate the build margin consist of ether:

(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.

available. Therefore, the sample group of power units *m* used to calculate the build margin is chosen (b).

In terms of vintage of data, Option 1 is chosen:

Option1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 5. Calculate the Build Margin emission factor ($EF_{grid,BM,y}$)

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (2\text{-}2)$$

Where:

$EF_{grid,BM,y}$ Build margin CO_2 emission factor in year *y* (tCO_2/MWh)

$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$EF_{EL,m,y}$ CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m Power units included in the build margin

The sample group of power units *m* used to calculate the build margin is chosen (b) in step 4. According to the EB's guidance on DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China", the EB accepted the following deviation[32]:

- Use of capacity additions during last 1-3 years for estimating the build margin emission factor for grid electricity;
- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

In accordance with the "Tool to calculate the emission factor for an electricity system", the CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance of options B1, B2 or B3 to calculate the simple OM, using for *y* the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.

due to for a power unit *m* only data on electricity generation and the fuel types used is available in China, so the emission factor should be determined using Option B2 based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit.

Therefore, $EF_{grid,BM,y}$ should be calculated by the above method, the calculation formula is:

$$EF_{grid,BM,y} = \frac{\sum_{m} CAP_{fossil,y-s}}{\sum_{m} CAP_{y-s}} \times EF_{EL,fossil,y} \quad (2\text{-}3)$$

Where:

$\Sigma CAP_{fossil,y-s}$	Total capacity additions of fossil fuel fired power of NCPG from year *s* to year *y*,
ΣCAP_{y-s}	Total capacity additions of NCPG from year *s* to year *y*,
$EF_{EL,fossil,y}$	The emission factor for fossil fuel fired power of NCPG with the efficiency level of the best technology commercially available,
y	Mostly recent year that the relevant data can be obtained publicly,
s	Determined by: Starting from year *y*, the differences of total installed capacity of the grid between year *y* and year *y*-1, year *y* and year *y*-2, …year *y* and year *y-s*, year *y* and year *y-s*-1, …are calculated respectively, and then divided by the installed capacity of *y* year. The year that can make the left-hand side of the following formula greater than 20% will be regarded as *s*. The formula is as follows: $\Sigma CAP_{y-s}/\Sigma CAP_{y}$ (see Annex 3 for detailed information)

The types of fossil fired power include coal-fired, oil-fired and gas-fired power, so the emission factor for fossil fuel fired power with the efficiency level of the best technology commercially available is calculated as follows:

$$EF_{BL,fossil,adv,y} = \lambda_{Coal} \times EF_{Coal,Adv,y} + \lambda_{Oil} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} \quad (2\text{-}4)$$

Where:

λ is the different kinds of fuel emission share of total Emissions in NCPG. *Coal, Oil* and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

It is calculated as follows:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (2\text{-}5)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (2\text{-}6)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (2\text{-}7)$$

Where:

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

$COEF_{i,m}$	is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*; *Coal, Oil* and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

.

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ in formula(4) represent the related Emission Factor of the commercially available most advanced coal, oil and gas fired power technology, which shall be determined using Option B2, as follows:,

$$EF_{coal,adv,y} = \frac{COEF_{coal}}{\eta_{coal,adv}} \times 3.6 \qquad (2\text{-}8)$$

$$EF_{oil,adv,y} = \frac{COEF_{oil}}{\eta_{oil,adv}} \times 3.6 \qquad (2\text{-}9)$$

$$EF_{gas,adv,y} = \frac{COEF_{gas}}{\eta_{gas,adv}} \times 3.6 \qquad (2\text{-}10)$$

Where:

η_{Adv}	net energy conversion efficiency of the best thermal power technology commercially. *Coal, Oil* and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

The build margin emissions factor ($EF_{grid,BM,y}$) is calculated with reference to the *Notification on Determining Baseline Emission Factor of China's Grid* issued by Chinese DNA (http://cdm.ccchina.gov.cn), (see Annex 3 for details).

Step 6. Calculate the combined margin emissions factor

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

$$EF_{grid,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \qquad (2\text{-}11)$$

Where:

$EF_{grid,BM,y}$	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 (%)
w_{BM}	Weighting of build margin emissions factor (%)

Where the weight w_{OM} and w_{BM} by default, are 50%.

Calculate the project GHG emissions

Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and

electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of heat/energy/electricity or other supplementary electricity consumption.

$$PE_y = PE_{AF,y} + PE_{EL,y} \quad \textbf{(3-1)}$$

PE_y Project emissions due to project activity.

$PE_{AF,y}$ Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason.

$PE_{EL,y}$ Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption.

<u>Project emissions due to auxiliary fossil fuel</u>

These emissions are calculated by multiplying the quantity of fossil fuels *($FF_{i,y}$)* used by the recipient plant(s) with the CO_2 emission factor of the fuel type *i ($EF_{CO2,i}$)*, as follows:
*W*here:

$$PE_{AF,y} = FF_{i,y} * NCV_i * EF_{CO2,i} \quad \textbf{(3-2)}$$

$FF_{i,y}$ is the quantity of fossil fuel type *i* combusted to supplement waste gas in the project activity during the year y, in energy or mass units

NCV_i is the net calorific value of *i* combusted as supplementary fuel, in TJ per unit of energy or mass units, obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy or mass of the fuel *i* in tons CO_2 obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors

Only supplementary fossil fuel consumption in the project activity will be used to ignite the waste gas during the start-up of boiler. Currently, only a few of acetylene (C_2H_2) supplied as liquefied bottle is expected to use for ignition. After the start-up, the bottle of liquefied C_2H_2 will be removed from the ignition equipment and completely separated from the combusting system due to safety consideration.

<u>Project emissions due to electricity consumption of gas cleaning equipment or other supplementary electricity consumption</u>

Because the electricity was consumed in gas cleaning equipment in baseline as well, project emission due to electricity consumption for gas cleaning can be ignored. So, only the emission for supplementary electricity consumption will be account as project emission.

$PE_{EL,y}$ is calculated by multiplying the CO_2 emission factor for electricity (*$EF_{CO2,EL}$*) by the total amount of electricity used as a result of the project activity (*$EC_{PJ,y}$*). The source of electricity is the grid.

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

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y} \quad \textbf{(3-3)}$$

Where:

$EC_{PJ,y}$ Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh)

$EF_{CO2,EL,y}$	CO_2 emission factor for electricity consumed by the project activity in year *y* (t CO_2/MWh)

In the project activity, the additional electricity is purchased from the grid, so the CO_2 emission factor for electricity ($EF_{CO2,EL,y}$) may be determined according to the latest approved version of the "Tool to calculate the emission factor for an electricity system"**.** The formula (3-3) can be changed as follow:

$$PE_{EL,y} = EC_{PJ,y} \times EF_{grid,y} \quad \textbf{(3-4)}$$

Calculate the project leakage

According to the consolidated baseline methodology ACM0012, no leakage is considered, $L_y = 0$ tCO_2e.

Calculate the emission reductions

As per the consolidated baseline methodology ACM0012, the emission reduction (ER_y) by the project activity during a given year y is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(4)}$$

Where:

ER_y	is the emissions reductions of the project activity during the year y (tCO_2e),
BE_y	is the baseline emissions due to displacement of electricity during the year y (tCO_2e),
PE_y	is the project emissions during the year y (tCO_2e).

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

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plant/units, in year y
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the China Electric Power Yearbook is reliable.
Any comment:	-

Data / Parameter:	$FC_{i,y}$
Data unit:	a mass or volume unit of the fuel i
Description:	the amount of fuel i (in a mass or volume unit) consumed by project electricity system in year(s) y,
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3 for details
Justification of the choice	The data obtained from the China Energy Statistical Yearbook is reliable

of data or description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	NCV_i
Data unit:	MJ/t, or MJ/Km^3
Description:	the net calorific value per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook 2005, pg 365
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the priority for the regional specific value, national specific value was selected.
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ(which can be converted to tCO_2e/TJ)
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because the regional specific value is not available, the IPCC default value was selected.
Any comment:	-

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	the oxidation factor of the fuel i
Source of data used:	IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because the regional specific value is not available, the IPCC default value was selected.
Any comment:	-

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	The capability of power plant with technology *j* in NCPG in year *y*
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details

Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the China Electric Power Yearbook is reliable.
Any comment:	

Data / Parameter:	η_{adv}
Data unit:	%
Description:	Net energy conversion efficiency of the best thermal power technology commercially.
Source of data used:	*Notification on Determining Baseline Emission Factor of China's Grid* issued by Chinese DNA (http://cdm.ccchina.gov.cn)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the priority for the regional specific value, national specific value was selected. The data is obtained from official web site of China's DNA. The data source is reliable.
Any comment:	-

Data / Parameter:	f_{wg}
Data unit:	%
Description:	Fraction of total electricity generated by the project activity using waste gas or waste pressure.
Source of data used:	-
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The electricity generation is purely from waste gas and waste pressure, so f_{wcm} is equal to 1.
Any comment:	-

Data / Parameter:	$Q_{BL,BF}$
Data unit:	ton/yr
Description:	Pig iron production associated with the relevant BFG generation as it occurs in baseline
Source of data used:	The manufacture's date
Value applied:	2,415,600
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because some new industrial facilities are involved in the project, the manufacture's data for normal operating conditions is used. The annul production of 3# blast furnace is 494,100 ton, 4# blast furnace is 494,100 ton and new blast furnace is 1,427,400 ton.
Any comment:	-

Data / Parameter:	$q_{wg,BFG}$
Data unit:	Nm^3/t
Description:	Amount of waste energy per unit of pig iron production generated in blast furnace.
Source of data used:	energy efficiency engineering design institute
Value applied:	585
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$Q_{BL,CO}$
Data unit:	ton/yr
Description:	Raw steel production associated with the relevant LDG generation as it occurs in baseline
Source of data used:	The manufacture's date
Value applied:	2,589,000
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because some new industrial facilities are involved in the project, the manufacture's data for normal operating conditions is used. The annul production of 1# convertor is 647,250 ton, 2# blast furnace is 647,250 ton and 3# blast furnace is 1,294,500 ton.
Any comment:	-

Data / Parameter:	$q_{wg,LDG}$
Data unit:	Nm^3/t
Description:	Amount of waste energy per unit of raw steel production generated in convertor.
Source of data used:	energy efficiency engineering design institute
Value applied:	53
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$Q_{WG,BL}$
Data unit:	Nm^3/yr
Description:	Quantity of waste energy generated prior to the start of the project activity
Source of data used:	Calculated by the equation $Q_{WCM,BL} = Q_{BL,BF} \times q_{wcm,BFG} + Q_{BL,CO} \times q_{wcm,LDG}$
Value applied:	1,550,343,000
Justification of the choice of data or description of measurement methods	Because some new industrial facilities are involved in the project, the manufacture's data for normal operating conditions is used.

and procedures actually applied :	
Any comment:	-

Data / Parameter:	$Q_{OE,BL}$
Data unit:	MWh/yr
Description:	Output energy, net power supplied, that can be theoretically produced, 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:	The data from FSR is adopted.
Value applied:	34,200
Justification of the choice of data or description of measurement methods and procedures actually applied :	The output energy is calculated on the assumption of every power load of 3 MW for each TRT unit, the annual operation hours of 6000 h and the power consumption rate of 5%. The estimation is made by a third party, the FSR design institute and the data is obtained from the *approved* FSR. It is in line with the requirement of ACM0012, so is justice.
Any comment:	-

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

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I. Calculate the emission factor of grid

II. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

The baseline emissions for the year *y* shall be determined as follows:

$$BE_y = BE_{Elec,y} = \sum_{k=1,2} f_{cap,k} \times f_{wg} \times EG_{k,y} \times EF_{grid,y} = 1*1*196200*1.0303 = 202{,}145 tCO_2e$$

where

$EG_{k,y}$ According to the *Feasibility Study Report,* net electricity supplies to recipient by the project activity in year y is 196,200MWh .

$EF_{Elec,y}$ is 1.0303 tCO_2e/MWh, which is based on the data and calculating method provide by DNA of China.(http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf)

$f_{wcm,k}$ is 1 because the electricity generation is purely from use of waste gas or waste pressure.

$f_{cap,k}$ is 1 in estimating the baseline emission, according to ACM0012.

III. Estimated project activity emissions:

$PE_y = PE_{AF,y} + PE_{EL,y}$ = 2 + 40= 42tCO_2e

Where:

$PE_{AF,y} = FF_{i,y} * NCV_i * EF_{CO2,i}$ =600×3.385×10^{-3}=2 tCO_2e

$FF_{i,y}$ is 600kg, assumed that two bottles of liquefied acetylene (C_2H_2) will be used for each time of ignition and 20 times of ignition per year.

$NCV_i * EF_{CO2,i}$ is 3.385gCO_2/gC_2H_2, assumed that acetylene is contained C_2H_2 of 100% and C_2H_2 is combusted completely. The assumption is conservative.

$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y}$ =39×1.0303= 40 tCO_2e

$EG_{PJ,y}$ Additional electricity consumed in year *y* as a result of the implementation of the project activity is 39MWh

$EF_{grid,y}$ is 1.0303 tCO_2e/MWh, which is based on the data and calculating method provide by DNA of China.(http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf)

IV. Estimated project leakage:

As per the consolidated baseline methodology ACM0012, the leakage of the Project is not considered, i.e. L_y =0 tCO_2e.

V. Estimated emission reductions

$$ER_y = BE_y - PE_y$$

Where:

ER_y = 202,103 tCO_2e

BE_y = 202,145 tCO_2e

PE_y = 42 tCO_2e.

As per formula provided in Section B.6.1, the annual emission reductions of the Project are 202,103 tCO_2e.

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

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It is expected that the project activities will generate emission reductions within the North China Power Grid for about 202,103 tCO_2e per year over a 10-year fixed crediting period from 01/09/2009 to 30/06/2019.

Year	**Estimation of project activity emissions (tCO_2e)**	**Estimation of baseline emissions (tCO_2e)**	**Estimation of leakage (tCO_2e)**	**Estimation of overall emission reductions (tCO_2e)**
01/07/2009~ 31/12/2009	21	101,073	0	101,052
2010	42	202,145	0	202,103
2011	42	202,145	0	202,103
2012	42	202,145	0	202,103
2013	42	202,145	0	202,103
2014	42	202,145	0	202,103
2015	42	202,145	0	202,103
2016	42	202,145	0	202,103
2017	42	202,145	0	202,103
2018	42	202,145	0	202,103
01/01/2019~ 30/06/2019	21	101,072	0	101,051
Total (tCO_2e))	**420**	**2,021,450**	**0**	**2,021,030**

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

B.7.1. Data and parameters monitored:

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Data / Parameter:	***$EG_{k,y}$***
Data unit:	MWh
Description:	Quantity of electricity supplied to the recipient by plant *k*, which in the absence of the project activity would have sourced from grid during the year y in MWh
Source of data to be used:	electricity meters on site
Value of data applied for the purpose of calculating expected emission reductions in section B.6	162000 MWh for 24 MW waste gas fueled power plant; 34200 MWh for 6 MW TRT power plant.
Description of measurement methods and procedures to be applied:	Two meters at each measuring points will be used to measure electricity continuously and the data will be recorded regularly both in paper and electronic files.
QA/QC procedures to be applied:	The energy meters will undergo maintenance and calibration according to the industry standards. Sales records and purchase receipts are used to ensure the consistency. The error information will be recorded and filed with a regular and transparent management.
Any comment:	Data measured at the recipient plant(s) and at the generation plant are obtained for cross check. Sales receipts shall be used for verification.

Data / Parameter:	***$EG_{PJ,y}$***
Data unit:	MWh/y
Description:	Auxiliary electricity consumption by the project activity during the year y
Source of data to be used:	electricity meters on site
Value of data applied for the purpose of calculating expected emission reductions in section B.6	39MWh imported from grid during the generator failed to operate
Description of measurement methods and procedures to be applied:	Two meters at each measuring points will be used to measure electricity continuously and the data will be recorded regularly both in paper and electronic files.
QA/QC procedures to be applied:	The energy meters will undergo maintenance and calibration according to the industry standards. Sales records and purchase receipts are used to ensure the consistency. The error information will be recorded and filed with a regular and transparent management.
Any comment:	-

Data / Parameter:	$Q_{WG,y}$
Data unit:	Nm^3/yr
Description:	Quantity of waste energy used for electricity generation during year y

Source of data to be used:	Flow meters on site
Value of data applied for the purpose of calculating expected emission reductions in section B.6	not adopted in B.6.
Description of measurement methods and procedures to be applied:	Continuously Measured by the flow meters at the gases fuel pipelines.
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular according to industrial standards.
Any comment:	

Data / Parameter:	$Q_{OE,y}$
Data unit:	MWh
Description:	Quantity of actual output energy supplied by TRT power plant during year y
Source of data to be used:	electricity meters on site
Value of data applied for the purpose of calculating expected emission reductions in section B.6	not adopted in B.6.
Description of measurement methods and procedures to be applied:	Two meters at each measuring points will be used to measure electricity continuously and the data will be recorded regularly both in paper and electronic files.
QA/QC procedures to be applied:	The energy meters will undergo maintenance and calibration according to the industry standards. Sales records and purchase receipts are used to ensure the consistency. The error information will be recorded and filed with a regular and transparent management.
Any comment:	The meaning of parameter $Q_{OE,y}$ is the amount of electricity supplied by TRT power plant, so $Q_{OE,y}$ is the same as $EG_{k=2,y}$

Data / Parameter:	$FF_{i,y}$
Data unit:	kg
Description:	Quantity of fossil fuel type *i* combusted to supplement waste gas in the project activity during the year *y*.
Source of data to be used:	Production records
Value of data applied for the purpose of calculating expected emission reductions in section B.6	600
Description of measurement methods and procedures to be applied:	As the supplementary fossil fuel used for ignition is supplied in the form of liquefied bottles, the records about the amount of bottles used and the weight of each bottle shall be made in every ignition, and then $\boldsymbol{FF_{i,y}}$ can be calculated. Specially, when the amount of liquefied fossil fuel used less than one bottle, for the conservative consideration, to record it as a whole bottle for calculated.

QA/QC procedures to be applied:	Data of supplementary fossil fuel (e.g. acetylene) consumption should be consistent with the ignition record of the boiler system. In addition, the purchase records of fossil fuel and storage are designated as backup data in case of error takes place in the record. The error information will be recorded and filed with a regular and transparent management.
Any comment:	-

B.7.2. Description of the monitoring plan:

>>

Emission factor of the Project is determined ex ante. Therefore the key parameters monitored in the crediting period include the electricity supply to recipient, additional electricity consumption by the project and the quantity, NCV of waste gas.

1. **Methods for monitoring of electricity supplied to the recipient $EG_{k,y}$ and auxiliary electricity consumption by the project $EG_{PJ,y}$**

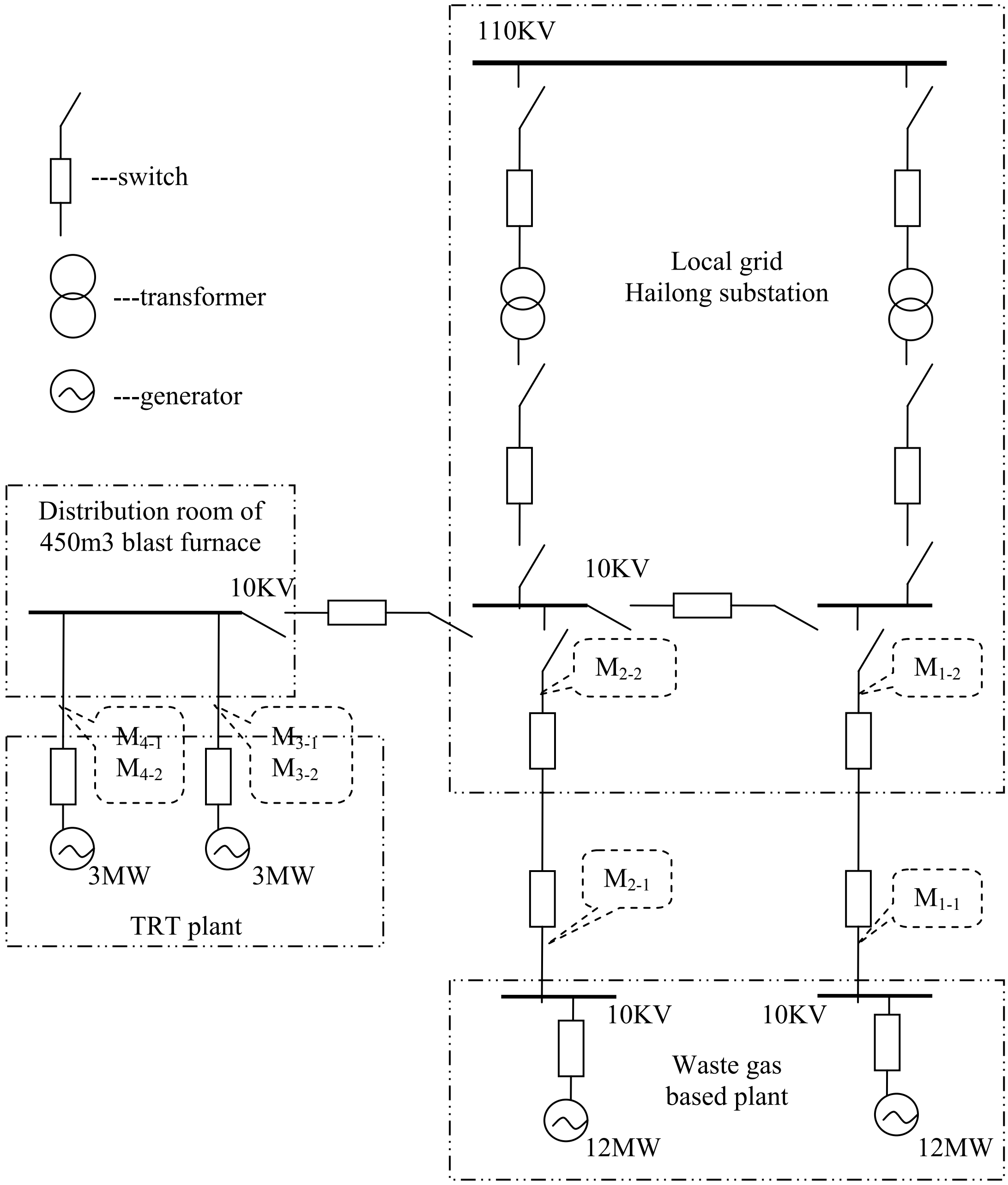

Figure 4 Electricity Monitoring System

The main electric connection scheme is shown in figure 4. The power from waste gas based plant is planned to delivered to low voltage side of Hailong substation, the local grid, by two transmission lines and the power form TRT units is planned to delivered the distribution room of $450m^3$ blast furnace by two transmission lines . $\boldsymbol{EG_{k,y}}$ and $\boldsymbol{EG_{PJ,y}}$ will be monitored through four main digital bidirectional ammeters (M_{1-1}, M_{2-1}, M_{3-1}, M_{4-1}) and the other four are stand-by (M_{1-2},M_{2-2},M_{3-2},M_{4-2}).

$$\boldsymbol{EG_{k,y}} = \text{positive power } (M_{1-1}+M_{2-1}+M_{3-1}+M_{4-1}) = \text{positive power } (M_{1-2}+M_{2-2}+M_{3-2}+M_{4-2})$$

$$\boldsymbol{EG_{PJ,y}} = \text{negative power } (M_{1-1}+M_{2-1}+M_{3-1}+M_{4-1}) = \text{negative power } (M_{1-2}+M_{2-2}+M_{3-2}+M_{4-2})$$

The electricity quantities of the eight ammeters will be recorded. Usually, the records of main ammeters will be used for calculation, if the any main ammeter was failure, the records of the records of the corresponding stand-by would be used.

The management regulation of power metering devices (DT/L488-2000) will be complied with.
In addition, the corresponding receipts in financial sector will be kept as a backup date to cross check.

2. **Methods for monitoring quantity of waste gas:** $Q_{WG,y}$ and quantity of fossil fuel type *i:* $FF_{i,y}$

$Q_{WG,y}$ will be monitored through flow meters installed in the inlets of the two gas boilers.

As the supplementary fossil fuel used for ignition is supplied in the form of liquefied bottles, the records about the amount of bottles used and the weight of each bottle shall be made in every ignition, and then $FF_{i,y}$ can be calculated. Specially, when the amount of liquefied fossil fuel used less than one bottle, for the conservative consideration, it will be recorded as a whole bottle for calculated.

3. Calibration of Meters & Metering

Calibration of Meters & Metering should be implemented according to relevant national and local standards and rules. And all the records should be documented and maintained by the project owner for DOE's verification.

4. Quality Assurance and Quality Control

The project owner has passed the quality management system ISO9000. The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity according to EB rules and real practice. This is an on-going process which will be ensured through the CDM mechanism in terms of the need for verification of the emission reductions on an annual basis according to this PDD.

5. Data Management System

Specific staff will be appointed by the project owner to take the overall responsibility for monitoring of greenhouse gas emission reductions and keeping all the data and information for emission reductions verification. Electronic data, files including the log data in DCS is supposed to be backup and copied to CD or other disk, which should be kept at least for two years after the end of credit period.

6. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually.

7. Management structure

Details regarding the management structure of the monitoring plan are illuminated in Figure 4.

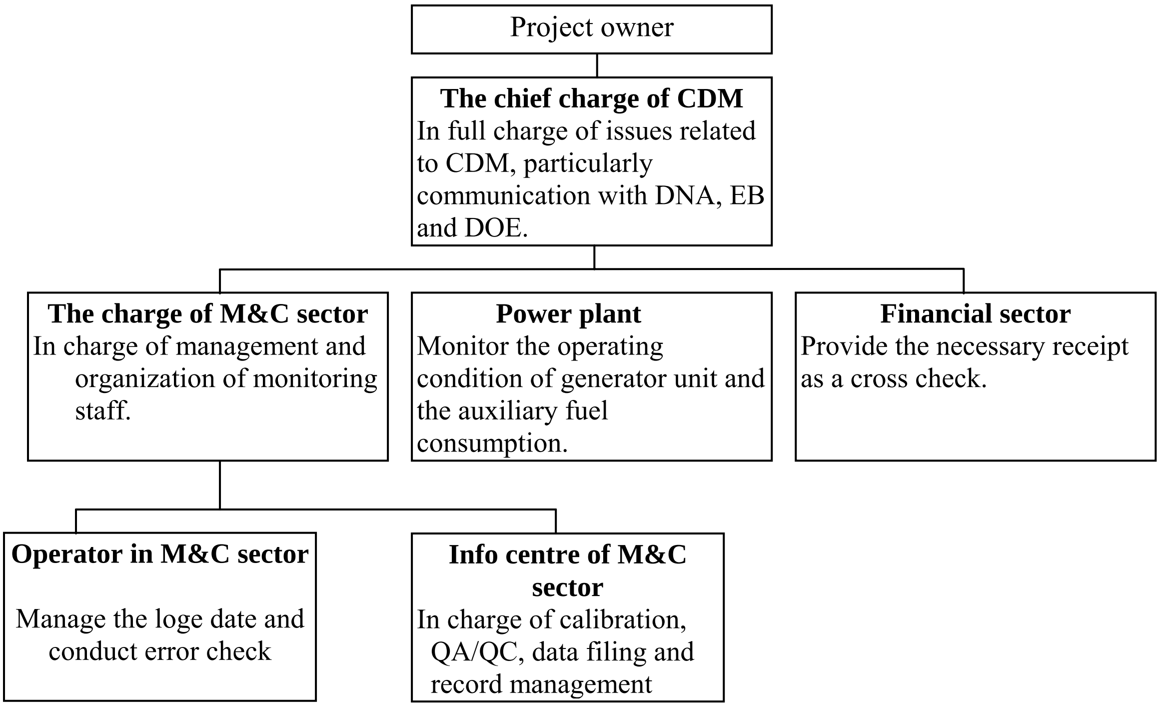

Figure 4. Management Structure of Monitoring Plan

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 application of the baseline study and monitoring methodology of the Project was completed on 10/12/2007 by KOE Environmental Consulting, Inc. (Japan)

The entity is not project participant listed in Annex 1. The contact information of KOE who drafted the baseline and monitoring plan is indicated in the table below.

KOE Environmental Consulting, Inc. (Japan)

Daniel Cao

Email: cy@cncdm.cn ; Website: http://www.cncdm.cn

Tel: +86 010 62219066 ; Fax: +86 010 66001008

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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:

>>
07/01/2007
The starting date of the project activity is the earliest of the dates on which the main equipment purchase or construction contract or construction begins. The milestones of the project in section B.5 show that ordering the steam turbine generator on 07/01/2007 is the earliest, so this date has been determined as the starting date.

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

>>
15 years

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

>>

C.2.1. Renewable crediting period

>>

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

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>
01/07/2009, or the date of registration, whichever is later.

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

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

>>
The Project Activity has undergone and passed full Environmental Impact Assessments (EIA) in line with the requirements of the Chinese Government in Dec.20.2006. All of which is available for review.
According to the Environmental Impact Assessments (EIA), as a conclusion, several suggestions were documented as follows:

1、As a small amount of sediment is generated when the raw water goes through the filter, it is necessary to clear them in time, to ensure it will not impact the production process and the environment.

2、One major resource of air pollution is fume from gas-fuelled boiler. It is better to test the temperature of the furnace chamber and the concentration of the nitrogen oxide at the same time to get the optimal running state. And it is also necessary to keep the burning temperature strictly under control to have the fume meet the emission standards. Then the fume coming out of the 50 meter chamber can satisfy the environmental requirements.

3、The water discharged by the project is mainly the cooling water of the equipment, such as the fans and generator. The water discharge and the making up water is $112m^3/h$ and $253m^3/h$ separately. This assessment proposes the project owner to treat the waste water effectively which can meet the recycling requirements. And the reuse water can be used to generate electricity and other processes.

4、Waste water and residential waste will be generated during the construction and operation of the project. And the residential waste will be collected and transported to the garbage station, so it will not impact on the environment. The waste water has to be treated by the sewage treatment equipment to protect and improve the water environment.

5、Acid waste water and alkali waste water will be generated by recovering the cation exchange and the anion exchange separately. But these two kinds of waste water treated through neutralizing can discharge without any impacts on the environment.

6、Labor security precautionary measures are also necessary, such as fire protection, explosion protection, lighting prevention, electrostatic prevention, electricity security, supplying current, water and lighting safely, accident prevention and scalding prevention. Fire conservancy also has to be set up at the two sides of the gas transportation pipeline and related areas.

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

>>
Environmental impacts arising from this project are considered insignificant; therefore, it is not necessary to make additional explanation here.

SECTION E. Stakeholders' comments

>>

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

>>

In Feb. 2007, Longgang Group carried out a survey on the local residents and comments received from the survey are summarized as follows. The government of Neiqiu Country issued a support letter for the Project after conducting sufficient investigation. It is available for DNA and DOE checking.

E.2. Summary of the comments received:

>>

The survey was conducted through distributing and collecting responses to a questionnaire. Totally 50questionnaires returned out of 48 with 96% response rate. The basic structure of the respondents is illustrated in Table 3.

Table 3. Statistics on the basic conditions of people surveyed

Structure of gender			Structure of educational background			Structure of age		
gender	population	share	Educational background	population	share	age	population	share
Male	36	75%	Junior college and above	12	25%	20~30	20	41%
Female	12	25%	Senior high school and below	36	75%	31~40	19	40%
						41~60	9	41~60

As shown in Table 3, people surveyed are representative of the public in terms of occupation and educational levels. Therefore their attitudes towards the Project can be a comprehensive reflection of the attitudes of the local residents possibly affected by the Project. Among the 48 responses to the questionnaire:

41 people surveyed (accounting for 85%) have a clear understanding of the basic information of the Project,·48 people surveyed (accounting for100%) hold a supportive attitude towards the project, which was considered to reduce environmental pollution (79%), increase income (15%), decrease electricity purchase price (46%) and provide employment opportunity (15%).

As the suggestion towards the project, People surveyed supposed it is necessary to control noise appropriately during the construction and operation process of the project (0.04%) and the related environmental protection measure should be fulfilled (0.02%), furthermore, hoped the project could put into operation on time (0.125%).

The survey shows that most of the residents at the Project site consider that construction of the Project will benefit the local economic development, but they still have some concerns about the air pollution and noise pollution possibly caused by the Project, but they still have some concerns about the air pollution and noise pollution possibly caused by the Project. The project owner has given adequate consideration to noise control in the process of project design and construction and taken appropriate measures. Compared to the baseline scenario, implementation of the Project will reduce emissions of air pollutants as a whole; the advanced air pollution control technologies as mention in Section F.1 will be applied to effectively abate the air pollutant emissions.

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

>>

The project owner has taken full consideration of relevant comments and suggestions from stakeholders in the process of project construction. People and local government are all very supportive of the Project therefore it is not necessary to modify the Project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Xingtai Longhai Steel Group Co., Ltd.
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Postfix/ZIP:	
Country:	P.R.China
Telephone:	----
FAX:	----
E-Mail:	----
URL:	----
Represented by:	Lin Yuehai
Title:	Director
Salutation:	Mr.
Last Name:	Lin
Middle Name:	----
First Name:	Yuehai
Department:	----
Mobile:	----
Direct FAX:	----
Direct tel:	----
Personal E-Mail:	----

Organization:	PEAR Carbon Offset Initiative,Ltd.
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Represented by:	Mr. Kazuo Sasaki
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Direct FAX:	----
Direct tel:	----
Personal E-Mail:	k_sasaki@pear-carbon-offset.org

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for this Project.

Annex 3

BASELINE INFORMATION

Data recommended in the *Notification on Determining Baseline Emission Factor of China's Grid* issued by China DNA on 9th Aug. 2007 for the North China Power Grid are adopted for the Project.

The following tables summarize the numerical results from the equations listed in the The *Tool to calculate the emission factor for an electricity system* (version 1). The information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Fuel consumption and emission of North China Power Grid in 2003

Energy	unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mogonlia E	Shandong F	Total fuel G=A+B+C+D+E+F	Emission factor tc/TJ H	Oxidation rate (%) I	NCV (MJ/t or 1000m^3) J	Emission (tCO_2e) K[33]
Coal	10^4t	714.73	1052.74	5482.6	4528.5	3949.32	6808	**22535.94**	25.8	100	20908	445,737,636.11
Cleaned coal	10^4t						9.41	**9.41**	25.8	100	26344	234,510.60
Other washed coal	10^4t	6.31		67.28	208.21		450.9	**732.7**	25.8	100	8363	5,796,681.31
Coke	10^4t					2.8		**2.8**	25.8	100	28435	75,318.63
Coke oven gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	**3.08**	12.1	100	16726	228,559.67
Other gas	10^8m^3	16.92		10.63		10.32	1.56	**39.43**	12.1	100	5227	914,399.71
Crude oil	10^4t						29.68	**29.68**	20	100	41816	910,139.18
Gasoline	10^4t						0.01	**0.01**	18.9	100	43070	298.48
Diesel	10^4t	0.29	1.35	4		2.91	5.4	**13.95**	20.2	100	42652	440,693.26
Fuel oil	10^4t	13.95	0.02	1.11		0.65	10.07	**25.8**	21.1	100	41816	834,672.45
LPG	10^4t							**0**	17.2	100	50179	0.00
Refinery gas	10^4t			0.27			0.83	**1.1**	18.2	100	46055	33,807.44
Natural gas	10^8m^3		0.5				1.08	**1.58**	15.3	100	38931	345,076.60
Other oil fuel	10^4t							**0**	20	100	38369	0.00
Other coking	10^4t							**0**	25.8	100	28435	0.00
Other energy	10^4tce	9.83					39.21	**49.04**	0	100	0	0.00
Total emission of the North China Power Grid (tCO_2e)							455,551,793.43					

China Energy Statistical Yearbook (2004)

Table A2. The fuel-fired electricity generation of North China Power Grid in 2003

province	Electricity generation	Auxiliary electricity consumption	Electricity delivered to the grid
	（MWh)	（%）	（MWh)
Beijing	18,608,000	7.52	17,208,678.4
Tianjin	32,191,000	6.79	30,005,231.1
Hebei	108,261,000	6.5	101,224,035
Shanxi	93,962,000	7.69	86,736,322.2
Inner Mongolia	65,106,000	7.66	60,118,880.4
Shandong	139,547,000	6.79	130,071,759
Sum	425,364,906		

Data source: China Electric Power Yearbook 2004.

Total emission of the Northeast China Power Grid (tCO_2e)	174,151,899
Electricity exportation of the Northeast China Power Grid (MWh)	153,227,363
Emission factor of the Northeast China Power Grid (tCO_2e/MWh)	1.13656
Electricity importation from Northeast China Power Grid (MWh)	4,244,380

Total emission (tCO2e): 460,375,781
Total electricity exportation (MWh): 429,609,286

EF(2003): 1.071615 tCO2e/MWh

Table A3. Fuel consumption and emission of North China Power Grid in 2004

Energy	unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mogonlia E	Shandong F	Total fuel G=A+B+ C+D+E+ F	Emission factor tc/TJ H	Oxidation rate (%) I	NCV (MJ/t or $1000m^3$) J	Emission (tCO_2e) K
Coal	10^4t	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	100	20908	538,547,476.6
Cleaned coal	10^4t						40	**40**	25.8	100	26344	996,856.96
Other washed coal	10^4t	6.48		101.04	354.17		284.22	**745.91**	25.8	100	8363	5,901,190.88
Coke	10^4t					0.22		**0.22**	25.8	100	28435	5,917.89
Coke oven gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	100	16726	1,153,187.45
Other gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	100	5227	1,578,574.39
Crude oil	10^4t							**0**	20	100	41816	0
Gasoline	10^4t								18.9	100	43070	0
Diesel	10^4t	0.39	0.84	4.66				**5.89**	20.2	100	42652	186,070.49
Fuel oil	10^4t	14.66		0.16				**14.82**	21.1	100	41816	479,451.38
LPG	10^4t							**0**	17.2	100	50179	0
Refinery gas	10^4t		0.55	1.42				**1.97**	18.2	100	46055	60,546.05
Natural gas	10^8m^3		0.37		0.19			**0.56**	15.3	100	38931	122,305.63
Other oil fuel	10^4t							**0**	20	100	38369	0
Other coking	10^4t							**0**	25.8	100	28435	0
Other energy	10^4tce	9.41		34.64	109.73	4.48		**158.26**	0	100	0	0
Total emission of the North China Power Grid (tCO_2e)							549,031,577.7					

China Energy Statistical Yearbook (2005),

Table A4 The fuel-fired electricity generation of North China Power Grid in 2004

province	Electricity generation	Auxiliary electricity consumption	Electricity delivered to the grid
	（MWh)	（%）	（MWh)
Beijing	18,579,000	7.94	17,103,827
Tianjin	33,952,000	6.35	31,796,048
Hebei	124,970,000	6.5	116,846,950
Shanxi	104,926,000	7.7	96,846,698
Inner Mongolia	80,427,000	7.17	74,660,384
Shandong	163,918,000	7.32	151,919,202
Sum	489,173,110		

Data source: China Electric Power Yearbook 2005.

Total emission of the Northeast China Power Grid (tCO2e)	199,754,431
Electricity exportation of the Northeast China Power Grid (MWh)	170,132,885.1
Emission factor of the Northeast China Power Grid (tCO2e/MWh)	1.174108289
Electricity importation from Northeast China Power Grid (MWh)	4,514,550

Total emission (tCO2e): 554,332,148
Total electricity exportation (MWh): 493,687,660

$EF_{(2004)}$: 1.122840 tCO2e/MWh

Table A5. Fuel consumption and emission of North China Power Grid in 2005

Energy	**unit**	**Beijing** **A**	**Tianjin** **B**	**Hebei** **C**	**Shanxi** **D**	**Inner Mogonlia** **E**	**Shandong** **F**	**Total fuel G=A+B+ C+D+E+ F**	**Emission factor tc/TJ** **H**	**Oxidation rate (%)** **I**	**NCV (MJ/t or 1000m^3)** **J**	**Emission (tCO_2e)** **K**
Coal	10^4t	897.75	1675.2	6726.5	6176.5	6277.23	10405.4	**32158.53**	25.8	100	20908	636,062,535.8
Cleaned coal	10^4t						42.18	**42.18**	25.8	100	26344	1,051,185.67
Other washed coal	10^4t	6.57		167.45	373.65		108.69	**656.36**	25.8	100	8363	5,192,725.19
Coke	10^4t					0.21	0.11	**0.32**	25.8	100	28435	8,607.84
Coke oven gas	10^8m^3	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	100	16726	1,742,396.48
Other gas	10^8m^3	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	100	5227	2,111,027.27
Crude oil	10^4t					0.73		**0.73**	20	100	41816	22,385.5
Diesel	10^4t			0.01				**0.01**	18.9	100	43070	298.48
Fuel oil	10^4t	0.48		3.54		0.12		**4.14**	20.2	100	42652	130,786.39
LPG	10^4t	12.25		0.23		0.06		**12.54**	21.1	100	41816	405,689.63
Refinery gas	10^4t							**0**	17.2	100	50179	0
Natural gas	10^8m^3			9.02				**9.02**	18.2	100	46055	277,221.01
Other oil fuel	10^4t	0.28	0.08		2.76			**3.12**	15.3	100	38931	681,417.08
Other coking	10^4t							**0**	20	100	38369	0
Other energy	10^4tce							**0**	25.8	100	28435	0
Total emission of the North China Power Grid (tCO_2e)							647,686,276.3					

China Energy Statistical Yearbook (2006).

Table A6. The fuel-fired electricity generation of North China Power Grid in 2005

province	Electricity generation	Auxiliary electricity consumption	Electricity delivered to the grid
	（MWh)	（%）	（MWh)
Beijing	20,880,000	7.73	19,265,976
Tianjin	36,993,000	6.63	34,540,364
Hebei	134,348,000	6.57	125,521,336
Shanxi	128,785,000	7.42	119,229,153
Inner Mongolia	92,345,000	7.01	85,871,616
Shandong	189,880,000	7.14	176,322,568
Sum			560,751,013

Data source: China Electric Power Yearbook 2006.

Total emission of the Northeast China Power Grid (tCO2e)	207,282,748
Electricity exportation of the Northeast China Power Grid (MWh)	179,031,569
Emission factor of the Northeast China Power Grid (tCO2e/MWh)	1.157799983
Electricity importation from Northeast China Power Grid (MWh)	23,423,000

Total emission (tCO2e): 674,805,425
Total electricity exportation (MWh): 584,174,013

EF(2005): 1.100906944 tCO_2e/MWh

The Simple OM emission factor ($EF_{grid,OM,y}$): 1.1208CO2e/MWh

The conservative calculation of the build margin emission factor of the North China Power Grid has been explained in Section B in the PDD. The data, sources and calculation process of the build margin emission factor and combined emission factor of the North China Power Grid are shown in Table A7 and A8.

Table A7. Calculation of the CO_2 emission proportion among the total respectively of solid, liquid and gas fuel used for power generation

Energy	unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Shandong E	Inner Mogonlia F	Total fuel G=A+B+C+D+E+F	Emission factor tc/TJ H	Oxidation rate (%) I	NCV (MJ/t or 1000m^3) J	Emission (tCO_2e) K=G*H*I*J*44/12/1000
Raw coal	10^4t	897.75	1675.2	6726.5	6176.45	10405.4	6277.23	**32158.53**	25.8	100	20908	636,062,536
Cleaned coal	10^4t	0	0	0	0	42.18	0	**42.18**	25.8	100	26,344	1,051,186
Other washed coal	10^4t	6.57	0	167.45	373.65	108.69	0	**656.36**	25.8	100	8,363	5,192,725
Coke	10^4t	0	0	0	0	0.11	0.21	**0.32**	25.8	100	28,435	8,608
Sub-total												**642,315,054**
Crude oil	10^4t	0	0	0	0	0	0.73	**0.73**	20	100	41,816	22,385
Gasoline	10^4t	0	0	0.01	0	0	0	**0.01**	18.9	100	43,070	298
Diesel	10^4t	0.48	0	3.54	0	0	0.12	**4.14**	20.2	100	42,652	130,786
Fuel oil	10^4t	12.25	0	0.23	0	0	0.06	**12.54**	21.1	100	41,816	405,690
Sub-total												**559,160**
Natural gas	10^8m^3	2.8	0.8	0	27.6	0	0	**31.2**	15.3	100	38,931	681,417
Coke oven gas	10^8m^3	6.4	7.5	6.2	210.8	0	3.9	**234.8**	12.1	100	16,726	1,742,396
Other gas	10^8m^3	160.9	78.6	388.3	98.8	0	183.7	**910.3**	12.1	100	5,227	2,111,027
Refinery gas	10^4t	0	0	9.02	0	0	0	**9.02**	18.2	100	46,055	277，211
Sub-total												**4,812,062**
Total												**647,686,276**

China Energy Statistical Yearbook (2005)

In accordance to Table A7 and formula (3-4) ~ (3-6)， the calculation results are λ_{Coal} =99.17%%， λ_{Oil} =0.08%， λ_{Gas} =0.74%

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel (tC/TJ)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C44/12
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Based on formula (3-7), $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9465tCO2e/MWh.

Table A9. Installed capacity of the North China Power Grid in 2005

Capacity	Unite	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mogonlia**	**Shandong**	Total
Thermal power	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydro power	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and Other	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.2	37413.4	**114620.5**

Date Source：China Electric Power Yearbook 2006

Table A10. Installed capacity of the North China Power Grid in 2004

Capacity	Unite	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mogonlia**	**Shandong**	Total
Thermal power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydro power	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and Other	MW	0	0	13.5	0	111.8	12.4	137.7

Total	MW	4514.4	6013.5	20730	18480.5	14321.2	32923.6	**96983.2**

Date Source：China Electric Power Yearbook 2005

Table A11. Installed capacity of the North China Power Grid in 2003

Capacity	Unite	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mogonlia**	**Shandon g**	Total
Thermal power	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
Hydro power	MW	1058.1	5	764.3	795.7	592.1	50.8	3266
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and Other	MW	0	0	13.5	0	76.6	0	90.1
Total	MW	4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	**87362.7**

Date Source：China Electric Power Yearbook 2004

Table A12 installed capacity addition in 2003~2005 and the share of which the different technologies account for

	Installed capacity in 2003	installed capacity in 2004	installed capacity in 2005	New installed capacity during 2003-2005	Share in the new installed capacity
	A	B	C	D=C-A	
Thermal power（MW）	84006.6	93594.9	111068.7	27062.1	99.28%
Hydro power（MW）	3266.0	3250.7	3216.2	-49.8	-0.18%
Nuclear power（MW）	0	0	0	0	0.00%
Wind power and Other（MW）	90.1	137.5	335.5	245.4	0.90%
Total（MW）	87362.7	96983.1	114620.4	27257.7	100.00%
Percentage of total installed capacity in 2005	76.22%	84.61%	100%		

Based on the Table A12, the share of thermal power in the installed capacity addition from 2003 to 2005 is 99.28%, therefore according to formula (8)，$EF_{BM,y}$=0.9465×99.28%=0.9397 tCO_2/ MWh.

In accordance to the formula (9), EF_y =1.1208×50%+0.9397×50% = 1.0303 tCO_2/ MWh.

Annex 4

MONITORING INFORMATION

No additional information