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

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SECTION A. General description of project activity

A.1. Title of the project activity:

Shaanxi Haiyan Coke Making Group 24MW Waste Coke Oven Gas (COG) Based Electricity Generation Plant
Version: 3.2
Date: 29/11/2011

A.2. Description of the project activity:

The proposed project is located in Longmen Town, Hancheng City, Shaanxi Province and the owner of the proposed project is Shaanxi Haiyan Coke Making (Group) Co., Ltd. (hereinafter referred to the project owner), who has coke production lines with total annual production capacity of one million tons. During the coke production process, Coke Oven Gas (COG) is produced (CH_4, CO, H_2, N_2, and the other combustible gas with the calorific value of 16,375~16,853 KJ/Nm^3 and the pressure of 4,000~6,000 Pa). The amount of the COG is about 22,000 Nm^3/h, which is directly emitted to the atmosphere through the chimney after ignition; therefore, a lot of energy (WECM) is wasted. The proposed project is to recover the waste COG, which is realized by setting up two sets of power unit using the waste COG as the energy source for grid-connected electricity generation.

Without other revenues, the IRR of the project lower than the benchmark IRR. So, the owner considered to apply the project as a CDM project. The owner convened the meeting regarding CDM on May 10, 2007. The board made the preliminary investment decision of the proposed project activity under the consideration of CERs income on Oct. 16, 2007. The owner signed the CDM consulting contract with Shanghai Tepia Environmental Protection Co., Ltd. on Nov. 21, 2007. After the FS Report of the proposed project activity considering the CERs income seriously being completed, the owner made the formal and final investment decision on Dec. 28, 2007. The project was approved on Apr. 30, 2008 by Shaanxi Development & Reform Committee (SDRC). Following to the construction contract, the project started on May 6, 2008. The project will come into commercial operation on July 1, 2009 and be out of commission on June 30, 2024.

The baseline scenario of the proposed project is the continuation of the existing situation. The proposed project will install two sets of 75 t/h waste gas recovery boiler and two sets of 12 MW steam-turbine and generator to recover and utilize the waste COG. The net annual delivered electricity is 163,800 MWH/y. In the absence of the proposed project, the same amount of electricity (163,800 MWH/y) should be from the regional grid system (NWPG) which is dominated by fossil fuel. According to the data provided by the China's DNA, the emission factor of the regional grid (NWPG) is 0.8712 tCO_2e/MWH[1]; therefore, the annual emission from the gird for the same amount of electricity is 142,702 tCO_2. As the proposed project will use the waste COG to generate power, there will be no emission of greenhouse gas to be involved. Hence, the emission reduction of the proposed project is 142,702 tCO_2e/y.
The project, which utilizes the waste COG from coke production line for electricity generation, will bring significant environmental and social benefits. It will contribute to the local sustainable development as follows.

- Promote the integrated utilization of waste gas resource and reduce the waste of energy resources.
- Increase the supply of power and relieve the local shortage of power partly.

[1] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081230102527637.pdf

- Displace a part of electricity of NWPG and reduce the local environmental pollution (SO_2, TSP) resulted from burning coal.
- Reduce the heat pollution caused by the direct emission of high temperature flue gas.
- Create 115 employment opportunities at the start of operation.
- Support Chinese Western Development Program and contribute to poverty alleviation and anti-poverty.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Shaanxi Haiyan Coke Making (Group) Co., Ltd.	No
Japan	Tepia Corporation Japan Co., Ltd., CERs Buyer	No

For detailed contact information of the project participants, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Shaanxi Province

A.4.1.3. City/Town/Community etc.:

Longmen Town, Hancheng City

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

The project is located in Longmen town, Hancheng City, Shaanxi Province. The project is 30 km away from Hancheng Railway station, which lies on the west of No. 108 Highway. It enjoys the convenient traffic as showed in Figure A.1.
The proposed project is situated within the coke making factory. Its geographical coordinates are N 35°37′08.8″, E110°34′13.9″.

Hancheng city in Shaanxi Province

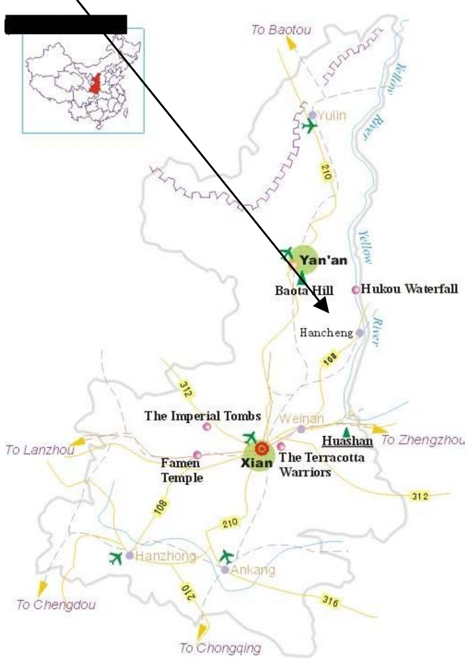

Figure A.1. Project Location (Hancheng City, Shaanxi Province)

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

Sectoral scope 1: Energy Industries
Sectoral scope 4: Manufacturing Industries

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

The maximum production capacity of the coke oven is 1,000,000 t-coke/y. During the coke making process, the coke oven will produce 40,000 Nm^3/h COG as the by-product. The COG mainly contains CH_4 (22.9-24.2%), CO (6.21-6.9%), H_2 (53.6-55.4%), CO_2 (2.71-3.2%), N_2 (8.46-9.4%) with the calorific value of 16,375~16,853 KJ/Nm^3 and the pressure of 4,000-6,000 Pa. Hereinto, 12,600 Nm^3/h COG is re-used in the coke making process. In the absence of the proposed project, the remaining COG would be released into the atmosphere after incineration. Before the implementation of the project, there are two sets of chimney installation and automatic flaring device to dispose the remaining COG; one is for operation the other is for backup.

The project will recover the waste Coke Oven Gas (COG) of 22,000Nm^3/h. Therefore; the proposed project is waste gas recovery activity from coke production through waste gas boiler, which will produce 118ton-steam/h with pressure 3.82Mpa and temperature 450 deg C.

The steam will supply to two set of 12MW steam turbine generator to generate electricity of 24MWH/hour, 2.16MW/hour electricity will be consumed by itself and finally 21.84MW/h or 163,800MWH/year will be supply to local grid then the regional grid (NWPG).
The electricity will be connected to Xiayukou 110 KV transformer substation after being set up to 35 KV through Haixia and Haizhu line, which is connected to Shaanxi Grid, then to NWPG Grid.

Table A.1. Equipment and system before and after the implementation of the proposed project

The system BEFORE the implementation of the project	The system AFTER the implementation of the project
Coke ovens → ↓ Chimneys and flaring devices	COG Collection, Pre-treatment, Secondary treatment, Compressor, and Distribution System ↓ Waste Gas boiler ↓ Turbine/generator ↓ Connection to the grid system. ↓ NWPG ↓

—— : Gas → : Steam ⋯→ : Electricity

Table A.2. Waste gas balance after the proposed project

Total amount of waste gas at full load operation (Nm^3/h)	Purpose of the waste gas	Amount of waste gas (Nm^3/h)	Remarks
40,000	Power generation (Normal load operation, Design value)	22,000 (=40,000x86.5% - 12,600)	Emitted to open air after incineration before this project
	Re-use in the coke making process	12,600	It is re-used also before the proposed project
	Directly released to the atmosphere after incineration.	0-5,400	Normal operation - Full load operation .

The total amount of waste gas (40,000 Nm^3/h) is the maximum value for a working condition of the coke oven when operating under a full load. The load factor of normal operation is 86.5% based on the project owner's experience, which is used for determining capacity of the steam turbine generator. Calculation procedure is as follows:

The enthalpy of COG is 16,614 KJ/Nm^3; the temperature of smoke gas is 150 deg C

The enthalpy of COG burning per hour:

$I_{coke,gas}$ = 16,614×22,000 = 365.508×10^6 (KJ/h)

The enthalpy of smoke gas with 150 deg C:

$I_{150\ deg\ C}$=22.344×10^6 (KJ/h)

The burning enthalpy per hour:

I = $I_{coke,\ gas}$ - $I_{150deg\ C}$ = 343.164×10^6 (KJ/h)

The enthalpy loss of boiler draining per hour:

Is = 150×2%× (1075 - 632.2) = 1,328.4×103(KJ/h)

Where, 150= Rated evaporation of two sets of boiler (t/h)

1075=the enthalpy of steam with a medium temperature/medium pressure.

632.2= the enthalpy of the boiler feed water with temperature, 150 deg C

The boilers' efficiency≥93% , the steam amount of the boilers producing per hour:

M = (I×93% - Is) /(3331.7-632.2)=118(t/h)

Where, 3331.7= the enthalpy of the overheating steam with temperature, 450 deg C

Taking account of 3.53 t/h loss and leakage of overheating steam in total, 114.17 t/h (2*57 t/h) will be put into the steam turbines and the generators to generate power.

Rated capacity of steam turbines for each is 114.17/4.568=25.0MW

Where 4.568= the unit steam consumption (kg/kWh) according to the criteria in GB50049-1994

Consequently, specification of N12-3.43 with capacity of 12MW is applicable to the steam turbine.

The baseline scenario is same as the scenario before the implementation of the proposed project activity. As the baseline scenario, the same amount of power, which would be produced by the proposed project, is from NWPG which includes Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang according to the Chinese DNA[2].

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

Based on the FS Report[3] of the proposed project, the proposed project includes the following key equipment: two sets of waste gas boiler (75 t/h), two sets of steam turbine, and two sets of generator (12 MW).
The major equipment is as follows:

1) Two sets of 75 t/h waste gas boiler

Type: TG-75/3.82-Qj
Rated evaporation: 75 t/h
Rated steam temperature: 450 deg C
Rated steam pressure: 3.82 MPa
Designed boiler efficiency ≥ 93%
Waste gas pressure input: 4,000 Pa
Designed life time: 16 years
Producer: TAIYUAN BOILER MAKER
Applicable Criteria: GB/T 16508-1996 "Calculation for the press intensive of boiler's shell organ"
GB/T 50273-1998 "Criterion for the installation construction and acceptance testing of industry boiler"

2) Two sets of 12 MW Steam Turbine

Type: N12-3.43/ (0.981)
Capacity: 12 MW
Rated Inlet steam pressure: 3.43 MPa
Rated Inlet steam temperature: 435 deg C
Rated inlet steam: 58 t/h
Designed life time: 16 years
Producer: QINGDAO JIENENG STEAM TURBINE MANUFACTURER
Applicable Criteria: GB/T 5578-2007 "Criterion for Steam Turbine matched with fixed generator"

3) Two sets of 12 MW Generator

Type: QF -12-2
Capacity: 12 MW
Efficiency: 97.8%
Outlet voltage: 6300V
Rated speed: 3000r/min
Frequency: 50 HZ
Designed lifetime: 16 years
Producer: JINAN GENERATOR MANUFACTURER
Applicable Criteria: GB/T 7064-2002 "Technical Requirement for Turbo synchrony Generator"

[3] The FS Report was prepared by China Machinery International Engineering Design & Research Institute, in Dec., 2007.

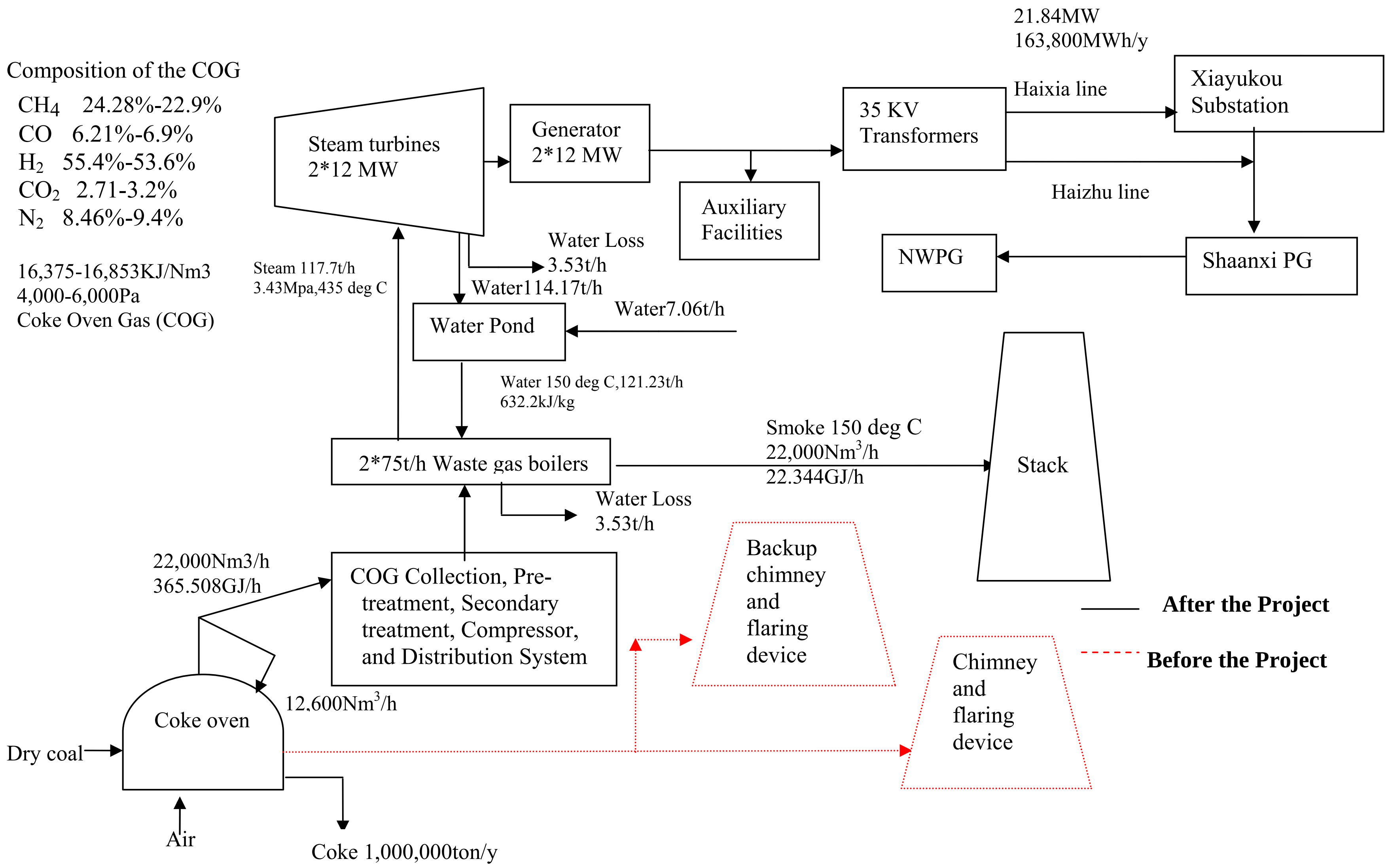

Figure A.2. The schematic figure before and after the implementation of the proposed project

The technologies in the proposed project are all domestic technologies, and no international technology transfer is involved in the proposed project. The technologies of similar gas boilers, steam turbines, and generators are widely used in China commercially, and the project design engineer reports that they have been in good operation currently.

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

The project applies a fixed crediting period of 10 years (01/06/2011-31/05/2021) and the total reduction is estimated as 1,427,026 tCO_2e during the crediting period. The emission reduction in each year is estimated as follows:

Table A.4. Estimated amount of emission reductions over the chosen crediting period

Years	Annual estimation of emission reductions in tones of CO_2e
01/06/2011-31/12/2011	83,243
2012	142,702
2013	142,702
2014	142,702
2015	142,702
2016	142,702
2017	142,702
2018	142,702
2019	142,702
2020	142,702
01/01/2021-31/05/2021	59,459
Total estimated reductions (tCO_2e) (10 years)	1,427,020
Total number of crediting years	10
Annual average over the crediting period of estimated reductions ($t CO_2e$)	142,702

A.4.5. Public funding of the project activity:

No public funding from parties in Annex 1 is involved in this project activity

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:

ACM0012 (Ver. 03.2): "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects";
"Tool to calculate the emission factor for an electricity system" (Version 02), and;
"Tool for the demonstration and assessment of additionality" (Ver. 05.2).
More information about the Methodology can be found on the website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The consolidated methodology is for the following types of project activities:

- Type-1: All the waste energy in identified WECM stream/s, that will be utilized in the project activity, is, or would be flared or released to atmosphere in the absence of the project activity at the existing or new facility. The waste energy is 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); or
  - For generation of mechanical energy.
- Type-2: An existing industrial facility, where the project activity is implemented, that captures and utilizes a portion of the waste gas stream(s) considered in the project activity, and meet the following criteria:
  - The project activity is to increase the capture and utilization of waste gas for generation of electricity that is flared or vented in the absence of the project activity, and not only the replacement/modification/expansion of existing generation equipment with or to a more efficient equipment;
  - The portion of waste gas captured prior to implementation of the project activity is used for generation of captive electricity. The use of a portion of the waste gas in the baseline for the purpose of heat generation or other use prior to implementation of the project activity is also permitted under this methodology provided the generation of heat or other use in the crediting period remain same as that in the baseline;
  - If the project participant uses a part of the electricity generated in the project activity onsite and exports the remainder, both shall be monitored. In such situations it shall be demonstrated that the electricity generated for own consumption from waste gas is not reduced in the project activity;
  - Emission reductions generated in the project activity are attributable to the amount of waste gas captured and utilized in the project activity that was flared or vented in the absence of the project activity and to the increase in energy efficiency of the new power generating facility;
  - No auxiliary fossil fuel (except start-up fuel) is used in the waste gas boiler for the generation of captive electricity in the absence of the project.

The proposed project activity is applicable to the methodology ACM0012 (Ver. 03.2) as it is to use the waste gas from the existing coke oven to generate electricity, according to Type-1 condition. The

following table is to show how the proposed project meets all the conditions listed in the methodology.

Table B.1. Analysis of the applicable condition in the methodology

Items listed in the methodology	The relevant situation of the proposed project corresponds to the methodology items.	Remarks
If the project activity is based on the use of waste pressure to generate electricity, electricity generated using waste pressure should be measurable.	The proposed project will not use the waste pressure to generate electricity.	NA.
Energy generated in the project activity may be used within the industrial facility or exported from industrial facility;	All of the electricity generated by the project will be connected to Northwest China Power Grid (NWPG) which is dominated by fossil fuel.	Applicable
The electricity generated in the project activity may be exported to the grid or used for captive purpose;	All of the electricity generated by the project will be exported to NWPG.	Applicable
Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility.	The owner owns the generated electricity by the proposed project.	Applicable
Regulations do not constrain the industrial facility that generates waste energy from using the fossil fuels prior to the implementation of the project activity.	There are no regulations which constrain the coke production line from using fossil fuels before the implementation of the project activity.	Applicable
The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	The proposed project will recover the waste gas from the existing coke production facility which started operation in Jan., 2008.	Applicable
The emission reductions are claimed by the generator of energy using waste energy;	The credits are claimed by the project owner.	Applicable
In case the energy is exported to other facilities an official agreement exists between the owners 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 project supplies electricity to grid company, the grid company will not claim the emission generated by the project.	Applicable
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	The designed life of the project is 15 years, and the lifespan of NWPG is surely more than 15 years. The remaining life time of the coke production is also more than 15 years, therefore, the fixed credit period will be	Applicable

baseline), the credits can be claimed for minimum of the following time periods: → The remaining lifetime of equipment currently being used; and → Credit period.	claimed, i.e., 10 years.	
Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for.	Under the abnormal operation of the project (emergencies, shut down), the waste energy that is released will not be accounted for.	Applicable
This methodology is not applicable to projects where the waste gas/heat recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) to generate power. However, the projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology.	The proposed project is to recover waste gas from the coke oven. There is not a single-cycle power plant (gas turbine or diesel generator) involved in the proposed project.	NA.

Demonstration of use of waste energy in absence of CDM project activity

As listed in the Methodology ACM0012 (Ver. 03.2), there're a few ways to demonstrate the use of waste energy in the absence of the project activity under the different situations.

For Type-1 project activities: It shall be demonstrated that the waste energy utilized in the project activity was flared or released into the atmosphere (or wasted in case of project activity recovering waste pressure) in the absence of the project activity at the existing facility by either one of the following ways.

- By **direct measurements** of the energy content and amount of the waste energy produced for at least three years prior to the start of the project activity;
- Providing an **Energy balance** of the relevant sections of the plant to prove that the waste energy was not a source of energy before the implementation of the project activity. For the energy balance ~~the~~ applicable process parameters are required. The energy balance must demonstrate that the waste energy was not used and also provide conservative estimations of the energy content and amount of waste energy 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 energy 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 design specifications and layout diagrams from the facility could be used as an estimate of the quantity and energy content of the waste energy produced for the rated plant capacity/per unit of product produced;
- **On site checks conducted by the DOE** prior to project implementation can confirm that no equipment for waste energy recovery and utilization, on the WECM stream recovered under the project activity, had been installed prior to the implementation of the CDM project activity.

For Type-1 project activities, in cases where waste energy recovery activities were already implemented in other streams of WECM prior to the implementation of the CDM project activity, the following should be demonstrated:

- That there is no decrease in energy generated from the waste energy recovered previous to the implementation of the CDM project activity; or

- In the case where there is a decrease in energy generation from previously recovered waste energy, it can be demonstrated that the decrease is due to a decrease in generation of waste energy on account of the factors not related to the project activity;
- The conditions shall be confirmed by the verifying DOE for each issuance period.

The situation of Type-1 project activities is considered as the situation of the project. Therefore, the option of **on site checks conducted by the DOE** is selected for the demonstration of using the waste energy in the absence of CDM project activity.

As a conclusion, the proposed project is to recover the COG from the existing coke oven for grid-connected electricity generation. All of the electricity generated by the project will be exported to NWPG. The owner owns the electricity generated by the proposed project and the emission reductions. There are no regulations which constrain the coke oven from using fossil fuels. There is not a single-cycle power plant (gas turbine or diesel generator) involved in the proposed project.

The proposed project satisfies the applicable conditions of the methodology ACM0012 (Ver. 03.2). Therefore, ACM0012 (Ver. 03.2) is applicable to the proposed project.

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

The proposed project activity is to recover and utilize the remaining COG from the existing coke oven, which will result in the increase of net electricity supplied to the grid. In the absence of the proposed project, the same amount of electricity (163,800 MWH/y) should be from the regional grid system (NWPG) which is dominated by fossil fuel. And the proposed project will use the remaining COG to generate power; no auxiliary fossil fuels are needed.

Therefore, according to ACM0012 (Ver. 03.2), the project boundary includes:

1. The industrial facility where waste energy is generated, including the part of the industrial facility where the waste gas was utilized for generation of captive electricity prior to implementation of the project activity);
2. The facility where process heat in the element process/steam/electricity/mechanical energy is generated (generator of process heat/steam/electricity/mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary; and
3. The facility(ies) where the process heat in the element process/steam/electricity/ mechanical energy is used (the recipient plant(s)) and/or grid where electricity is exported, if applicable.

Hence, all of the power plants connected to NWPG (according to the delineation of grid boundaries provided by the Chinese DNA, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang are counted as NWPG.), are included in the project boundary.

According to ACM0012 (Ver. 03.2), an overview of emission sources included in or excluded from the project boundary for determination of both baseline and project emission are as follows:

Table B.2. Summary of gases and sources included in the project boundary, and justification explanation where gases and sources are not included

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation, grid or captive source	CO_2	Included	Main emission source.
		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	No fossil fuel consumption.
		CH_4	Excluded	No fossil fuel consumption.
		N_2O	Excluded	No fossil fuel consumption.
	Fossil fuel consumption in cogeneration plant	CO_2	Excluded	No cogeneration plant.
		CH_4	Excluded	No cogeneration plant.
		N_2O	Excluded	No cogeneration plant.
	Baseline emissions from generation of steam used in the flaring process, if any	CO_2	Excluded	No generation of steam.
		CH_4	Excluded	No generation of steam.
		N_2O	Excluded	No generation of steam.
Project Activity	Supplemental fossil fuel consumption at the project plant	CO_2	Excluded	No supplemental fossil fuel.
		CH_4	Excluded	No supplemental fossil fuel.
		N_2O	Excluded	No supplemental fossil fuel.
	Supplemental electricity consumption.	CO_2	Excluded	No supplemental electricity consumption.
		CH_4	Excluded	No supplemental electricity consumption.
		N_2O	Excluded	No supplemental electricity consumption.
	Electricity import to replace captive electricity, which was generated using waste gas in absence of project activity.	CO_2	Excluded	No electricity import
		CH_4	Excluded	No electricity import.
		N_2O	Excluded	No electricity import.
	Project emissions from cleaning of gas	CO_2	Excluded	No cleaning of gas
		CH_4	Excluded	No cleaning of gas.
		N_2O	Excluded	No cleaning of gas.

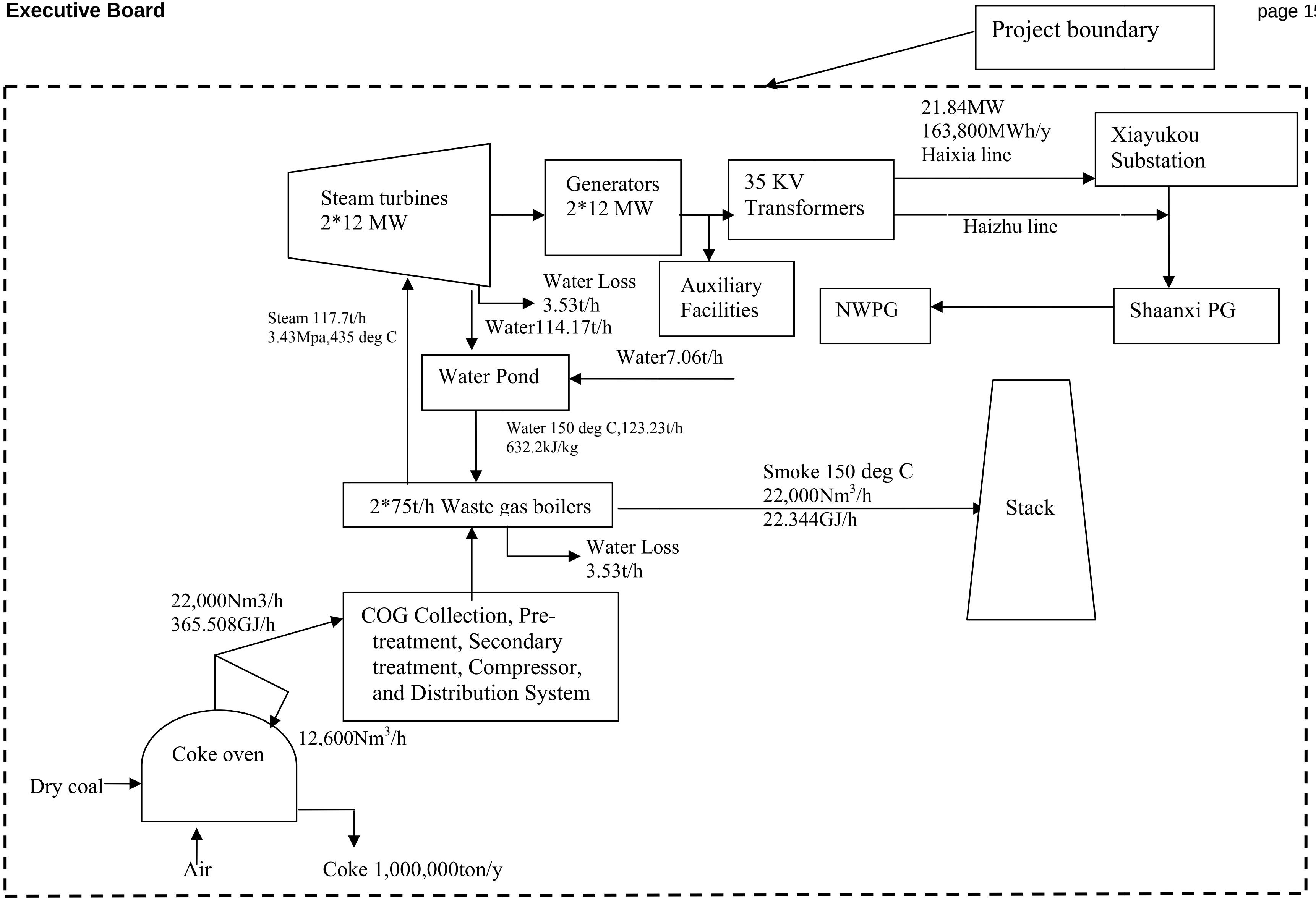

Figure B. 1. The boundary of the proposed project

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

According to the methodology ACM0012 (Ver. 03.2), the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).
Realistic and credible alternative(s) should be determined for:

- Waste energy use in the absence of the project activity; and
- Power generation in the absence of the project activity; and
- Steam/heat generation in the absence of the project activity; and
- Mechanical energy generation in the absence of the project activity.

Multiple sub-systems generating energy in the project activity scenario
Determine the heat, power or mechanical energy requirement of the system(s) in the project boundary that can be met from one or more than one sub-system(s) in the project activity scenario. In determining the baseline scenario, project participants shall identify the realistic and credible alternatives to the project activity that would provide an output equivalent to the combined output of all the sub-systems in the project activity scenario. These alternatives may comprise one system or more than one sub-system(s). Therefore the alternative as, identified for the project activity should provide the same heat, power or mechanical energy output as in the project activity scenario and should include the alternate use of the waste energy utilized in the project activity. These alternatives shall be determined as realistic combinations of the following options available for meeting the 'heat requirement' and/or 'power requirement' and/or 'mechanical energy requirement' and for ensuring 'alternate use of waste energy' as described below:
The project participant shall exclude baseline options that:

- Do not comply with legal and regulatory requirements; or
- Depend on fuels (used for generation of heat, power, or mechanical energy), that are not available at the project site.

The project participant shall provide evidence and supporting documents to exclude baseline options that meet the above-mentioned criteria.

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations
The baseline candidates should be considered for following facilities:

- For the industrial facility where the waste energy is generated; and
- For the facility where the energy is produced; and
- For the facility where the energy is consumed.

For the use of waste energy, the realistic and credible alternative(s) may include, inter alias:

W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized;

W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;

W3: Waste energy is sold as an energy source;

W4 Waste energy is used for meeting energy demand;

W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared;

W6: All the waste gas produced at the industrial facility is captured and used for export electricity

generation.

Table B.3. Realistic and credible alternative(s) for the use of waste energy

Option	Description of plausibility	Conclusion
W1	"Emission standard of Air Pollutants for Coke Oven (GB16171-1996)" stipulates that the remaining COG must be released into the atmosphere after incineration. Hence, option W1 is not a plausible baseline scenario.	NA.
W2	It's the common method dealing with the waste COG in Shaanxi Province that the waste COG is released into the atmosphere after incineration.	A plausible baseline scenario.
W3	As there is no waste gas/heat demand in the area, it is not sensible to set it as baseline scenario.	NA.
W4	No regulations or laws constrain that the COG is to be used as an energy source. It is possible to use the waste COG as an energy source for meeting energy demand.	A plausible baseline scenario.
W5	No COG is used for captive electricity generation.	NA.
W6	A portion of COG (12,600 Nm^3/h) has been reused by the coke oven itself, and this portion shall be necessary for the coke production.	NA.

For power generation, the realistic and credible alternative(s) may include, inter alias:

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 or other waste energy based existing captive or identified plant;

P6: Sourced Grid-connected power plants;

P7: Captive Electricity generation waste energy (if project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency than the project activity.);

P8: Cogeneration using waste energy (if project activity is cogeneration with waste energy, this scenario represents cogeneration with lower efficiency than the project activity);

P9: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from **a captured portion** of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid.

P10 Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from **a captured portion** of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for won consumption and for export;

P11: Existing power generating equipment is maintained and additional electricity generated by grid connected power plants.

Table B.4. Realistic and credible alternative(s) for the power generation

Option	Description	Conclusion
P1	No regulations or laws constrain the project from being implemented. So, it is possible for the proposed project not to be undertaken as a CDM project activity.	A plausible baseline scenario.
P2	There is not a fossil fuel fired cogeneration plant. The construction of a new cogeneration plant with the same installed capacity as the project is forbidden according to "Small thermal power plant construction management (Ministry of electricity, 1997)".	NA.
P3	There is no existing renewable energy based cogeneration plant. Due to the limitation of renewable resource and the high cost, it is impossible to construct a new renewable energy based cogeneration plant, which can provide the same amount of electricity as the project.	NA.
P4	There is no existing fossil fuel fired captive or identified plant on site or off-site. According to the regulation - "Small thermal power plant construction management (Ministry of electricity, 1997)" [4], the construction of a fossil (coal, oil, natural gas) power plant (including captive plant) with an installed capacity of less than 100 MW is restricted and an installed capacity of less than 25 MW is forbidden. As the installed capacity of the proposed project is only 24 MW, the fossil power plants with the same capacity would not be in compliance with the existing laws and regulations.	NA.
P5	For renewable energy generation project, due to the technology limitation and the high cost, solar PV, geothermal, wind farm and biomass of the similar installed capacity as the proposed project are unattractive in finance in Shaanxi Province. For example, the first biomass project in Shaanxi Province (Shaanxi Nanniao 2*30 MW Biomass	NA.

[4] http://info.westpower.com.cn/cgi-bin/Ginfo.dll?DispLaw&w=westpower&ac=&gr=6851&pr=0&lid=15812

	Power Plant Project) is applying for being as a CDM project due to the high cost[5]. Furthermore there is no wind power[6] and hydropower resource[7] in this area to provide a comparable output or the same service as the proposed project. Therefore, due to the limitation of renewable resource and the high cost, it is impossible to obtain the same amount of power which is sourced from small hydro, biomass, wind and other renewable energy. In addition, there is no other waste energy based existing captive or identified plant.	
P6	Under this scenario, the same amount of electricity which would be generated by the proposed project can be purchased from the grid (NWPG). It is also a continuation of current practice. Therefore, it is included in the plausible alternatives.	A plausible baseline scenario.
P7	In the process of coke making, the load capacity of power needed by the owner is only 2~3 MW, which is less than the capacity of the project. Therefore, it is impossible to construct a captive electricity plant with the same capacity as the project for the owner.	NA.
P8	The proposed project is not cogeneration plant.	NA.
P9	There is no existing power generating equipment.	NA.
P10	There is no existing power generating equipment.	NA.
P11	There is no existing power generating equipment.	NA.

As the outcome of step 1, the alternatives W2, W4, P1, and P6 are remained as the baseline options. A scenario matrix can be developed based on the various combinations of baseline options.

Table B.5. The plausible baseline scenarios combinations

	P1	P6
W2	W2/P1 does not match. The waste gas is used for power generation in P1, which conflicts against W2 where the waste gas is released into atmosphere directly after incineration.	W2/P6 does match. This is considered to be a plausible baseline scenario combination, as the continuation of the present status.
W4	W4/P1 does match. This is the proposed project activity not undertaken as a CDM project activity.	W4/P6 does not match. The waste gas is used for power generation in W4, which conflicts against P6 where the same amount of electricity is purchased from the grid.

The outcome of the step 1: The plausible baseline scenarios may include:

[5] http://www.sndrc.gov.cn/showfile.jsp?ID=10074
[6] http://www.ylmb.gov.cn:8080/nyqx/wind_gk.asp
[7] http://www.cigem.gov.cn/readnews.asp?newsid=383

W2/P6: The COG generated by the coke oven will be flared after incineration and the same amount of electricity, which would be generated by the proposed project activity, is to be purchased from NWPG.
W4/P1: The project owner will utilize the COG for power generation to displace the same amount of electricity which would be purchased from the grid. In other words, the project activity would be implemented not undertaken as a CDM project activity.

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable
As discussed above, the option P6 is plausible baseline alternative. NWPG is dominated by fossil fuel. Therefore, the fuel is fossil fuel. The option P1 is also an alternative; the fuel is the COG.
Step 3: Step 2 and/or Step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).
Combination of Options W4 and P1 is consistent with host country's current laws and regulations; however, it is not the most plausible baseline scenario when the financial indicators are taken into account. The financial internal return rate (IRR) of the combination W4/P1 is 5.2% which is lower than the power industrial benchmark IRR 8% (after tax). Therefore, W4/P1 combination is not acceptable from the viewpoint of finance, and is financially unattractive for the owner. Detailed discussion will be provided at section B5.

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
From the above discussion, the most plausible combination baseline scenario of the proposed project is:

Table B.6. The most plausible baseline scenario combination

Baseline Scenario: Generation of Electricity only			
Scenario	Baseline options		Description of situation
	Waste energy	Power	
1	W2	P6	The waste COG is directly vented to the atmosphere after incineration, and the same amount of electricity, which would be generated by the project, is to be purchased from the grid (NWPG).

Conclusion: The combination of W2/P6 is considered as the most plausible baseline scenario combination.

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

The timelines of the proposed CDM project activity are as follows:

Table B.7. Timeline of the important dates of the proposed CDM project activity

Milestone	Date	Description

Meeting regarding CDM	10/05/2007	Preliminary consideration of CDM
Preliminary investment decision under the consideration of CERs income	16/10/2007	Resolution of the board of Shaanxi Haiyan Coke Making (Group) Co., Ltd.
CDM consulting agreement	21/11/2007	The CDM consulting contract signed with Shanghai Tepia Environmental Protection Co., Ltd.
Completion of FS Report	12/2007	"FS Report"
The final and formal investment decision under the serious consideration of the CDM	28/12/2007	Resolution of the board of Shaanxi Haiyan Coke Making (Group) Co., Ltd.
Application of Project Implementation	19/02/2008	"Application of Project Implementation" with FS Report to the Hancheng Economic Development Bureau
EIA Report completion	03/2008	**"EIA Report"** completed by China Coal Science Research Institute, Xi'an Branch
EIA approval date	14/04/2008	Approved by Shaanxi Environment Protection Bureau.
Approval of the project	30/04/2008	Approved by Shaanxi Development and Reform Commission.
Construction Contract	06/05/2008	**"Agreement"** with Jiangsu Huaneng Construction Engineering Group Co., Ltd. **(Starting date of the project activity)**
Application of construction start	06/05/2008	**"Application of Construction Start"** to the Hancheng Economic Development Bureau.
Purchase Contract of the Boiler	08/05/2008	**"Agreement"** with Taiyuan Boiler Group Co., Ltd.
Purchase Contract of the Turbine	09/05/2008	**"Agreement"** with Qingdao Jieneng Steam Turbine Group Co., Ltd.
Purchase Contract of the Generator	13/05/2008	**"Agreement"** with Shandong Jinan Generator Manufacturer.
Pre-announcement of the project implementation	01-20/05/2008	"**Pre-announcement of the Project Implementation**" at announcement boards in the neighboring villages
Answers to the questionnaire collected	20-31/05/2008	**"Answers to the questionnaire"** collected from stakeholders
MOU of ERPA	08/10/2008	"MOU" signed with Tepia Corporation Japan Co., Ltd.
Application for CDM to NDRC	31/10/2008	**"Application Form"** prepared by the Owner
Approved by China's DNA as a CDM project	18/02/2009	**"LOA" signed by China's DNA**
Project operation start permit date	07/07/2009	Approval letter from Weinan power company.

Among all of the dates, the date signing the purchase contract of the main equipment or the construction contract is taken as the real start date of the project. Therefore, the start date of the project is May 6, 2008.

According to ACM0012 (Ver. 03.2), the latest version (Ver. 05.2) of 'Tool for the demonstration and assessment of additionality" is employed in this section to assess the additionality of proposed project.

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

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

As stated in the section B.4, Step 1, there left only two combinations of plausible baseline alternatives, which are W2/P6 and W4/P1, as shown below:

(a) W2/P6 The waste COG is directly vented to the atmosphere after incineration, and the same amount of electricity which would be generated by the project is to be purchased from the grid (NWPG).

(b) W4/P1 Waste heat/gas is used to generate energy, and the project will be implemented not undertaken as a CDM project.

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

The combinations W2/P6 and W4/P1 are in compliance with all applicable laws and regulations. The related laws and regulations can be found and downloaded from the website of State Electricity Regulatory Commission (SERC), and National Development and Reform Commission (NDRC)[8].

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

In "Tool for the demonstration and assessment of additionally," three options can be chosen for the investment analysis: the simple cost analysis, the investment comparison analysis, and the benchmark analysis.

The plausible baseline alternatives are the combinations W2/P6 and W4/P1.

The simple cost analysis is not applicable for those two alternative combinations, because the combination W4/P1 will produce economic benefit (from electricity sale) other than CERs income. The combination W2/P6 is to buy electricity from NWPG, which is an existing grid and not a new-built project, therefore, the investment comparison analysis is also not applicable for the proposed project.

Then the benchmark analysis will be used to identify whether the financial indicator, such as Financial Internal Return Rate (IRR) is better than the benchmark value or not.

Sub-step 2b: Apply benchmark analysis (Option III)

All of the electricity generated by the project will be transmitted to the grid, so the project will adopt the electricity generation section benchmark IRR rather than the coke section benchmark IRR.

"Interim Measures for Economical Assessment of Electrical Technological Transformation Project" is the most important reference for project assessment in China. According to the scenario mentioned above, a project would be financially acceptable if the IRR (after income tax) is higher than the benchmark IRR (after income tax).

The electricity generation section benchmark IRR on total investment is 8% (after income tax).

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

According to the Feasibility Study Report (FS Report) which was prepared by China Machinery International Engineering Design & Research Institute, the main parameters for financial analysis are as follows:

Table B.8. Main parameters for calculation of financial calculation

[8] http://www.serc.gov.cn/opencms/export/serc/laws/index.html and http://nyj.ndrc.gov.cn.

Items	Unit	Value	Source
Installed Capacity	MW	24	FS Report (Feasibility Study Report)
Static Investment	Million Yuan	98.4	FS Report
Current capital	Million Yuan	7.65	FS Report
O & M Cost	Million Yuan/y	29.89	FS Report
Delivered Electricity	MWH/y	163,800	FS Report
Electricity Tariff (including tax)	Yuan/MWH	300	As per FS Report, it is 285, including VAT. It is adjusted as per the current situation by Chinese Government[9]
Value added tax	%	17%	FS Report and set by Chinese Government[10]
Additional tax for city development	%	7%	FS Report and set by Chinese Government[11]
Additional tax for education		3%	FS Report and set by Chinese Government[12]
Income tax	%	25%	FS Report and set by Chinese Government[13]
Project life	Years	16	FS Report, from 06/05/2008 to 30/06/2024, including one year for construction.
Project operation life	Years	15	FS Report, from 01/07/2009 to 30/06/2024
Time span for IRR calculation	Years	17	FS Report, from 2008 to 2024
CERs price	€/tCO_2	9	Purchase Contract
Exchange rate(predicted)	RMB/EUR	9.5	Predicted
Credit period	Years	10	

Electricity Tariff:
The project will adopt the fixed electricity tariff (300 Yuan/MWH) during the project operating life for the following reasons:

1. In China, according to the government regulations, the feasibility study should use the current price as the basis for the calculation of IRR, and it is fixed during the whole project life. Moreover, it is common practice in China.
2. In China, the electricity tariff is fully controlled by the government[14]. In order to control the inflation, the local government will consider the overall economic situation and refer to the central government requirement to change electricity tariff. It is not controllable or predictable for the project owner.
3. From the consideration of the electricity sale contract, the tariff is also fixed for a long period. The Grid Company is fully owned by the government and has full power to decide electricity tariff.
4. If the electricity tariff is not fixed and increases annually, then the cost, including labour cost, spare parts cost, maintenance cost should also increases annually. The historical electricity tariff and price indexes are shown as follows:

9 http://www.ndrc.gov.cn/zcfb/zcfbtz/2008tongzhi/t20080702_222225.htm
10 http://www.gov.cn/banshi/2005-08/19/content_24733.htm
11 http://www.gov.cn/banshi/2005-08/19/content_24817.htm
12http://www.gov.cn/gongbao/content/2005/content_91662.htm
13 http://www.gov.cn/flfg/2007-03/19/content_554243.htm
14 http://www.chinacourt.org/flwk/show1.php?file_id=100966

Table B.9. Historical electricity tariff and price indexes

Year	Electricity tariff Yuan/KWh[15]	Electricity tariff increase rate %	The average price indexes derived from water, materials, etc. Increase rate %[16]
2004	0.26	---	11.4%
2005	0.27	3.85%	8.3%
2006	0.285	5.56%	6.0%
2007	0.3	5.26%	4.8%[17]
Average annual increase rate		4.89%	7.63%

As shown in the above table, from 2004 to 2007, the increase rate of the average price indexes is much higher than the increase rate of the electricity tariff. From this point of view, the adoption of the fixed tariff is a conservative method.

Table B.10. Comparison of financial indicators with and without CERs revenues

Item	IRR(after income tax)	Benchmark
Without income from CERs	5.2%	8%
With income from CERs	14.0%	8%

As shown in the above table, the IRR (after income tax) without the revenues from CERs is 5.2%, lower than that of the electricity generation section benchmark, so the proposed project is financially unacceptable because of its low profitability. Taking the CERs revenue into account, the IRR (after income tax) of the proposed project is increased to 14.0%, higher than the benchmark and the financial attraction will be dramatically improved. Therefore, the alternative W4/P1 is not the most plausible baseline scenario.

Sub-step 2d: Sensitivity analysis

Three impact factors are considered in the following sensitivity analysis:
1) Static investment
2) O & M Cost
3) Delivered electricity
According to "Guidance on the Assessment of Investment Analysis"[18], assuming the above three factors vary in the range of -10%-+10%, the IRR of the proposed project (without CERs revenue) varies in the different extent, as shown in the following:

Table B.11. Sensitivity analysis of the project total investment IRR (after income tax)

Varying range	-10.00%	0%	10.00%
Static investment	6.3%	5.2%	4.3%
Delivered electricity	1.0%	5.2%	8.9%

[15] http://www.spic.gov.cn/admin/pub_journalshow.asp?id=101592&chid=100068
[16] http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm
[17] http://www.88gu.cn/news/caijing/2008012651.html
[18] http://cdm.unfccc.int/EB/041/eb41_repan45.pdf

O & M Cost	7.9%	5.2%	2.3%

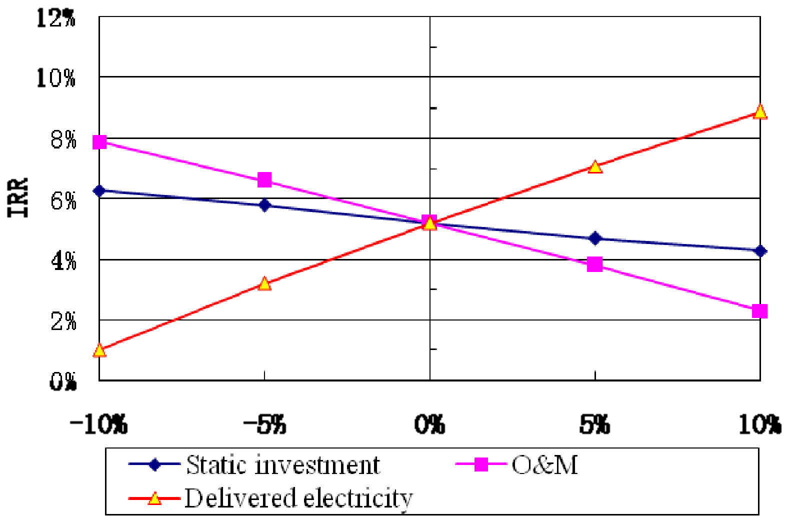

Figure B. 2. Sensitivity analysis of the project total investment IRR (after income tax)

The change of delivered electricity is the most important factor affecting the financial attractiveness of the proposed project. When the output of the annual net delivered electricity increase by 10%, the IRR will reach 8.9%, which is higher than the benchmark (8%). But the annual average time for overhaul and regular yearly maintenance of the proposed project activity is 840 h/y and the annual average time for the unexpected maintenance hours is 420 h/y. Even if the project operation time reaches its max operating time, i.e., 7920 h/y, without any emergency happens, the IRR will be 7.3%, which is still lower than the benchmark (8%). Therefore, the IRR will not reach 8% under the normal condition.

The next most important factors are the static investment and the O&M cost. In these two cases, the IRR is still lower than the benchmark (8%). That is to say, without CERs income, the project is not financially attractive.

Although electricity tariff is not shown on the above figure, the delivered electricity line shows the similar trend. The tariff needs to increase 7.5% to reach IRR benchmark 8%. From table B9, the annual average increasing of the tariff is 4.89%, which is much smaller than other material annual increasing rate 7.63%. Therefore, it can be predicted the project IRR cannot reach 8% with the current tariff regulation.

In conclusion, without the income from the CERs sale, the proposed project activity is not financially attractive.

Step 3: Barrier analysis

Base on step 2, without the income from the CERs sale, the project has poor financial attractiveness and the proposed project is additional, therefore, the barrier analysis step is omitted.

Step 4: Common practice analysis

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

According to "Tool for the demonstration and assessment of additionality (Ver. 05.2)", the projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities are not to be included in this analysis.

Choose similar region (Geographical scope of the common practice):
The project is located in China, which is a large country. There are many provinces in China, and each province has its individual investment climate, which largely depends on the natural resources, regulation and policy framework. Therefore, Shaanxi province, where the project is located, is defined as the targeted region in this analysis.

Choose similar technology/scale (Technology or industry type of the common practice analysis):

The project is to recover the combustible waste gas (COG) from coke making line to generate electricity with the capacity of 2x12 MW steam-turbine and generator. Therefore, all the coke making line produces COG, with or without recovering the combustible, should be similar technology to the project. The technologies and scales of utilization of the COG could be vary, a survey was carried out by Shaanxi Industrial Technology Research Institute to find out the general use of the COG from coke making line in Shaanxi province. The scale of the similar projects' power generation, if any, is limited to those projects in the targeted region, whose capacity is equal to or lower than 36MW, onepoint five (1.5) times of 2x12MW. Based on the survey, the similar projects in Shaanxi Province were observed as following.

Table B.12. Coke making Project with waste gas in Shaanxi Province

	Project Name	Capacity of Coke production (ton/y)	Capacity of power generation (MW)	Waste gas usage
1	Shaanxi Dongling Smelting Co., Ltd.	700,000	20MW	Generating electricity, applying for CDM
2	Hancheng Rongchang Coke Making Co., Ltd.	150,000	None	Emission into atmosphere after ignition
3	Hancheng Zhongtian Coke Making Co., Ltd.	150,000	None	Emission into atmosphere after ignition
4	Hancheng Heli Coke Making Co., Ltd.	100,000	None	Emission into atmosphere after ignition
5	Shaanxi Coke Making Co., Ltd.	700,000	3MW	Generating electricity , without CDM, Glass-making

The similar projects are all coke making projects and produce lots of combustible COG. Project 1, 5, have the similar coke making capacity with Shaanxi Haiyan Coke Making (Group) CO., Ltd. Project 2, 3, and 4 have the same measures as the baseline scenario of the project.

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

As shown in the above table, the project 1 recovers COG for power generation and applies for CDM, which should not be included in this analysis. The projects 2, 3, and 4 are same as the baseline Scenario of the proposed project.
Project 5 is a quite special case and more detailed discussion is given here. It's a captive power plant with an installed capacity of 3 MW. The main task is to provide service for the prime business and ensure its operation smoothly. So it is only an auxiliary project, the purpose of the project's construction and operation is not from financial and economic angle.

The similar activities are observed, but there are essential distinctions between the proposed project activity and them, therefore, the proposed project activity is NOT common practice.

As a conclusion of four steps mentioned above, the proposed project activity is assured to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to ACM0012 (Ver. 03.2), the emission reduction calculation is carried out as follows:

- ♦ Baseline emission calculation
- ♦ Project emission calculation
- ♦ Leakage
- ♦ Emission reduction

1. Baseline Emission (BE_y)

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

$$BE_y = BE_{En,y} + BE_{flst,y} \quad \text{(ACM0012: 1)}$$

Where:

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

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

$BE_{flst,y}$ =Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (t CO_{2e} /y), calculated as per equation 1c. This is relevant for those project activities where in the baseline steam is used to flare the waste gas.

No fossil fuel would be consumed in flaring the waste gas in the proposed project baseline scenario, therefore, $BE_{flst,y}$ is considered as zero for the baseline emission calculation.

The calculation of baseline emissions ($BE_{En,y}$) depends on which of the following the identified baseline scenarios have been identified.

<u>Baseline emissions for Scenario 1</u>

Scenario 1 represents the situation where the electricity is obtained from a specific existing power plant or from the grid, mechanical energy (displaced waste energy based mechanical turbines in project) is obtained by electric motors and heat from a fossil fuel based element process (e.g. steam boiler, hot water generator, hot air generator, hot oil generator).

Note: If the project activity is either generation of electricity only, or mechanical energy only or generation of heat only, then one of the two sub-sections below shall be used for estimating baseline,

depending on the type of energy generated by the project activity. Further, in cases where the project activity uses the waste pressure to generate electricity then only, then section a.i) below is used.

$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$ (ACM0012: 1a)

$BE_{Elec,y}$ = Baseline emissions from electricity during the year y in tons of CO_2
$BE_{Ther,y}$ = Baseline emissions from thermal energy (due to heat generation by element process) during the year y in tons of CO_2
As discussed on B4 and B5, the baseline scenario for the proposed project only take electricity generation into account, hence, there is no $BE_{Ther,y}$ involved in the calculation.

(a.i.) Baseline emissions from electricity ($BE_{electricity,y}$) Type-1 activities:

Case-1: Waste energy is used to generate electricity

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \text{(ACM0012: 1a-1)}$$

Where:

$BE_{elec,y}$ = Baseline emissions due to displacement of electricity during the year y in tons of CO_2.
$EG_{i,j,y}$ = The quantity of electricity supplied to the recipient j by generator, that in the absence of the project activity would have been sourced from i^{th} source (i can be either grid or identified source) during the year y in MWh, and
$EF_{elec,i,j,y}$ = 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 in tons CO_2/MWH
f_{wcm} = Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy. If the boiler providing steam for electricity generation uses both waste and fossil fuels, this factor is estimated using equation (1d). If the steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1d/1e). Note: For project activity using waste pressure to generate electricity, electricity generated from waste pressure use should be measurable and this fraction is 1
f_{cap} = Energy that would have been produced in project year y using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year y. The ratio is 1 if the waste energy generated in project year y is same or less than that generated in base year. The value is estimated using equations (1f), or (1f-1) or (1f-2), or (1g), (1g-1) or (1h)

Capping of baseline emissions

As an introduction to the element of conservativeness, this methodology requires that baseline emissions should be capped irrespective of planned/unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuel type and quantity resulting in an increase in generation of waste energy. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using the three Methods described below. Project proponents shall use Method-1 to estimate the cap if data is available. In case of project activities implemented in a new facility, or in facilities where three-year data on production is unavailable, Method-2 shall be used. In case the project proponents demonstrate technical limitations in direct monitoring of waste heat / pressure of waste energy carrying medium

(WECM), then Method-3 is used.

The Method-3 is used for the project to determine baseline emissions capping, as the current technical limitations for direct monitoring of the waste heat of the hot coke.

Method-3:

In some cases, it may not be possible to measure the waste energy (heat, sensible heat, heat of reaction, heat of combustion etc.), enthalpy or pressure content of WECM. Therefore, there is no historic data available for these cases. These cases may be of following two types.

Case-1: The energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases f_{cap} should be the ratio of maximum theoretical energy recoverable using the project activity waste heat recovery equipment and actual energy recovered under the project activity (using direct measurement). 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.

Case-2: The energy is recovered from WECM in intermediate energy recovery equipment using an intermediate source. For example, an intermediate source to carry energy from primary WECM may include the sources such as water, oil or air to extract waste energy entrapped in chemicals (heat of reaction) or solids (sensible heat). This intermediate energy source is finally used to generate the output energy in the final waste heat recovery equipment. For these cases f_{cap} is the ratio of maximum theoretical intermediate energy recoverable from intermediate waste heat recovery equipment and actual intermediate energy recovered under the project activity (using direct measurement). For estimating the theoretical energy, manufacturer's specifications can be used. Alternatively, technical assessment can be carried out by independent qualified/certified external process experts such as chartered engineers.

Following equation should be used to determine f_{cap}:

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}}$$ **(ACM0012:1h)**

Where:

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

$Q_{OE,y}$ = Quantity of actual output/intermediate energy during year y (in appropriate unit)

Case-1 is chosen because the delivered electricity is reliable and the theoretical energy recovered and the final output under the project activity can be either directly estimated or measured.

CALCULATION OF CO_2 EMISSION FACTOR ($EF_{Elec,gr,j,y}$) FOR NWPG

According to the methodology ACM0012 (Ver. 03.2), 'Tool to calculate the emission factor for an electricity system' (Version 02) (hereafter, referred as the Tool) is used to calculate the project baseline emission factor. Based on the Tool, the calculation is followed as described below:

Step 1. Identify the relevant electricity systems

According to the delineation of China DNA, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang are counted as NWPG. This project is in Shaanxi Province, the relevant electric power system of the proposed project activity is NWPG.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional).

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The project is to deliver electricity to the grid, therefore, option I is chosen.

Step 3. Select a method to determine the operating margin (OM).

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

Each method is described under Step 4.

Dispatch data analysis OM(Option c) shall be used if (1) the data required to apply this option is publicly available and (2) off-grid power plants are not included in the project electricity system as per Step 2 above. For the dispatch data analysis OM, the emission factor shall be determined for the year in which the project activity displaces grid electricity and updated annually during monitoring.

In case the grid emission factor is used to calculated project emissions or leakage, any of the four options could be used, provided that the conditions specified below are fulfilled for the selected option.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

• Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of of submission of the CDM-PDD for validation

• Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months

after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the most recent 5 years (2002-2006) of NWPG, the low-cost/must run resources account for 22.82%, 18.78%, 22.05% , 27.44% and 23.42% respectively, which are less than 50%. So, the simple OM method can be used. And Ex ante option is used for this CDM-PDD, therefore it is not required to monitor and recalculate during the crediting period.

Step 4. Calculate the operating margin emission factor according to the selected method.
(a) Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_{2e}/MWH) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The simple OM may be calculated:

Option A : Based on the net electricity generation and a CO_2 emission factor of each power unit[3], or

Option B : Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step).

Option B is adopted in this PDD for Option A isn't available. Accordingly, only nuclear and renewable power generations are considered as low-cost/must run power sources and the data of the quantity of electricity supplied to the grid by these sources is available.

Where Option B is used, 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2i,y}}{EG_y} \quad \text{("Tool": 7)}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWH)
$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/ mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWH)
i = All fossil fuel types combusted in power plant / unit m in year y
y = The relevant year as per the data vintage chosen in Step3

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 Chinese DNA published the latest $EF_{OM,y}$ of NWPG will of be adopted in this PDD and its value is 1.1225 (tCO2/MWH) and the detail calculation is shown as Annex 3.

Step 5. Identify the group of power units to be included in the build margin (BM)
The sample group of power units m used to calculate the build margin consists of either:
(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWH) and that have been built most recently

The CDM-PDD identifies option (b) for sample group of power units m, as the information for five power units that have been built most recently is not available in China.
In terms of vintage of data, project participants can choose between one of the following two options:

- Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 is selected.
As the crediting period for the proposed project is fixed 10 years, the build margin emission factor ex-ante will the only BM emission factor calculated for the proposed project.

Step 6. Calculate the build margin emission factor
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:

$$EF_{grid\ BM,y} = \frac{\sum_m F_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \text{(“Tool”: 13)}$$

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
y	=	Most recent historical year for which power generation data is available

Because some data are not available, the BM calculation in this PDD adopts the deviation method (*Application of AM0005 and AMS-I.D in China* requested by DNV) agreed by the CDM EB[19].
Firstly, calculate the new installed capacity and its power generation technology mix. Secondly, calculate the weights of new capacity in each generation technology. Finally, calculate the BM emission factor at the commercialized best efficiency performance of each generation technology.
Because the installed capacity of the coal-fired, oil-fired and gas-fired technology can not be extracted directly from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance sheets on the most recent year to calculate the share of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, use the proportions as the weights, based on the emission factors at the commercialized best efficiency performance of each generation technology, calculate the emission factor of the thermal power in grid. Thirdly, this thermal emission factor is multiplied by the proportion of thermal power in the new 20% capacity. Finally the BM emission factor is got.
The detail calculation steps are as follows:

Step (1): Calculation of the share of CO_2 emissions from solid, liquid, and gaseous fuels.

$$\lambda_{COAL,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \qquad (13\text{-}1)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \qquad (13\text{-}2)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \qquad (13\text{-}3)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* consumed by province *j* 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)

Coal, Oil and *Gas* refer to the solid, liquid, and gaseous fuel.

Step (2): Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad (13\text{-}4)$$

$EF_{Coal,Adv}$ ⊥ $EF_{Oil,Adv}$ ⊥ $E_{FGas,Adv}$ represent the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies.

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[19] http://cdm.unfccc.int/Projects/Deviations/index.html

Step (3): Calculation BM in the grid.

$$EF_{grid,BM,y} = \frac{EF_{Thermal,y} \times CAP_{Thermal,y}}{CAP_{Total,y}} \quad (13\text{-}5)$$

Where:

CAP_{Total} is the total added installed capacity;

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

Same as the OM, The Chinese DNA published the latest $EF_{BM,y}$ of NWPG will be adopted in this PDD and its value is 0.6199 (tCO_2/MWH) and the detail calculation is shown as Annex 3.

Step 7. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated are as follows:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad \text{("Tool": 14)}$$

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 (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Therefore, for the proposed project, w_{OM} = 0.5 and w_{BM} = 0.5 are chosen. Then CO_2 emission factor for NWPG: $EF_{Elec,gr,j,y}$ is 0.8712 (tCO_2/MWH). (0.5*1.1225+0.5*0.6199=0.8712)

2. PROJECT EMISSION (PE_y)

According to the methodology, Project Emissions include emissions due to (1) combustion of auxiliary fuel to supplement waste gas/heat and (2) electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption; and (3) emissions due to consumption of imported electricity that in the absence of project activity would have been supplied by captive electricity generated (only for Type-2 project activities).

$$PE_y = PE_{AF,y} + PE_{EL,y} + PE_{EL,Import,y} \quad \text{(ACM0012: 2)}$$

Where:

PE_y = Project emissions due to project activity

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to nonavailability of waste energy 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 (as per Table B.2: Summary of gases and sources included in the project boundary)
$PE_{EL,Import,y}$ = Project activity emissions from import of electricity replacing captive electricity generated in the absence of the project activity for Type-2 project activities

The proposed project activity is to recover the waste COG to generate electricity and Type-1 project. Therefore, $PE_{AF,y}$ is zero, $PE_{EL,Import,y}$ is zero.

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

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y}$$

Where:

$PE_{EL,y}$ = Project emissions from consumption of electricity in gas cleaning equipment of project activity or other supplementary project electricity consumption (t CO_2/yr)
$EC_{PJ,y}$ = Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh)
$EF_{CO2,EL,y}$ = CO_2 emission factor for electricity consumed by the project activity in year y (t CO_2/MWh)

For the proposed project, the additional electricity consumed in year y, $EC_{PJ,y}$, has been deducted from estimation of the $EG_{i,j,y}$. Then $PE_{EL,y}$ is zero here, and $EC_{PJ,y}$ will be monitored and used as the cross check for $EG_{i,j,y}$. Therefore, the project emission is zero.

3. LEAKAGE
According to the methodology ACM0012 (Ver. 03.2), no leakage is applicable under this methodology.

4. EMISSION REDUCTION
Emission reductions due to the project activity during the year y are calculated are as follows:

$$ER_y = BE_y - PE_y = BE_y \qquad \text{(ACM0012:3)}$$

Where:
ER_y = The total emissions reductions during the year y in tons of CO_2
PE_y = The emissions from the project activity during the year y in tons of CO_2
BE_y = The baseline emissions for the project activity during the year y in tons of CO_2.

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

Data / Parameter:	F_{wcm}
Data unit:	Fraction
Description:	Fraction of total energy generated by the project activity using waste gas.
Source of data used:	Feasibility study report of the proposed project.

Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This fraction is 1 if the energy generation is purely from the waste gas in the project generation unit.
Any comment:	

Data / Parameter:	f_{cap}
Data unit:	Fraction
Description:	Energy that would have been produced in project year y using waste gas/heat generated in base year expressed as a fraction of total energy produced using waste gas in year y.
Source of data used:	Feasibility study report of the proposed project.
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The ratio is 1 if the energy generated in project year y is same or less than that generated in base year. The value is estimated using equation (1h)
Any comment:	

Data / Parameter:	$Q_{OE,BLt}$
Data unit:	MWh/y
Description:	Production by process that most logically relates to waste gas generation in baseline.
Source of data used:	Feasibility study report of the proposed project.
Value applied:	163,800 MWH,
Justification of the choice of data or description of measurement methods and procedures actually applied :	The generator's rated capacity is 24 MW, and the assumed working hour is 7500 hours per year, the self use and line loss rate is 9%.
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit of fuel i
Description:	The amount of fuel i consumed (in a mass or volume unit) by project electricity system in year(s) y
Source of data used:	China Energy Statistical Yearbook 2005-2007
Value applied:	Please refer to annex 3.
Justification of the	All the data are published officially.

choice of data or description of measurement methods and procedures actually applied :	Detail information, refer to annex 3.
Any comment:	

Data / Parameter:	$GEN_{j,y}$
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 electricity Statistical Yearbook 2005~2007
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the data are published officially. Detail information, refer to annex 3.
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ / mass or volume unit
Description:	The net calorific value (energy content) of fossil fuel type I in year y.
Source of data used:	China Energy Statistical Yearbook 2006
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the data are published officially. Detail information, refer to annex 3.
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	The CO_2 emission factor of fossil fuel type I in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2: Energy.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value

Any comment:	

Data / Parameter:	The best efficient of commercial coal-fired, oil-fuel and gas-fuel generation.
Data unit:	%
Description:	The best efficient and commercial coal-fired, oil-fuel and gas-fuel generation.
Source of data used:	China DNA: Bulletin on Baseline Emission Factor of China Region Grid-the calculation of baseline Build Margin emission factor for China Grid. Please refer to annex 3.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the data are published officially. The figures of OM and BM are identical to those provided in China DNA publication of 18th July 2008. (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1880.pdf) Detail information, refer to annex 3.
Any comment:	

Data / Parameter:	Share of CO_2 emissions from solid, liquid and gaseous fuels
Data unit:	%
Description:	Share of CO_2 emissions from solid, liquid and gaseous fuels
Source of data used:	Please refer to annex 3.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the data are published officially. The figures of OM and BM are identical to those provided in China DNA publication of 18th July 2008. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081230102527637.pdf Detail information, refer to annex 3.
Any comment:	

Data / Parameter:	$CAP_{fossil,y}$
Data unit:	MW
Description:	The total capacity additions of fossil fuel fired power of NWPG in year y.
Source of data used:	Please refer to annex 3.
Value applied	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	All the data are published officially. The figures of OM and BM are identical to those provided in China DNA publication of Dec. 30, 2008. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/20081230102527637.pdf Detail information, refer to annex 3.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

According to the analysis in section B.6.1, the emission reduction is calculated by following equations.
$ER_y = BE_y = BE_{Elec,y}$

$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum\sum((EG_{i,j,y} * EF_{Elec,i,j,y})$
Since there is no flaring activity or heat supply involved in the proposed project, BE_y equals to $BE_{Elec,y}$. f_{cap} is 1 according to above mentioned analysis, and f_{wcm} is 1 as the generated electricity are purely from waste gas.
The emission factor $EF_{Elec,i,j,y}$ for Northwest China Power Grid (NWPG) is calculated as in B.6.1, which is 0.8712 tCO_2e/MWH. As estimated in Feasible Study Report, $EG_{i,j,y}$ is 163,800 MWH/y, then ER_y=163,800*0.8712=142,702 tCO_2e/y.

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

As the starting date of the crediting period is expected on 01/06/2011 with the fixed crediting period (10 years), the emission reductions during the crediting period are estimated as follows:

Table B.13. Ex-ante estimation of emission reductions during the crediting period

Years	Estimation of Project activity Emissions (Tonnes of CO_2e)	Estimation of baseline emissions (Tonnes of CO_2e)	Estimation of Leakage (Tonnes of CO_2e)	Estimation of overall emission reductions (Tonnes of CO_2e)
01/06/2011-31/12/2011	0	83,243	0	83,243
2012	0	142,702	0	142,702
2013	0	142,702	0	142,702
2014	0	142,702	0	142,702
2015	0	142,702	0	142,702
2016	0	142,702	0	142,702
2017	0	142,702	0	142,702
2018	0	142,702	0	142,702
2019	0	142,702	0	142,702
2020	0	142,702	0	142,702
01/01/2021-31/05/2021	0	59,459	0	59,459
Total (tCO_2e) (10 years)	0	1,427,020	0	1,427,020

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{i,j,y}$
Data unit:	MWH
Description:	Annual electricity delivered by the proposed project
Source of data to be	Electricity Meters.

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	163,800 MWH, from FS Report estimation
Description of measurement methods and procedures to be applied:	This parameter will be continually measured and recorded monthly and aggregated annually. Electricity meters will be installed at Xiayukou and Zhubei substations to measure electricity supplied to the grid. In addition, the cross check measure will be taken as electricity meters will be installed at generators and auxiliary equipments to measure electricity generated and the consumption of the auxiliary equipments. Detailed diagram is in B.7.2. The supplied electricity from the project can be cross checked by the difference of the electricity between total generated and total consumed in the plant. All electricity meters are with accuracy of 0.2S (means that the uncertainty is less than 0.2%), except for meters installed for auxiliary equipment consumption with accuracy of 0.5S. The relevant data will be kept during the crediting period and two years after the end of the crediting period. Calibrated once every 12 months according to the relevant regulations of electricity industry.
QA/QC procedures to be applied:	The electricity meters will undergo maintenance/calibration to the industry standards.
Any comment:	Sales receipts shall be used for verification.

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWH
Description:	Additional electricity consumed in year y, for project related equipment, as a results of the implementation of the project activity
Source of data to be used:	Electricity Meters.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	16,200 MWH, from FS Report estimation
Description of measurement methods and procedures to be applied:	This parameter will be continually measured and recorded monthly and aggregated annually. Electricity meters will be installed at auxiliary equipments to measure electricity consumption of the auxiliary equipments. Detailed diagram is in B.7.2. The meter accuracy is 0.5S. The relevant data will be kept during the crediting period and two years after the end of the crediting period. Calibrated once every 12 months according to the relevant regulations of electricity industry.

QA/QC procedures to be applied:	The electricity meters will undergo maintenance/calibration to the industry standards.
Any comment:	

Data / Parameter:	$EG_{gen,y}$
Data unit:	MWH
Description:	Annual electricity generated by the proposed project
Source of data to be used:	Electricity Meters.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	180,000 MWH, from FS Report estimation
Description of measurement methods and procedures to be applied:	This parameter will be continually measured and recorded monthly and aggregated annually. Electricity meters will be installed the generators to measure electricity generated by the project. Detailed diagram is in B.7.2. All electricity meters are with accuracy of 0.2S (means that the uncertainty is less than 0.2%). The relevant data will be kept during the crediting period and two years after the end of the crediting period. Calibrated once every 12 months according to the relevant regulations of electricity industry
QA/QC procedures to be applied:	The electricity meters will undergo maintenance/calibration to the industry standards.
Any comment:	

Data / Parameter:	$Q_{OE,y}$(= $EG_{i,j,y}$)
Data unit:	MWh/year
Description:	Quantity of actual output/intermediate energy during year y
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	163,800 MWH,
Description of measurement methods and procedures to be applied:	Please see $EG_{i,j,y}$ description. The relevant data will be kept during the crediting period and two years after. The meter is calibrated once in 12 months according to relevant regulations of electricity industry.
QA/QC procedures to be applied:	please refer to B.7.2
Any comment:	

B.7.2. Description of the monitoring plan:

Monitoring Methodology

All data collected as a part of monitoring plan should be archived electronically and be kept at least for 2 years after the end of the crediting period. 100% of the data should be monitored if not indicated otherwise in the comments in the tables in section B.7.1. The following data shall be monitored.

1. Monitoring Data

1.1 $EG_{i,j,y}$

According to the methodology ACM0012 (Ver. 03.2), because there are no captive plants and no auxiliary fossil fuels to be needed, and the baseline emission factor (gird emission factor) is ex-ante and fixed during the crediting period. Therefore, only the electricity delivered to the grid (**$EG_{i,j,y}$**) is needed for the emission reduction calculation. The electricity delivered to the grid will be the sum of electricity supplied to Zhubei and Xiayukou substations, with meter accuracy 0.2S (sum of $EG_{y,HX}$ and $EG_{y,HZ}$ in Fig.B.4.).This can be cross checked by the electricity generated minors electricity consumed by auxiliary equipment, which will be measured by meters with 0.2S and 0.5S accuracy.

Monitoring Equipment: Electricity meter to monitor the net electricity delivered to the grid.

1.2 EGgen,y The meters with accuracy of 0.2S will be installed at the generators to measure the electricity generated by the project.

1.3 $EC_{PJ,y}$ The meters with accuracy of the 0.5S will be installed to measure electricity consumed for auxiliary equipments from the project.

1.4$Q_{OE,y}$

According to the methodology ACM0012 (Ver. 03.2), **$Q_{OE,y}$** need to be monitored.
Monitoring Equipment: Electricity meter

2. Monitor operational and management scheme

The project owner plans to appoint a CDM project director, a monitoring manager, and several monitoring engineers. The respective responsibilities are as follows:

CDM Project Director: Supervise the project operation related to the data monitoring, including coordinations with the grid company. Receive reports from the monitoring manager; manage the CDM project; coordinate with the Chinese Government and stakeholders; submit the monitoring report to UNFCCC.

Monitoring Manager: Based on the monitoring plan in the PDD, records the net delivered electricity $EG_{i,j,y}$, the electricity generated $EG_{gen,y}$, electricity consumed by the project $EC_{PJ,y}$, and the actual output $Q_{OE,y}$ in monthly base and aggregate annually, prepare the monitoring reports, and collect financial data such as the receipts of electricity sales, etc. The Monitoring manager reports to the CDM project director.

Monitoring Engineers: To calibrate and maintain the electricity meters and the flow meters, check and manage the data, achieve the responsibilities of the daily operation and maintenance of the project, and records daily $EG_{gen,y}$, $EC_{PJ,y}$, $EG_{i,j,y}$ and $Q_{OE,y}$.

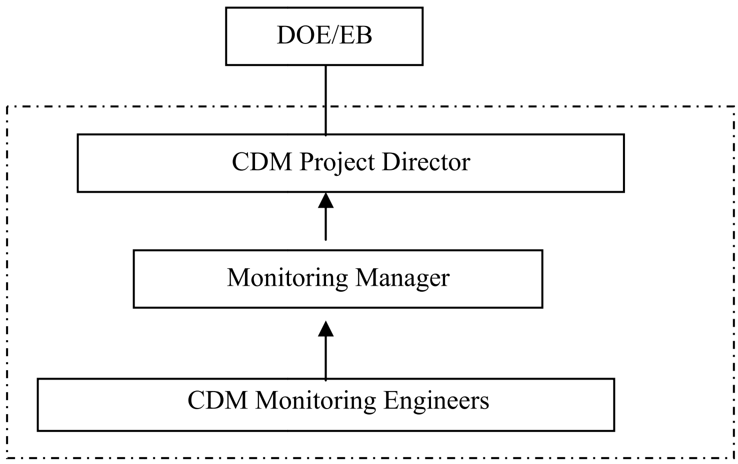

Figure B.3. Operational and Management Scheme

3. Installation and Calibration of Measuring Meters, and O&M

For the net delivered electricity ($EG_{i,j,y}$), electricity meters will be installed at the substations (Xiayukou substation and Zhubei substation) and at the generation plant for cross check.

The electricity meters are consistent with "Electricity measurement management rules (DL/T614-1997)". During those electricity meters installation, the authorized body (the grid company) will check the electricity meters, and verify them by issuance of licenses to ensure their reliability.

During the operation period, those electricity meters will be maintained and calibrated once every 12 months in accordance with the relevant regulations of the electricity industry and be verified with certificates of calibration by the entity.

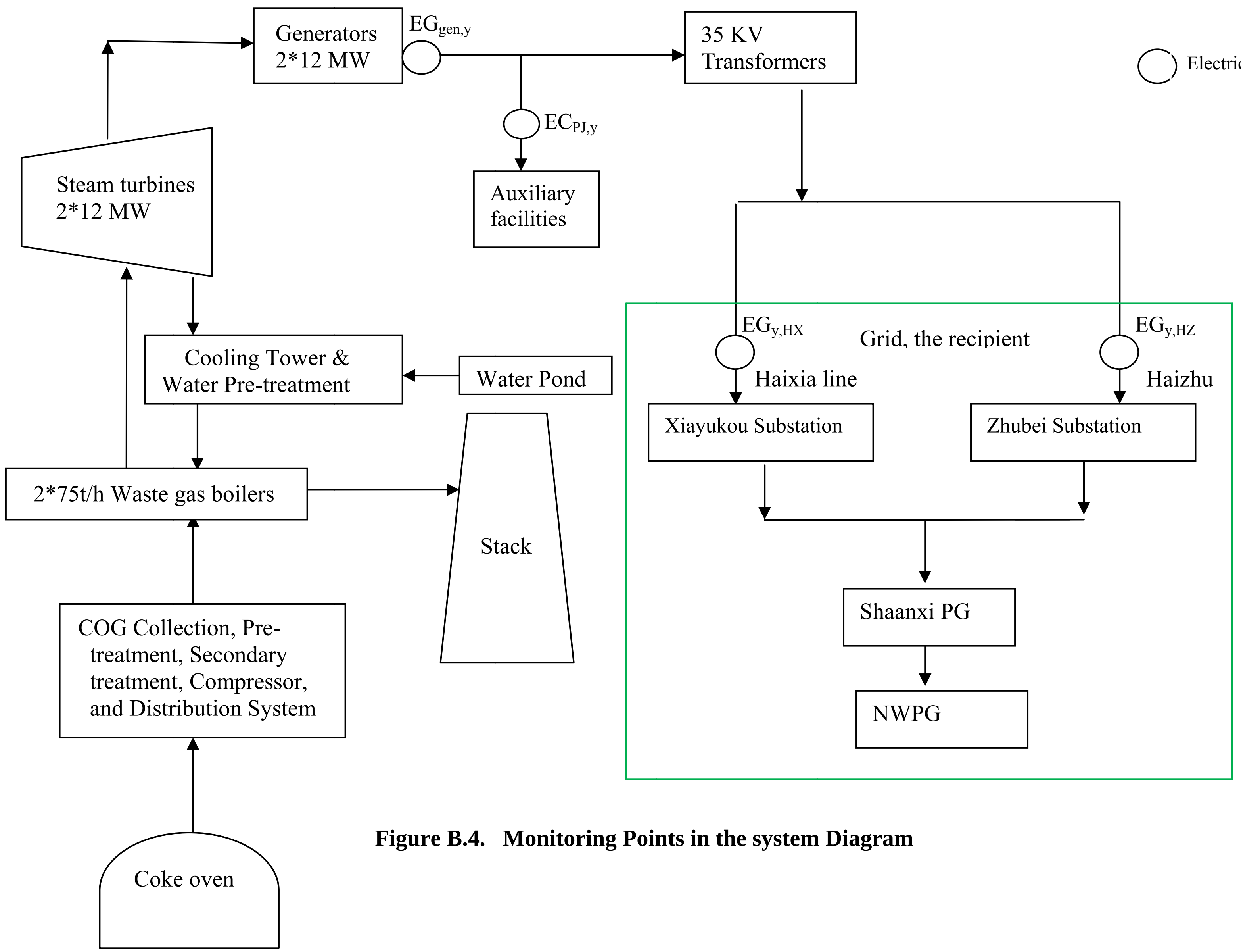

Figure B.4. Monitoring Points in the system Diagram

4. Training of the manager and engineers
The project owner will train the appointed monitoring managers and monitoring engineers to operate and maintain the electricity meters.
The monitoring plan will be incorporated into the existing monitoring system, implemented according to the special monitoring manual to ensure reliable, transparent, and comprehensive monitoring.

5. Treatment of Deviations
In the event that deviation(s) in the monitoring data are found, the Monitoring Engineers will study the operating parameters to identify the reason for the deviation(s) and take remedial measures.

6. Monitoring Reports
Monitoring reports will be prepared by the monitoring manager monthly and submitted to the CDM project director, who will aggregate and prepare the final reports for verification during the crediting period.

7. Monitoring Data Management
All monitoring data of the electricity meters will be continually recorded and automatically archived in electronic archives, and in parallel a paper (hard copy) record will be created for the archives. The relevant data will be kept during the crediting period and for two years after the end of the crediting period.

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

The baseline study and monitoring methodology was completed on 29 Nov. 2011 by:
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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:

06/05/2008 (Date of signing the construction contract)

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:

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/06/2011

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

During the Environmental Impact Assessment (EIA) period of the project, Longmen Town Government, Environment Protection Bureau of Hancheng City, and Longmen Village Committee convened the meeting with the local residents to ensure that the construction of the project won't cause inverse impact on the local environment, ecological environment, economy, society, etc. According to the application form of the meeting with the local residents, it is concluded that the local residents agreed the construction of the project.

Shaanxi Environmental Protection Bureau, on April 14, 2008, approved the Environmental Impact Assessment (EIA) Report of the proposed project which was prepared by Xi'an Branch of China Coal Research Institute in March, 2008. The project not only could enhance the local economic strength, but also could result in prominent environmental and social benefits.

The major conclusions of the environmental impact assessment are as follows:

1. Waste Gas

During the project construction period, no additional waste gas caused by construction work will be generated.

During the project operation period, no additional waste gas caused by the operation will be generated. According to the EIA Report, the concentration of dust, SO_2, and NO_2 of the waste gas from the coke oven are 34.5 mg/Nm^3, 33.72 mg/Nm^3 and 94.5 mg/Nm^3 respectively, which are under the threshold value described in GB13223-2003.

2. Waste water

During the project construction period, there will be a little construction waste water and residential sewage, which will be treated and managed efficiently and won't cause any inverse effects on the environment.

During the project operation period, the sewage from the project will include residential drainage and production drainage. The production waste water will be reused for Coke Quenching. The residential waste water will be used for sprinkling and watering grasses after treated by the existing sewage treatment equipment. Due to the reuse of the waste water mentioned above, no water pollution will be caused by the project.

3. Solid wastes

Solid waste consists of waste slag and domestic waste. The waste slag generated during the construction period will be piled up in a designated waste disposal site. When the construction activities are finished, the project entity will recover and green the temporary excavated land. The domestic waste will be piled up in some categorized forms and then transferred to the Waste Disposal Plant of Hancheng City.

During the operation period, the solid waste will be mainly domestic waste. The domestic waste will be collected using special waste-boxes, and finally transferred to the Waste Disposal Plant of Hancheng City.

4. Noise

During the project construction period, noise will be generated, but the construction site is located far from residential areas.

During the project operation period, the noise of the proposed project will be from boiler fans, boiler exhaust gas valves, electric motors, water pumps, etc. The noise level generally will be 95 ~ 110 dB. The noise will meet the criteria of the environmental requirements of the "Standards for noise for industrial plant" (GB12348-90), by the following countermeasures: To place the noise sources far away from the residential areas, to use the lower noise-polluted equipment, to install noise reduction devices with shock absorption, to strengthen worker protection measures, etc.

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:

In conclusion, the implementation of the proposed project will cause little impact on the environment and complies with the Chinese environmental rules and laws.

SECTION E. Stakeholders' comments

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

The stakeholders' comments will be collected by following means:

- **Questionnaire survey**

  The questionnaire survey activity was carried out by the owner with the assistance of Shaanxi Industrial Technology Research Institute in May, 2008. From 01-20/05/2008, the pre–announcement of the project implementation to the local residents had been done.

  From 21-30/05/2008, the answers to the questionnaire were collected from the local stakeholders.

- **Purpose of public questionnaire survey**

  To know the attitude of the public near the proposed project site towards the project, extensively to collect the opinions and suggestions of the stakeholders, and to receive more reasonable advices for the project implementation.

- **Questionnaire scope**

  The participants in this survey were the residents around the project site. During the period of the stakeholders' questionnaire survey, 45 questionnaires were delivered, and 42 answers were returned. The questionnaire survey scope included different ages, educational degrees, occupations and living areas. The ages between 18 and 45 were accounted as 88% of the total. More than 62% were graduates of high school. They were peasants, students and others. Therefore, the survey can reasonably represent the opinions of the local residents on this project.

- **Questionnaire Content**

  Questionnaire contents are shown as follows:

  1. Will the project improve the local quality of the environment (air, water, noise)?
  2. Will the project facilitate the local economic development?
  3. Will the project increase the employment opportunities?
  4. Is the construction of the project feasible?
  5. Any other suggestions or comments?

E.2. Summary of the comments received:

Questionnaire results are shown as follows:

- 98% of the participants thought that the project would improve the local quality of the environment (air, water, noise); 2% of the participants had no comments on this subject.
- 100% of the participants thought that the project would facilitate the local economic development.
- 98% of the participants thought that the project would increase the employment opportunities; 2% of the participants had no comments on this subject.
- 79% of the participants thought that the construction of the project would be feasible; 21% of the participants had no comments on this subject.

- No other suggestions or comments.

In conclusion, the local stakeholders will support the implementation of the proposed project.

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

As the proposed project is located within the present coke production factory, it is helpful to improve the local environment quality by using the waste COG to generate electricity. The project is basically a beneficial project for energy saving, economy development, and environmental protection. As long as the project owner implements the project according to the related laws and regulations, the local stakeholders of the proposed project will support the implementation of the project actively.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shaanxi Haiyan Coke Making (Group) Co., Ltd.
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Represented by:	
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Salutation:	Mr.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from parties in Annex 1 is involved in this project activity.

Annex 3

BASELINE INFORMATION

Table 3-1 Northwest China Power Grid(NWPG) 2002-2006 generation composition

Year	Thermal Electricity Generation (MWH)	Total Electricity Generation (MWH)	Thermal Electricity Share (%)	Others Electricity Share (%)
2002	93,428,000	121,052,000	77.18	22.82
2003	113,093,000	139,235,000	81.22	18.78
2004	131,939,000	169,253,000	77.95	22.05
2005	133,909,000	184,562,000	72.56	27.44
2006	156,142,241	203,899,330	76.58	23.42

Data Source: China electricity year book 2003-2007.

Table 3-2 OM and BM of Northwest China Power Grid

OM	tCO_2/MWH	1.1225
BM	tCO_2/MWH	0.6199

Data Source: China DNA, http://cdm.ccchina.gov.cn/

Table 3-3 NWPG simple OM calculation in 2004

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
								(tc/TJ)	**(%)**	**(MJ/t,km^3)**	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	2,428	1,595	322	1,270	1,240	**6,858**	25.8	100	20,908	135,652,074
Washed coal	10*kt						**0**	25.8	100	26,344	0
Other coal	10*kt				102	10	**113**	25.8	100	8,363	895,096
Coke	10*kt	0.78					**0.78**	29.2	100	28,435	23,747
Coke oven gas	100*Mm^3		0.3				**0.3**	12.1	100	16,726	22,262
Other oven gas	100*Mm^3	1.74	1.26				**3**	12.1	100	5,227	46,381
Crude oil	10*kt	0.01				0.06	**0.07**	20	100	41,816	2,147
Gasoline	10*kt	0.02					0.02	18.9	100	43,070	597
Diesel	10*kt	2.16	0.36		0.05	0.41	**2.98**	20.2	100	42,652	94,141
Fuel oil	10*kt	0.01	0.69			0.3	**1**	21.1	100	41,816	32,352
LPG	10*kt						**0**	17.2	100	50,179	0
Refinery gas	10*kt					3.26	**3.26**	15.7	100	46,055	86,430
Natural gas	100*Mm^3	1.61	0.59			6.27	**8.47**	15.3	100	38,931	1,849,873
Other oil	10*kt						**0**	20	100	38,369	0
Other coke	10*kt						**0**	25.8	100	28,435	0
others	10*ktce		6.17			3.46	**9.63**	0	100	0	0
										sub-total	138,705,098

Data source: China Energy Statistical Yearbook 2005.

Table 3-4 NWPG simple OM calculation in 2005

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
								(tc/TJ)	**(%)**	**(MJ/t,km³)**	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	2,461	1,597	345	1,467	1,358	7,229	25.8	100	20,908	142,985,522
Washed coal	10*kt	16.22					16	25.8	100	26,344	404,225
Other coal	10*kt	35.56			101.95	10.2	147	25.8	100	8,363	1,168,593
Coke	10*kt	3.23					3.23	29.2	100	28,435	98,335
Coke oven gas	100*Mm³						0	12.1	100	16,726	0
Other oven gas	100*Mm³						0	12.1	100	5,227	0
Crude oil	10*kt					0.18	0.18	20	100	41,816	5,520
Gasoline	10*kt	0.02				0.01	0.03	18.9	100	43,070	895
disel	10*kt	2.24	0.46	0.06		0.5	3.26	20.2	100	42,652	102,986
Fuel oil	10*kt	0.01	0.57			0.25	0.83	21.1	100	41,816	26,852
LPG	10*kt						0	17.2	100	50,179	0
Refinery gas	10*kt					7.71	7.71	15.7	100	46,055	204,410
Natural gas	100*Mm³	1.46	0.52	1.33		7.81	11.12	15.3	100	38,931	2,428,640
Other oil	10*kt						0	20	100	38,369	0
Other coke	10*kt						0	25.8	100	28,435	0
others	10*ktce	8.24	1.3				9.54	0	100	0	0
										sub-total	147,425,979

Data source: China Energy Statistical Yearbook 2006.

Table 3-5 NWPG simple OM calculation in 2006

Fuel type	Unit	**Shaanxi**	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	Sub-total	Emission factor	OXID	**NCV**	**emission(tCO_2e)**
								(tc/TJ)	**(%)**	**(MJ/t,km^3)**	**K=G*H*I*J*44/12/10000mass unit**
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	**K=G*H*I*J*44/12/1000 volume unit**
Raw coal	10*kt	2,834	1,660	421	1,833	1547	**8,298**	25.8	100	20,908	16,4138337
Washed coal	10*kt						**0**	25.8	100	26,344	0
Other coal	10*kt				112.7	8.45	**121**	25.8	100	8,363	958,466
Coke	10*kt				0.01		**0.01**	29.2	100	28,435	304
Coke oven gas	100*Mm^3	0.2					**0.28**	12.1	100	16,726	20,778
Other oven gas	100*Mm^3	0.1					**0.1**	12.1	100	5,227	2,319
Crude oil	10*kt					0.02	**0.02**	20	100	41,816	613
Gasoline	10*kt	0.01					0.01	18.9	100	43,070	298
Disel	10*kt	1.14	0.24	0.61		1.25	**3.24**	20.2	100	42,652	102,355
Fuel oil	10*kt		0.6			0.11	**0.71**	21.1	100	41,816	22,970
LPG	10*kt						**0**	17.2	100	50,179	0
Refinery gas	10*kt						**0**	15.7	100	46,055	0
Natural gas	100*Mm^3	1.59	0.56	1.06		7.49	**10.7**	15.3	100	38,931	2,336,911
Other oil	10*kt						**0**	20	100	38,369	0
Other coke	10*kt	1.86					**1.86**	25.8	100	28,435	50,033
others	10*ktce	33.57				2.2	**44.58**	0	100	0	0
										Sub-total	167,633,385

Data source: China Energy Statistical Yearbook 2007.

Table 3-6 NWPG thermal generation in 2004

NWPG thermal generation in 2004					
Province	**Generation**	**Self consumption rate**	**Delivery generation**		
	(MWH)	**(%)**	**(MWH)**		
Shaanxi	44,439,000	7.5	4,110,6075		
Gansu	33,242,000	6.21	3,1177,672	Total emission tCO_2	**13,870,5098**
Qinghai	6,208,000	7.96	5,713,843	Total delivery MWH	**122,605,243**
Ningxia	25,298,000	5.45	23,919,259	**Emission factor**	**1.13131**
Xinjiang	22,752,000	9.07	20,688,394		
Total			122,605,243		

Data source: China Electric Power Yearbook 2005.

Table 3-7 NWPG thermal generation in 2005

NWPG thermal generation in 2005					
Province	**Generation**	**Self consumption rate**	**Delivery generation**		
	(MWH)	**(%)**	**(MWH)**		
Shaanxi	41,100,000	7.16	38,157,240		
Gansu	33,106,000	4.23	31,705,616	Total emission tCO_2	**147,425,979**
Qinghai	5,500,000	2.69	5,352,050	Total delivery MWH	**125,496,682**
Ningxia	27,643,000	5.73	26,059,056	**Emission factor**	**1.17474**
Xinjiang	26,560,000	8.8	24,222,720		
total			125,496,682		

Data source: China Electric Power Yearbook 2006.

Table 3-8 NWPG thermal generation in 2006

NWPG thermal generation in 2006					
Province	**Generation**	**Self consumption rate**	**Delivery generation**		
	(MWH)	**(%)**	**(MWH)**		
Shaanxi	54,482,000	6.97	50,684,605		
Gansu	35,738,000	4.29	34,204,840	Total emission tCO_2	**167,633,385**
Qinghai	7,204,000	2.57	7,018,857	Total delivery MWH	**156,142,241**
Ningxia	36,731,000	0	36,731,000	**Emission factor**	**1.07359**
Xinjiang	29,901,000	8.02	27,502,940		
Total			156,142,241		

Data source: China Electric Power Yearbook 2007.

Finally, the average emission factor of the three years is: 1.1225 tCO_2/MWH.

BM calculation

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

Table 3-9 Calculation of the share of CO_2 emissions from solid, liquid, and gaseous fuels

Energy	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total fuel	Emission factor (tc/TJ)	Oxidation rate (%)	NCV (MJ/t,km3)	Emission (tCO_2e) K=G*H*I*J*44/12/10000(Mass unit)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	K=G*H*I*J *44/12/1000 (Vol unit)
Coal	10^4t	2,834	1,660	421	1,833	1,547	**8,298**	25.8	100	20,908	164,138,337
Cleaned coal	10^4t	0	0	0	0	0	**0**	25.8	100	26,344	0
Other washed coal	10^4t	0	0	0	112	8.45	**121**	25.8	100	8,363	958,466
Mould coal	10^4t	0	0	0	0	0	**0**	26.6	100	20,908	0
Coke	10^4t	0	0	0	0.01	0	**0.01**	29.2	100	28,435	304
Total											**165,097,108**
Crude oil	10^4t	0	0	0	0	0.02	**0.02**	20	100	41,816	613
Gasoline	10^4t	0.01	0	0	0	0	**0.01**	18.9	100	43,070	298
Diesel	10^4t	1.14	0.24	0.61	0	1.25	**3.24**	20.2	100	42,652	102,355
Fuel oil	10^4t	0	.06	0	0	0.11	**0.71**	21.1	100	41,816	22,970
Other Coke Product	10^4t	1.86	0	0	0	0	**1.86**	25.8	100	28,435	50,033
Total											**176,269**
Natural gas	10^8Nm^3	15.9	5.6	10.6	0	74.9	**107**	15.3	100	38,931	2,336,911
Coke gas	10^8Nm^3	2	0	0	0	0.8	**2.8**	12.1	100	16,726	20,778
Other gas	10^8Nm^3	1	0	0	0	0	**1**	12.1	100	5,227	2,319
Total											**2,360,008**
Grand total											**167,633,385**

Data source: China Energy Statistical Yearbook 2007

Based on above table and formula (4),(5) and (6), then

λ_{Coal} =98.49%, λ_{Oil} =0.11%, λ_{Gas} =1.41% .

Step (2): Calculation the emission factor of thermal power.

According to China DNA[20], the optimum commercial, coal-fired power supply generation efficiency 37.28%, oil and gas generation efficiency is 48.81% the relative emission factor as following table

Table 3-10 Emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies

type	vary	efficiency	Emission Factor (tc/TJ)	Oxidation Rate (%)	Emission Factor (tCO_2/MWH)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired	$EF_{coal,Adv}$	37.28	25.8	1	0.9135
Gas-fuel	$EF_{gas,Adv}$	48.81	15.3	1	0.4138
Oil-fuel	$EF_{oil,Adv}$	48.81	21.1	1	0.5706

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal, Adv} + \lambda_{Oil} \times EF_{Oil, Adv} + \lambda_{Gas} \times EF_{Gas, Adv} = 0.9062\ tCO_2/MWH$

Step (3): Calculation BM in the Grid.

Table 3-11 NWPG Installed Capacity in 2006

Installed Capacity	unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,723	6,448	1,517	6,002	5,937	29,627
Hydro	MW	2,165	4,291	5,423	429	1,766	14,074
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	46	199	0	11	189	445
Total	MW	11,934	10,938	6,940	6,442	7,892	44,146

Data source: China Electric Power Yearbook 2007.

Table 3-12 NWPG Installed Capacity in 2005

Installed Capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,132.1	5,715	8,86.8	4,577	5,051.7	25,362.6
Hydro	MW	1,578	4,036.2	4,825	428.5	1,352.1	12,219.8
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	46	109.1	0	112.2	132.2	399.5
Total		10,756.1	9,860.3	5,711.8	5,117.7	6,536	37,981.9

Data source: China Electric Power Yearbook 2006.

[20] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

Table 3-13 NWPG Installed Capacity in 2004

Installed Capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	7,640.4	4,975.6	889.8	3,782	4,959.7	22,247.5
Hydro	MW	1,876.5	3,566.1	4,053.4	3,66.2	973	10,835.2
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	0	138.2	0	42.5	95.3	276
Total	MW	9,516.9	8,679.9	4,943.2	4,190.7	6,028	33,358.7

Data source: China Electric Power Yearbook 2005.

Table 3-14 NWPG BM Calculation

	Installed capacity of 2004	Installed capacity of 2005	Installed capacity of 2006	Newly installed capacity from 2004 to2006	Share of the Newly installed capacity
	A	B	C	D=C-A	
Thermal(MW)	22,247.5	25,362.6	29,627	7,379.5	68.41%
Hydro(MW)	10,835.2	12,219.8	14,074	3,238.8	30.02%
Nuclear(MW)	0	0	0	0	0.00%
Wind farm(MW)	276	399	455	169	1.57%
Total (MW)	33,358.7	37,981.4	44,146	107,87.3	100.00%
Percent of the installed capacity of 2005	75.56%	86.04%	100.00%		

$EF_{BM,y}$=0.9062×68.41%=0.6199 tCO_2/MWH

IRR CALCULATION SPREADSHEET

Financial analysis		Shaanxi Haiyan Coke Making Group 24MW Waste Coke Oven Gas (COG) Based Electricity Generation Plant																
(10,000 RMB Yuan)																		
Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Calendar year		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
A. Revenue																		
A1. Electricity revenue																		
Electricity tariff (RMB Yuan/KWH)	**0.300**	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Delivered electricity (MWH/y)		0	81,900	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	163,800	81,900
Electricity revenue		0	2,457	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	4,914	2,457
A2. Others																		
Recovery of scrap value of fixed assets		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	492
Recovery of current capital																		765
Total revenue without CERs		**0**	**2,457**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**4,914**	**3,714**
B. CERs revenue																		
Projected emission reductions (tCO_{2e}/y)		0	83,243	142,703	142,703	142,703	142,703	142,703	142,703	142,703	142,703	142,703	59,459	0	0	0	0	0
Price of CERs (€/tCO_{2e})	**9.0**																	
Exchange rate (RMB/€)	**9.5**																	
Carbon Revenues (10,000 RMB Yuan)		0	712	1,220	1,220	1,220	1,220	1,220	1,220	1,220	1,220	1,220	508	0	0	0	0	0
C. Investment and cost																		
a) Investment																		
Static investment		9,840																
Current capital			765															
b) Operational costs		0	1,495	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989	1,495
c) Tax																		
VAT on electricity revenue	**17%**	0	357	714	714	714	714	714	714	714	714	714	714	714	714	714	714	357
The additional tax for city development and education	**10%**	0	36	71	71	71	71	71	71	71	71	71	71	71	71	71	71	36
Income tax	**25%**	0	65	129	129	129	129	129	129	129	129	129	129	129	129	129	129	188
Sub-total taxs		0	457	915	915	915	915	915	915	915	915	915	915	915	915	915	915	580
Depreciation	**6.33%**	0	312	623	623	623	623	623	623	623	623	623	623	623	623	623	623	312
Profit without CER revenue		-9,840	258	516	516	516	516	516	516	516	516	516	516	516	516	516	516	750
TOTAL CASHFLOW OUT		9,840	2,717	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	2,075
D. Cashflow without CER revenue																		
Without-carbon cashflow		-9,840	-260	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,639
Cumulative		-9,840	-10,100	-9,089	-8,079	-7,068	-6,058	-5,047	-4,037	-3,026	-2,016	-1,005	5	1,016	2,026	3,037	4,047	5,687
E. Cashflow with CER revenue																		
Income tax of CER Revenue		0	178	305	305	305	305	305	305	305	305	305	127	0	0	0	0	0
With carbon cashflow		-9,840	274	1,926	1,926	1,926	1,926	1,926	1,926	1,926	1,926	1,926	1,392	1,011	1,011	1,011	1,011	1,639
Cummulative		-9,840	-9,566	-7,640	-5,715	-3,789	-1,864	62	1,988	3,913	5,839	7,764	9,156	10,167	11,177	12,188	13,198	14,837

	With CERs	Without CERs
Net Present Value (10000 RMB Yuan) at discount 8%	3,762	-1,748
IRR	14.0%	5.2%
IRR Financial benchmark	8%	8%

Annex 4

MONITORING INFORMATION

Please refer to section B.7.2 of this PDD

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