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

## CONTENTS

## SECTION A. General description of project activity

### A.1. Title of the project activity:

Power Generation (20MW) by utilizing Coke Oven Gas of China Coal and Coke Jiuxin Limited in Lingshi, Shanxi, P. R. China

Version：05

Date：08/02/2008

The history of the previous PDD versions:
Version 01: 28/09/2006
Version 02: 10/11/2006, after the first review meeting held by the Chinese DNA on October 10, 2006.
Version 03: 04/01/2007, after the review by Chinese CDM Experts in December, 2007.
Version 04: 18/05/2007, after the second review meeting held by the Chinese DNA on February 9, 2007 and the Validation protocol by the DOE.

Main revisions from Version 01 to Version 02:
1. In B.5 step 1 of the PDD/Version 02, the alternatives to the project activity consistent with current laws and regulations instead of the baseline alternatives have been identified.
2. In B.5-Step 2-Sub-step 2c of the PDD/Version 02, the NPV has been deleted from the financial indicators of the project activity.
3. In B.6.1 of the PDD/Version 02, it has been stated that the project emission and the project leakage are zero in accordance with ACM0004/Version 02.

Main revisions from Version 02 to Version 03:
1. The estimation of annual emission reductions of the project activity has been modified from 76,619t$CO_2$e/y to 67,599t$CO_2$e/y in B.6.3 of the PDD/Version 03.
2. The self-consumption rate of the power plants connected to the North China Power Grid has been added in B.6.2 of the PDD/Version 03.
3. The $EG_{from\text{-}grid,\ y}$ has been added as the data and parameters monitored in B.7.1 of the PDD/Version 03.

Main revisions from Version 03 to 04:
1. see corrective action requests in the validation protocol

Main revisions from Version 04 to 05:
1. Following a request for review the EB decided to register the project if a corrected PDD is submitted selecting the appropriate baseline in accordance with the methodology i.e. for those alternatives, including the project activity, which cannot be eliminated due to prohibitive barriers, an economic comparison should be conducted to determine the appropriate baseline. The DOE shall then confirm that all input values used in the economic comparison are independently validated.
2. The original IRR analysis under option III was based on a Net Present Value (NPV) analysis. A NPV analysis is what is requested by the methodology i.e. an economic analysis that compares two possible scenarios based on their expected future cash flows. The PDD has thus been amended to present the NPV values comparing the two only realistic scenarios 1 and 2, rather than presenting the IRR values.
3. As the underlying economic comparison is the same to calculate both the IRR and the NPV, the DOE has already validated independently all its input values.

## A.2. Description of the project activity:

The purpose of the project activity-- utilizing Coke Oven Gas (COG) for power generation (20MW) -- is to utilize the excess COG of China Coal and Coke Jiuxin Limited (simplified as Jiuxin Coke Plant hereafter) for power generation. The electricity generated by this project will replace the equivalent quantity of electricity from the North China Power Grid which is coal dominated. The generated electric power will be used to fulfil the in-house requirement of Jiuxin Coke Plant. Without the project activity, the same quantity of electricity for the in-house requirement of Jiuxin Coke Plant will be purchased from the North China Power Grid.

The project is located in Lingshi county of Jinzhong city which is in the middle area of Shanxi province of the People's Republic of China. The total installed capacity of the project will be 20MW (40x500kW). On its implementation, the annual electricity supply of the project activity is estimated to be 68,796MWh and the ex-ante estimate of the total $CO_2$ emission reductions from the project activity will be 675,990 tones of $CO_2$ in a 10 year crediting period.
The investment to the project activity has been resolved which includes 30% of equity and 70% of Loan from the China Development Bank.
The project activity will contribute to the sustainable development in the following aspects:

- The electricity generated by this project will displace grid power generated by the coal –fired power plants. Therefore the project activity helps positively in reducing global warming by avoiding the generation of $CO_2$ which would have been generated if equivalent quantity of electricity would have been taken from the grid;
- It will also help in reducing the air pollution caused by $SO_2$, $NO_x$ and $TSP_s$ from the operation of the coal-fired power plants. Thermal pollution caused by direct COG flare will also be avoided by the implementation of the project.
- The project activity results in generation of employment opportunities during the construction and operation stages. 50 permanent staff will be employed for the operation and maintenance of the project.
- The project will promote the comprehensive resource utilization and thus will reduce the waste of the energy resources.

## A.3. Project participants:

The project participants are listed in Table A.3 -1:

**Table A.3-1 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) | China Coal and Coke Jiuxin Limited (project owner) | No |
| Sweden | Carbon Asset Management Sweden AB | No |

## A.4. Technical description of the project activity:

### A.4.1. Location of the project activity:

**A.4.1.1. Host Party (ies):**

People's Republic of China

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

Shanxi Province

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

Jinzhong city/Lingshi County

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

The project site is located inside the Jiuxin Coke Plant, which is 12 kM southwest of the downtown area of Lingshi County. The geographical coordinates of Jiuxin Coke Plant are east longitude 111°38'49'' and north latitude 36°48'52''. The project location is 7km northwest to Duanchun village, 4km southwest to Houtan village and 4.5km southeast to the Dayun highway. (As per Figure A.4-1)

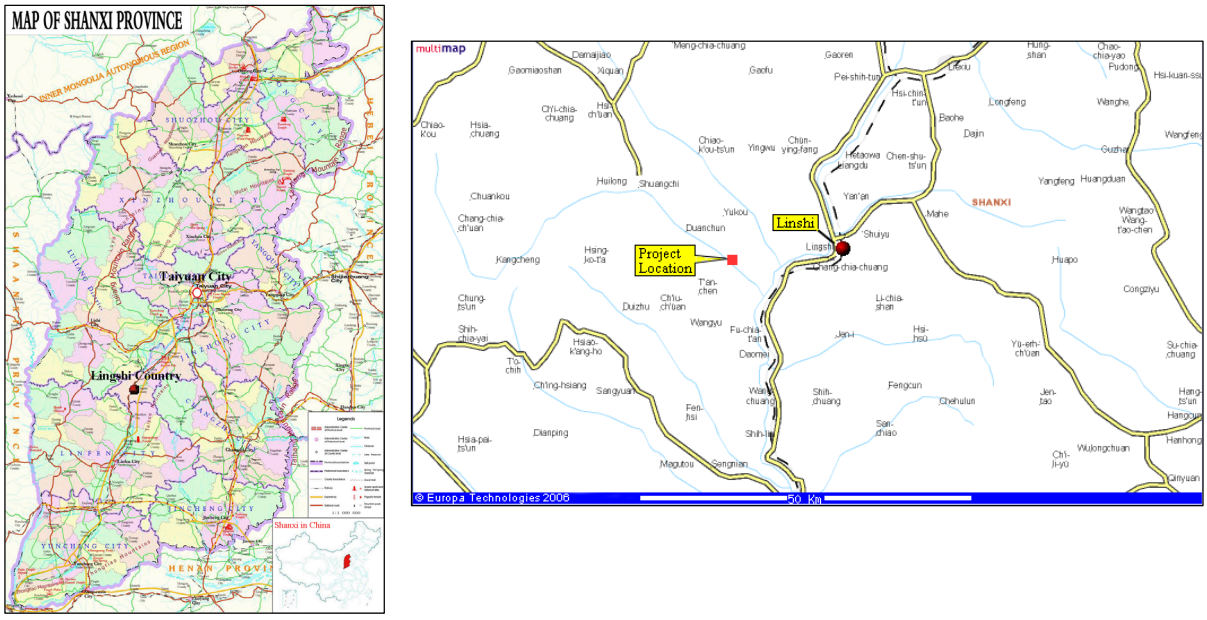


**Fig. A.4-1 Location of the project**

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

Category 1: Energy Industries (renewable/non-renewable sources)

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

The project activity consists of 40 (35 in use and 5 stand-by) sets of Internal Combustion Engine & Generator systems (Model: 500GF-3RJ, Rated power: 500kW) manufactured by Shengli Power Machinery Works of Shengli Petrolum. The generation system includes: the internal combustion engine, the generator, the air filter, the silencer, the auxiliary system, the pressure regulation device and the control panels.

The reciprocating and four-stroke internal combustion engine mainly consists of the engine, shaft, plug, ignition system and the cooling system. The natural gas, coal mine gas and COG can be burned in the engine by plug ignition.

The technical specifications of the key units are as follows:
Internal combustion engine:
Type : 4 stroke, plug ignition
Model: T12V190ZLD

Electric generator:
Type : automatic, brushless
Model : 1FC6 406-4
Rated power : 500kw
Rated speed : 1500r/min
Frequency : 50Hz
Power factor : 0.8(lagging)
Voltage : 400v

The generation system is originally designed for the utilization of natural gas and has been applied successfully in several CMM/CBM projects. Technical barriers exist for the utilization of COG which is characterized as high content of impurities, low calorie value and variable qualities. In order to grantee the safe and successful operation of the project activity, the project owner asks the equipment supplier to be responsible for the operation and maintenance at the beginning stage by signing a renewable agreement (the equipment manufacturer will be paid thereof). The initial operation training to the project owner has been provided by the equipment manufacturer-Shengli Power Machinery Works of Shengli Petroleum in November 2005 along with the commissioning of the project. And it is planned that the training activity will be conducted in the following years until the project owner can carry out the operation and maintenance work independently.

The time schedule of the project activity is shown below:

**Table A.4-1 Time schedule of the project activity**

| | |
|---|---|
| Project idea | September, 2003 |
| Resolution regarding CDM issue of China Coal and Coke Limited | March 18, 2004 |
| Feasibility study | August, 2004 |
| Preliminary design | September, 2004 |
| Construction start-up | February 25, 2005 |
| Construction completion & Equipment installation | July 12, 2005 |
| Commissioning | November , 2005 |
| Full operation | January 7, 2006 |

The project activity does not involve any transfer of technology.

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

The estimation of $CO_2$ emission reductions of the project activity during the crediting period are shown in Table A.4-2.

**Table A.4-2 The estimation of $CO_2$ emission reductions of the project activity**

| Years | Annual estimation of emission reductions in tonnes of $CO_2e$ |
|---|---|
| December 2007 | 5,633 |
| 2008 | 67,599 |
| 2009 | 67,599 |
| 2010 | 67,599 |
| 2011 | 67,599 |
| 2012 | 67,599 |
| 2013 | 67,599 |
| 2014 | 67,599 |
| 2015 | 67,599 |
| 2016 | 67,599 |
| January – November 2017 | 61,966 |
| **Total estimated reductions**(tonnes of $CO_2e$) | 675,990 |
| **Total number of crediting years** | 10 |
| **Annual average over the crediting period of estimated reductions** (tonnes of $CO_2e$) | 67,599 |

**A.4.5. Public funding of the project activity:**

No public funding from parties included in Annex-I is involved in the 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:**

1. Consolidated baseline and monitoring methodology for waste gas and/or heat and/or pressure for power generation, ACM0004/Version02;
2. Consolidated baseline methodology for grid-connected electricity generation from renewable sources, ACM0002/Version06;
3. Tool for the demonstration and assessment of additionality /Version03.

For more information please refer to:
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 project activity will combust the waste gas (COG) that is produced in the coal coking process of Jiuxin Coke Plant. It fulfils all of the application requirements of the approved consolidated methodology ACM0004/Version 02:

- The generated electricity will fulfill the in-house power demand of Jiuxin Coke Plant which would

otherwise have been purchased from the North China Power Grid in absence of the project activity. The project activity would thus displace the electricity generation with fossil fuels in the power grid;
- The project activity will not lead to fuel switch in the coal coking process.

Thus it is appropriate to use ACM0004/Version 02 for this project.

No capacity expansion of the existing facility is planned during the crediting period.

The electricity generated by the project activity will displace the electricity from the North China Power Grid, in accordance with the methodology ACM0004/Version 02, the emission factor should be calculated according to the approved baseline methodology ACM0002/Version 06.

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

In accordance with the requirements of ACM0004, the project boundary covers the coking process (the COG source), the COG inlet pipe, the internal combustion engines, the generators, and the auxiliary and control equipments in the generation station and all the devices and equipments in the Central Transformer Substation. It also includes all the power generation plants which are physically connected to the North China Power Grid. The region which is covered by the North China Power Grid includes Beijing, Tianjin, Hebei province, Shandong province, Shanxi province and the Inner-Mongolia autonomous region.

For the purpose of calculating project emissions and baseline emissions, the emission sources and gases which are included in the project boundary are listed in Table B.3-1.

**TableB.3-1 Project emissions and baseline emissions**

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|
| **Baseline** | Equivalent electricity generation from the grid with flaring of COG | $CO_2$ | Included | Main emission source |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative. |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative. |
| **Project Activity** | On-site fossil fuel consumption due to the project activity | $CO_2$ | Excluded | No other fossil fuels except the COG will be consumed during the start-up and operation of the project activity. Therefore no such related emissions. |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |
| | Combustion of COG for electricity generation | $CO_2$ | Excluded | It is assumed that COG would also have been burned in the baseline scenario. |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |

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

The possible alternative baseline scenarios which could supply the same quantity of electricity generated by the project activity are identified as follows:

Alternative 1: The project activity not undertaken as a CDM project activity;
Alternative 2: Equivalent electricity import from the grid with flaring of COG;
Alternative 3: New coal/diesel/natural gas/hydro/wind based captive power generation with flaring of COG;

Alternative 4: A mix of alternatives 2 and 3;
Alternative 5: Other uses of the waste COG.

**Alternative 1: The project activity not undertaken as a CDM project activity**
There were no related laws and regulations which oblige the utilization of COG when the proposal of this project was approved by the local government. This alternative is in compliance with all applicable legal and regulatory requirements. However, this alternative is not attractive from the financial point of view (as detailed in Section B5 below) that making it prohibitive. Hence this option is not a part of the baseline scenarios.

**Alternative 2: Equivalent electricity import from the grid with flaring of COG**
The in-house power requirements of Jiuxin Coke Plant could be fulfilled by purchasing grid electricity from the North China Power Grid. No additional investment will be needed for this alternative and it is therefore economically feasible. Most of the coke plants in China purchase grid electricity to fulfil their power requirements.

It is stipulated in the "Emission Standard of Air Pollutants for Coke Oven （GB16171-1996）" that the excess COG must be flared to the atmosphere and no direct discharge is allowed. The COG produced from Jiuxin Coke Plant would also have been flared into the atmosphere in the absence of the project activity.

This alternative is in compliance with all applicable legal and regulatory requirements and can be a baseline scenario.

**Alternative 3: New coal/diesel/natural gas/hydro/wind based captive power generation with flaring of COG**
Alternatives such as natural gas/hydro/wind based captive power generation are not realistic due to the non-availability of the related resources. According to the Chinese laws, it is strictly forbidden to build coal – fired captive power plants with the capacity of 135MW and below in the area under the coverage of the power grid[1]. And the fuel-fired captive power plants with the capacity below 100MW will be strictly controlled[2] . A coal/diesel based captive power generation station which supply the same quantity of electricity with the project activity will have a similar installed capacity (20MW). Hence it is not in compliance with the national legal and regulatory requirements. This alternative can be excluded from the baseline scenarios.

**Alternative 4: A mix of alternatives 2 and 3**
This alternative can be excluded from the baseline scenarios because alternative 3 is not a baseline scenario.

**Alternative 5: Other uses of the waste COG**
The other potential uses of waste COG include direct distribution of COG to local industrial and residential consumers.

This alternative complies with all legal and regulatory requirements. But there are no suitable industrial consumers in the project area. The residential areas are far away from the project site and further be

[1]"Decision on strictly forbidding the illegal construction of fuel-fired power plant with the capacity 135MW and below", General Office of the State Council, http://www.gov.cn/gongbao/content/2002/content_61480.htm

[2] "The provisional regulation on the construction of small fuel-fired power plants", August 1997.

separated by mountains. Hence the investment on gas pipeline for COG supply to residential area is too much to afford. In line with the methodology, this alternative depends on demand that is not available at or nearby the project site and can thus be excluded from the baseline scenarios.

As requested by the methodology:
- evidence and supporting documents to exclude the last three baseline options has been provided to the DOE and validated.
- It can be concluded that Alternative 1 and 2 are the only two possible baseline scenarios that cannot be eliminated due to prohibitive barriers. Step 2 of the additionality tool will determine the most economically attractive alternative as the baseline scenario.

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

In accordance with ACM0004, the additionality of this project is to be demonstrated and assessed by the latest version of "**Tool for the demonstration and assessment of additionality /Version 03**" created by CDM Executive Board and available on the UNFCCC website.

**Step 1. Identification of alternatives to the project activity consistent with current laws and regulations**
**Sub-step 1a. Define alternatives to the project activity;**
The alternatives to the project activity are as follows:
1. The project activity not undertaken as a CDM project activity;
2. Equivalent electricity import from the grid with flaring of COG;
3. New coal/diesel/natural gas/hydro/wind based captive power generation with flaring of COG;
4. A mix of alternatives 2 and 3;
5. Other uses of the waste COG.

**Sub-step 1b. Enforcement of applicable laws and regulations**
Alternatives 3 and 4 do not comply with legal and regulatory requirements. All the other three alternatives are in line with applicable laws and regulations and they are already discussed in Section B.4. Alternative 1 and 2 are the only two possible baseline scenarios that cannot be eliminated due to prohibitive barriers. These two scenarios thus have to be compared with an economic comparison in order to determine the appropriate baseline scenario.

**Step 2. Investment analysis**
The additionality of the project is going to be established by conducting the **step 2: Investment analysis.** It is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without the revenues from the sale of certified emission reductions (CERs). To conduct the investment analysis, the following sub-steps will be followed:

**Sub-step 2a. Determination of the appropriate analysis method**
The "Tools for the demonstration and assessment of additionality/Version 03" recommends three analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The proposed project activity generates both CDM related income and electricity related income, then option I-the simple cost analysis can not be used. Thus, the investment comparison analysis method

(Option II) is used.

**Sub-step 2b. Investment comparison analysis (Option II)**
A Net Present Value (NPV) analysis is an economic comparison tool widely used in the private sector for investment appraisal, comparing two possible scenarios with each other by taking into account relevant future cash flows. The NPV analysis's discount rate is chosen to be the equity Internal Rate of Return (IRR) in accordance with the "Tool for the demonstration and assessment of additionality /version 03". The value of equity IRR for the fuel-fired power plants (equity, after income tax) is chosen to be 13% in accordance with "Economic Evaluation Method and Parameters for Construction Projects/Version 03"[3]

**Sub-step 2c. Calculation and comparison of financial indicators**
(i). Basic parameters for the calculation of financial indicators

A project life time of 18 years was considered. According to the feasibility study of the project and "Economic Evaluation Method and Parameters for Construction Project/Version 03", major parameters needed for the calculation of equity NPV are listed in Table B.5-1. As the power supplied by the project activity to Jiuxin Coke Plant will displace the grid power from the North China Power Grid, the grid power purchasing cost will be saved and it can be regarded as an income created by the project activity. The electricity tariff is 0.3564 Yuan/KWh.

**Table B.5-1 Major Parameters for the calculation of IRR/NPV**

| | |
|---|---|
| Installed Capacity | 20MW |
| Electric power supply | 68,796MWh/y |
| Equity | RMB 27.336 million Yuan |
| Annual operation and maintenance cost | RMB 11.326 million Yuan |
| Electricity tariff | RMB 0.3564Yuan/kWh |
| Expected CERs price | US$ 9.5/t$CO_2$e |
| The exchange rate | 7.7(Yuan/US$) |
| Operation guarantee fee[4] | 0.12(Yuan/kWh) |
| Benchmark value of IRR | 13% (Equity, after income tax) |
| NPV Alternative 1 | -181 408,5 million Yuan |
| NPV Alternative 2 | -167 706,9 million Yuan |

(ii). Calculation and comparison of the equity IRR

**Sub-step 2d. Sensitivity analysis**
The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For such purpose, four parameters were selected as sensitive factors to check out their effects on the NPV.

1. Static total investment
2. Annual operation & maintenance cost
3. Annual power supply
4. Electricity tariff

[3] "Economic Evaluation Method and Parameters for Construction Projects/Version 03", China Plan Press, 2006.

[4] Referring to the labour fee paid by the project owner to the manufacturer of generator sets applied in this proposed project. According to the agreement between the project owner and the manufactuer of generator sets, the manufactuer will be responsible for the operation and maintenance, and the project owner will pay for it in term of RMB 0.12 yuan per KWh

Without CDM revenues, the NPV fluctuates with the variations of the above four factors. The results are shown in Table B.5-3 below.

**Table B.5-3 Sensitivity analysis of the project activity**

| | -10,0% | -7,5% | -5,0% | -2,5% | 0,0% | 2,5% | 5,0% | 7,5% | 10,0% |
|---|---|---|---|---|---|---|---|---|---|
| Annual power supply | -30 472 | -26 280 | -22 087 | -17 894 | -13 702 | -9 509 | -5 316 | -1 124 | 3 069 |
| Electricity tariff | -30 472 | -26 280 | -22 087 | -17 894 | -13 702 | -9 509 | -5 316 | -1 124 | 3 069 |
| Annual operation and maintenance co | -5 955 | -7 891 | -9 828 | -11 765 | -13 702 | -15 638 | -17 575 | -19 512 | -21 449 |
| Static total investment | -6 114 | -8 011 | -9 908 | -11 805 | -13 702 | -15 599 | -17 496 | -19 393 | -21 290 |

As shown in Table B.5-3, the NPV varies to different extent when the above four factors fluctuate within the range from -10% to 10%. Impacts of static total investment and annual operation and maintenance cost are less significant. Whether these two factors fluctuate, the NPV is always negative. The impacts of annual power supply and electricity tariff on the NPV are more significant compared with the other two factors. When these two factors vary from -10% to 8.17%, the NPV keeps lower than the benchmark value. But when they increase by more than 8.17%, the NPV begins to be positive. However, the scale of the coke production is relatively fixed therefore the waste gas utilized by the project is fixed too, so that the annual power supply is fixed. The electricity tariff is also fixed and will not be raised by 8.17% in recent years. The above analysis shows that it will not be possible to get a positive NPV without the CDM revenues. It is always true that the project activity is not financially attractive without the CDM revenues.

It is concluded after the sensitivity analysis that the project activity is unlikely to be financially attractive. Then goes to step 4 (Common practice analysis) according to the "Tool for the demonstration and assessment of additionality/Version 03".

**Step 4. Common practice analysis**

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

There was no case of power generation with COG in Shanxi province before 2002 based on the data provided in "China Energy Statistics Yearbook". The COG used for power generation only accounted for 3.34%[5] of the total recovered COG of Shanxi province in 2002. And no similar projects with the project activity had been found until 2002.

Between the year 2003-2006, nine power generation projects with COG by using the Internal Combustion Engine have been constructed in Shanxi province. But there are only two projects (including the project activity) are with installed capacity above 10MW. The project activity is the only one with the installed capacity above 15MW. In other words, this project activity is the first of its kind in Shanxi province between 2003 and 2006. As the first of its kind project with the largest scale, it is in lack of management experiences, skilled workers and related experts for the successful operation of the project activity. As stated in Step 2 : Investment analysis, this project activity is not finacially attractive without the CDM revenues. It could be concluded that the project activity is not a common practice in Shanxi Province. No new projects of the kind have been set up in 2006 because of the shrinking coke market in these two years.

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

The analysis of sub-step 4a demonstrates that the project activity is the biggest one of its type in Shanxi province between 2003 and 2006. In other words, no similar projects that are occurring have been observed. Therefore goes to step 5.

[5] "China Energy Statistic Yearbook", 2000-2002.

**Step 5. Impact of registering the project with CDM**
The successful registration as a CDM project would bring obvious economic benefit to the project owner. It also would improve the equity IRR from 10.10% to 16.04%, help the project to overcome the investment barrier and facilitate the investment decision. The successful registration as a CDM project would also make the project to be an environmental friendly project, improve its attractiveness to the investor and equipment supplier and make the construction, operation and maintenance of the project activity possible. Therefore the emission reductions of the project activity could be realized.

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

## B.6. Emission reductions:

### B.6.1 Explanation of methodological choices:

As per the methodology ACM0004, the project emissions, baseline emissions, leakage emissions and emission reductions are calculated as follows:

**1: Determination of project emissions and leakage emissions:**
In accordance with ACM0004, project emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the waste heat recovery boiler. This is not the situation of the project activity. Hence the project emission is zero.

And no leakage is considered according to ACM0004.

**2：Determination of baseline emissions:**
Baseline emissions are given as:
$BE_{electricity,y} = EG_y \times EF_y$ (B.2)
Where:
$EG_y$ is the net quantity of electric power supplied by the project activity during the year y in MWh;
$EF_y$ is $CO_2$ baseline emission factor for the grid electricity displaced due to the project activity during the year y （$tCO_2$/MWh）.

The electricity generated in this project will displace the equivalent grid electricity from the North China Power Grid. According to ACM0004, if the baseline scenario is determined to be grid power supply, the $CO_2$ emission factor for the displaced electricity can be calculated as in ACM0002/Version 06.

The office of National Coordination Committee on Climate Change under the DNA of China – the National Development and Reform Commission, has determined the baseline emission factors of Chinese regional grids in "Bulletin of Baseline Emission Factors of the Regional Power Grids of China" [6] published on December 15, 2006. It has been adopted in this PDD. Please refer to Annex 3 for the details in determining the emission factor of the North China Power Grid.

**Emission Factor of the North China Power Grid**

[6] Bulletin of Determining the Emission Factors of Chinese Power Grid, China National Development and Reform Committee, http://cdm.ccchina.gov.cn/web/index.asp.

According to the methodology ACM0002/Version 06, the baseline emission factor of the North China Power Grid (*EFy*) is calculated as a combined margin(CM), consisting of the combination of operating margin ( OM ) and build margin(BM) factors according to the following steps. The calculations are based on "China Energy Statistical Yearbook 2000-2002, 2004 and 2005", "China Electric Power Yearbook 2002, 2003, 2004 and 2005" and "Revised 1996 IPCC Guidelines for national Greenhouse Gas Inventories".

**Step 1: The calculation of the Operating Margin emission factor ($EF_{OM}$)**
In accordance with ACM0002, the Operating Margin (OM) can be calculated based on one of the four methods:
(a) Simple OM
(b) Simple adjusted OM
(c) Dispatch data analysis OM
(d) Average OM
As per the methodology, the Dispatch Data Analysis (c) should be the first methodological choice. However, "c" is not selected because the dispatch data of the power plants connected to the North China Power Grid are not publicly available. The Simple adjusted OM "b" is not selected because the Load Duration Curve at power plant level is not publicly available too. The simple OM method "a" can be used when low-cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years. The North China Power Grid to which the project is connected is dominated by fuel-fired power generation, the low-cost/must run power resources such as hydro, geothermal, wind, solar, nuclear, and low cost biomass only account for 0.76% in 2004, 0.86% in 2003, 0.89% in 2002, 0.85% in 2001 and 1.13% in 2000, respectively (As per Table A3-1to Table A3-5), of the total grid generation. Therefore it is reasonable to use "a" -the simple OM method to calculate the OM emission factor of the North China Power Grid. The Average OM (d) is not selected because it can only be used where low cost/must run resources constitute more than 50% of the total grid generation.

The Simple OM emission factor of the North China Power Grid is calculated (ex-ante) as a 3-year generation-weighted average based on the most recent statistics available at the time of PDD submission.

The Simple OM emission factor ($EF_{OM,\ simple,\ y}$) of the North China Power Grid is calculated as the generation-weighted average emissions per electricity unit (in $tCO_2/MWh$) of all generating sources serving the grid, excluding low-operating cost and must-run power plants in year y:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (B.3)$$

Where:
$F_{i,j,y}$ is the amount of fuel i consumed (in a mass or volume unit) by relevant power sources j in year y;
$COEF_{i,j}$ is the $CO_2$ emission coefficient of fuel i ($tCO_2$/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of fuel in year y;
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j;
*j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports from other grid.

The electricity delivered to the grid by source *j* $GEN_{j,y}$ is obtained as:

$$GEN_{j,y} = G_{j,y} \times (1\text{-}Self\ consumption\ rate_j) \qquad (B.4)$$

Where:
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j;
$G_{j,y}$ is the electricity (MWh) generated by the power sources j;
*Self-consumption rate*$_j$ is the electricity consumption rate of the power source j.

The $CO_2$ emission coefficient of fuel *i, COEF*$_i$ is obtained as:

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i \quad \text{(B.5)}$$

Where:
$NCV_i$ is the net calorific value per mass or volume unit of the fuel i, country-specific values;
$OXID_i$ is the oxidation factor of the fuel i, IPCC default values;
$EF_{CO2,i}$ is the $CO_2$ emission factor per unit of energy of the fuel i, IPCC default values.

The baseline OM emission factor ($EF_{OM}$) is calculated as a 3-year generation-weighted average based on the most recent statistics available on 2002, 2003 and 2004.

$$EF_{OM} = \sum_y \frac{EF_{OM,simple,y} \times GEN_y}{GEN_{TOTAL}} \quad \text{(B.6)}$$

Where：

*y* is the years 2002, 2003, and 2004;
$GEN_y$ is the electricity supplied to the North China Power Grid in year y;
$GEN_{Total}$ is the total electricity supplied to the North China Power Grid in three years.

Based on Table A3-6 to Table A3-14 of Annex 3, the calculated Simple OM Emission Factor of the North China Power Grid is:
$EF_{OM}$ = 1.0584962t$CO_2$e/MWh

**Step 2. The calculation of the Build Margin Emission Factor ($EF_{BM}$)**
In accordance with ACM0002, the Build Margin emission factor $EF_{BM,y}$ is given as the weighted average emission factor of a sample of power plants m, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m}}{\sum_m GEN_{m,y}} \quad \text{(B.7)}$$

Where：

$F_{i,m,y}$ is the amount of fuel i(tce)consumed by plant m in year y;
$COEF_{i,m,y}$ is the $CO_2$ emission coefficient (t$CO_2$/tce)of fuel i, taking into account the carbon content of the fuels used by plant m and the percent oxidation of the fuel in year y;

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant m ;

*m* is the sample group of power generation plants consists of either:

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

According to ACM0004, the Build Margin emission factor $EF_{BM}$ is calculated *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. Given the size of the North China Power Grid and the rate of plant additions to the grid (significantly more than 5 plants per year), the most recent 20% of capacity addition to the generation system is chosen as this would represent a sample group that comprises the larger annual generation.

Because data at plant's level of the North China Power Grid are not available, the EB's guidance on deviations is adopted in this calculation. The detailed steps and the related formulas are as follows:

**Sub-step 1. Calculating the proportion of $CO_2$ emissions from solid, liquid and gaseous fuels for power generation in the total $CO_2$ emissions**

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (B.8)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (B.9)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (B.10)$$

Where:
$F_{i,j,y}$ is the amount of fuel i consumed (in a mass or volume unit) by relevant provincial sub-grids j in year y;
$COEF_{i,j}$ is the $CO_2$ emission coefficient of fuel i ($tCO_2$/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provincial sub-grids j and the percent oxidation of fuel in year y;
*COAL*, *OIL*, and *GAS* refers to all forms of coal, oil and gas.

**Sub-step 2. Calculating the Emission Factor of fuel-fired power technology**

$$EF_{Fuel-fired} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (B.11)$$

Where:
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the related Emission factor of the commercially available most advanced coal, oil and gas fired power technology, please refer to Annex 3 for more details.

**Sub-step 3. Calculating the $EF_{BM}$ of the North China Power Grid**

$$EF_{BM} = \frac{CAP_{Fuel-fired}}{CAP_{Total}} \times EF_{Fuel-fired} \quad (B.12)$$

Where:
$CAP_{Total}$ is the newly increment of total installed capacity;
$CAP_{Fuel\text{-}fired}$ is the newly increment of fuel-fired installed capacity.

Based on the above statements and data, the calculated Build Margin emission factor of the North China Power Grid is:
$EF_{BM}$=0.9066 $tCO_2e/MWh$
The key information and data can be found in Table A3-15 to Table A3-20 of Annex 3.

**Step 3. The calculation of the baseline emission factor $EF_y$**
Finally, the baseline emission factor ($EF_y$) is calculated as the arithmetic average of operating margin (OM) and build margin (BM), therefore:
$EF_y = 0.5 \times EF_{OM} + 0.5 \times EF_{BM} = 0.9826\ tCO_2e/MWh$ (B.13)

**3: Estimation of emission reductions:**
In accordance with the methodology ACM0004 the emission reductions by the project activity are calculated as the difference between the baseline emissions and the project emissions. Since there are no project emissions and leakage emissions in the project activity so the emission reductions are equivalent to the baseline emissions.
The ex-ante estimate of emission reductions is 67,599$tCO_2e/y$ (as per B.6.3 for details).

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

| | |
|---|---|
| Data / Parameter: | $OXID_i$ |
| Data unit: | % |
| Description: | The oxidation factor of fuel i |
| Source of data used: | Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Table 1-2 on page1.6 and table 1-4 on page 1.8, chapter 1. |
| Value applied: | As per table A3-6, A3-9 and A3-12 of Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default values are adopted in accordance with ACM0002/Version06. |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $NCV_i$ |
| Data unit: | GJ/t ,$km^3$ |
| Description: | The net calorific value per mass or volume unit of a fuel i |
| Source of data used: | China Energy Statistics Yearbook 2005, page 365 |
| Value applied: | As per table A3-6, A3-9 and A3-12 of Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Local values should be used in accordance with ACM0002/Version06. |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $EF_{CO2,i}$ |
| Data unit: | tC/TJ |
| Description: | The $CO_2$ emission factor per unit of energy of the fuel i |
| Source of data used: | Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Table 1-2 on page1.6 and table 1-4 on page 1.8, chapter 1. |

| | |
|---|---|
| Value applied: | As per table A3-6, A3-9 and A3-12 of Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | If no local values of $EF_{CO2,i}$ are available, the IPCC default values should be used in accordance with ACM0002/Version06. |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $COEF_{i,y}$ |
| Data unit: | $tCO_2$/mass or volume unit of the fuel |
| Description: | The $CO_2$ emission coefficient of fuel i, taking into account the carbon content of the fuels and the percent oxidation of the fuel in year y |
| Source of data used: | Calculated from $NCV_i$, $EF_{CO2,i}$ and $OXID_i$ |
| Value applied: | As per table A3-6, A3-9 and A3-12 of Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data source of the parameters used for the calculation of $COEF_{i,y}$ are all in accordance with ACM0002/Version 06 |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $F_{i,j,y}$ |
| Data unit: | $10^4$t , $10^8m^3$ |
| Description: | The amount of fuel i (in a mass or volume unit) consumed by relevant provincial sub-grid j in year y |
| Source of data used: | China Energy Statistical Yearbook 2000-2002, 2004,2005 |
| Value applied: | As per Table A3-6, A3-9 and A3-12 in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Authoritative national publications |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $GEN_{j,y}$ |
| Data unit: | MWh |
| Description: | Electricity delivered to the North China Power Grid by provincial sub-grid j in year y |
| Source of data used: | China Electric Power Yearbook 2002, 2003,2004,2005 |
| Value applied: | As per Table A3-7, Table A3-10 and Table A3-13 in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Authoritative national publications |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $Eff_{\text{fuel coal, oil, gas - fired plants, Adv}}$ |
| Data unit: | % |
| Description: | Average power supply efficiency of the commercially available most |

| | |
|---|---|
| | advanced fuel-fired power plants in China |
| Source of data used: | Bulletin on Baseline Emission Factors of the Regional Power Grids of China http://cdm.ccchina.gov.cn/web/index.asp |
| Value applied: | As per Table A3-16 in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Authoritative government bulletin |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | Installed capacity |
| Data unit: | MW |
| Description: | Installed capacity of provincial sub-grids |
| Source of data used: | China Electric Power Yearbook 2002,2003,2005 |
| Value applied: | As per Table A3-17 , A3-18 and A3-19 in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Authoritative national publications |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $H_r$ |
| Data unit: | % |
| Description: | Self-consumption rate of the provincial sub-grids the North China Power Grid |
| Source of data used: | China Electric Power Yearbook 2003,2004,2005 |
| Value applied: | As per Table A3-7, A3-10, A3-13 in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Authoritative national publications |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $EF_y$ |
| Data unit: | $tCO_2/MWh$ |
| Description: | $CO_2$ baseline emission factor of the grid (the North China Power Grid) electricity displaced due to the project activity during the year y |
| Source of data used: | Calculated as the arithmetic average of operating margin (OM) and build margin (BM) |
| Value applied: | 0.9826 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Calculated by Chinese DNA according to ACM0002/Version 06 and EB guidance, using publicly available statistic data |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $EF_{OM}$ |
| Data unit: | $tCO_2/MWh$ |
| Description: | $CO_2$ operating margin emission factor of the grid |
| Source of data used: | Calculated ex-ante as the generation-weighted average emissions per electricity unit of all generating sources serving the system, not including low-operating cost and must-run power plants, as per the |

| | |
|---|---|
| | "Bulletin on Baseline Emission Factors of the Regional Power Grids of China, http://cdm.ccchina.gov.cn/web/index.asp" |
| Value applied: | 1.0584962 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Calculated by Chinese DNA according to ACM0002/Version 06 and EB guidance, using publicly available statistic data |
| Any comment: | Low uncertainty |

| | |
|---|---|
| Data / Parameter: | $EF_{BM}$ |
| Data unit: | $tCO_2/MWh$ |
| Description: | $CO_2$ build margin emission factor of the grid |
| Source of data used: | Calculated ex-ante as the weighted average emission factor of the electricity delivered to the grid by the power plants that comprise 20% capacity additions of the system generation (in MWh)and that have been built most recently, as per the "Bulletin on Baseline Emission Factors of the Regional Power Grids of China, http://cdm.ccchina.gov.cn/web/index.asp" |
| Value applied: | 0.9066 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Calculated by Chinese DNA according to ACM0002/Version 06 and EB guidance, using publicly available statistic data |
| Any comment: | Low uncertainty |

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

As stated above, the project emission is zero and no leakage is considered so the emission reductions of the project equal to the baseline emissions as presented in formula (B.1) $BE_{electricity,y} = EG_y \times EF_y$.

As calculated in B.6.1, the $EF_y$ of the North China Power Grid is 0.9826 $tCO_2e/MWh$ and the $EG_y$ is the difference between the annual electricity generation and the annual self-power utilization of the project activity, it is calculated to be 68,796MWh（35sets x 300kw/set x 7200h/y x (1-9%)/1000 = 68,796MWh）.

Therefore the annual emission reductions is *ex-ante* calculated to be 0.9826 $tCO_2e/MWh \times 68{,}796MWh/y$ =67,599 $tCO_2e/y$.

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

| Year | 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 $CO_2e$) |
|---|---|---|---|---|
| December, Year 2007 | 0 | 5,633 | 0 | 5,633 |
| Year 2008 | 0 | 67,599 | 0 | 67,599 |
| Year 2009 | 0 | 67,599 | 0 | 67,599 |
| Year 2010 | 0 | 67,599 | 0 | 67,599 |
| Year 2011 | 0 | 67,599 | 0 | 67,599 |
| Year 2012 | 0 | 67,599 | 0 | 67,599 |
| Year 2013 | 0 | 67,599 | 0 | 67,599 |

| | | | | |
|---|---|---|---|---|
| Year 2014 | 0 | 67,599 | 0 | 67,599 |
| Year 2015 | 0 | 67,599 | 0 | 67,599 |
| Year 2016 | 0 | 67,599 | 0 | 67,599 |
| January-September 2017 | 0 | 61,966 | 0 | 61,966 |
| **Total (tonnes of $CO_2e$)** | 0 | 675,990 | 0 | 675,990 |

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

### B.7.1. Data and parameters monitored:

| | |
|---|---|
| *Data / Parameter:* | $EG_{Gen,y}$ |
| *Data unit:* | MWh |
| *Description:* | Total electricity generated by the project activity during the year y |
| *Source of data to be used:* | Electricity meters |
| *Value of data applied for the purpose of calculating expected emission reductions in section B.5* | 75,600 |
| *Description of measurement methods and procedures to be applied:* | The electricity will be monitored continuously and the daily and monthly records in a paper format will be archived in the power generation station. Model of the electricity meters is DSSD666 (manufactured by Zhejiang Zhengtai Instrument and Device Co., Ltd.) with accuracy class of 0.5S. |
| *QA/QC procedures to be applied:* | Monitoring instrument will be subject to a regular maintenance and calibration by qualified entities in accordance with national regulations and standards. |
| *Any comment:* | Low uncertainty |

| | |
|---|---|
| *Data / Parameter:* | $EG_{Aux,y}$ |
| *Data unit:* | MWh |
| *Description:* | The auxiliary electricity consumed by 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* | 6804 |
| *Description of measurement methods and procedures to be applied:* | The electricity will be monitored continuously and the daily and monthly records in a paper format will be archived in the power generation station. Model of the electricity meters is DSSD666 (manufactured by Zhejiang Zhengtai Instrument and Device Co., Ltd.) with accuracy class of 0.5S. |
| *QA/QC procedures to be applied:* | Monitoring instrument will be subject to a regular maintenance and calibration by qualified entities in accordance with national regulations and standards. |
| *Any comment:* | Low uncertainty |

| | |
|---|---|
| *Data / Parameter:* | $EG_y$ |
| *Data unit:* | MWh |
| *Description:* | Net quantity of electricity supplied by the project activity during the year y |
| *Source of data to be used:* | By calculation , $EG_y = EG_{Gen,y} - EG_{Aux,y}$ |
| *Value of data applied for the purpose of calculating expected emission reductions in section B.5* | 68,796 |
| *Description of measurement methods and procedures to be applied:* | $EG_y$ will be calculated by the measured amount of electricity generated by the project activity ( $EG_{Gen,y}$ ) and the measured amount of auxiliary electricity consumed by the project activity ( $EG_{Aux,y}$ ) |
| *QA/QC procedures to be applied:* | This data is calculated from $EG_{Gen,y}$ and $EG_{Aux,y}$, therefore the QA/QC procedure applied to $EG_{Gen,y}$ and $EG_{Aux,y}$ also could be applied to $EG_y$. |

| | |
|---|---|
| *Any comments* | Low uncertainty |

**B.7.2. Description of the monitoring plan:**

As the project owner, China Coal and Coke Jiuxin Limited will be responsible for the implementation of this monitoring plan. The project owner will take all the responsibilities as outlined in the monitoring plan. The monitoring plan can be modified according to the requirements of DOE in order to make sure that the monitoring will be reliable, transparent and conservative.

**1. The purpose of establishing monitoring plan**
The monitoring plan is established in order to ensure that the real, measurable and long-term GHG emission reductions for the project activity is monitored and reported. A credible, transparent and accurate data estimation, measurement, collection and tracking system will be set up in order to preserve the information needed for the verification of emission reductions.

**2. The duration of the monitoring plan**
The duration of the monitoring plan will be the crediting period of the project activity (10 years).

**3. Management operation**
China Coal and Coke Jiuxin Limited will establish a CDM project management office with responsibilities for all project related activities including project management, contact with CDM EB and DOE as well as Quality Assurance and Quality Control of the related data, documents and reports.

Staff of the CDM project management office includes the deputy general manager (responsible person), the director of the power generation station, the head of the power generation workshop, the head of the power distribution workshop and the person responsible for record keeping and preservation. Figure B.7-1 outlines the operational and management structure that the project owner will implement for the project activity and to monitor emission reductions.

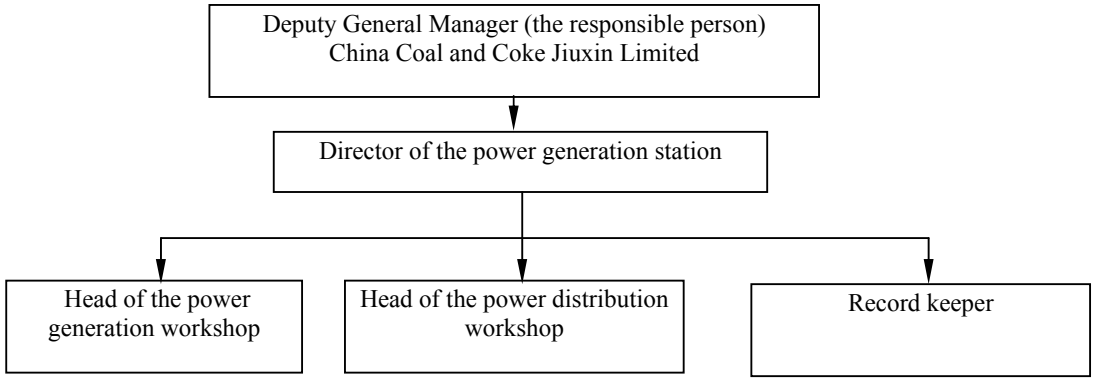


**Fig. B.7-1 Operational and management structure of the project activity**

**4. Installation of relevant instruments**
The total electricity generated and the auxiliary electricity consumed by the project activity will be monitored by electricity meters installed in the Central Transformer Substation of the power generation station. The installation, maintenance and calibration of the meters will be conducted by qualified entities.

The installed instruments will be co-checked and sealed by China Coal and Coke Jiuxin limited and the qualified entity. Any party will not be allowed to open the seal without the presence of another party or its authorized representative.

**5. Recording & preservation of relevant data**

In accordance with the approved monitoring methodology ACM0004, the following data will be required to be monitored and recorded.

- The total electricity generated by the project activity—by the electricity meters installed in the Central Transformer Substation.
- The auxiliary electricity consumed by the project activity—by the electricity meter installed in the central Transformer Substation.

The readings of the electricity meters will be monitored continuously and the data will be collected and recorded accordingly. All the data would be preserved in paper format during and two years after the crediting period, and the data of the electricity meters will also be preserved electronically. Necessary back-up of the electronic data is to be done at regular intervals. Physical document will be stored by the project owner and kept one copy in order to facilitate the verification of the DOE.

Any change within the project boundary, such as change in equipments or instruments will be recorded and any change in the emission reduction due to such alteration will also be studied and recorded.

**6. Calibration of relevant instruments**

- All meters and devices will be properly calibrated and checked by qualified entities annually according to the requirement from "Stipulated Procedures for Technical Administration of Electricity Metering Equipment (DL/T448-2000 ) " in order to ensure the reliability of the system and the accuracy of the readings;
- The related calibration records will be submitted to the project owner for its record preservation;
- When the accuracy of a device can meet the requirement of national standard, the accuracy of the net quantity of electricity supplied by the project activity can be ensured to meet the verification requirement of DOE.
- When a device or meter is found to be malfunctioning or registering data outside the acceptable limits of accuracy, the electricity will be estimated as follows:

    1. Data of the electricity meters are remotely transmitted to local electric power supply company and any malfunctions of the electricity meter will be detected immediately. The local electric power supply company will be responsible to repair or replace the malfunctioning meter within two working days.
    2. The electricity during the two working days will be determined as follows: first, take the reading of the transmitted data to local electric power supply company. If this reading is obviously unreasonable, an appropriate and reasonable estimation method will be designed by local electric power supply company. Evidence will be provided to DOE for the verification to show the estimation is reasonable and conservative.

**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)**

Date of completion of the baseline and monitoring study:
15/08/2006

Contact information of the person and entity determining the baseline and monitoring methodology:

Ms. Liu Honghui
China CDM Center for Coal Industry, which is not a project participant
Suit 1701, The Coal Tower
No. 35, 13th Region of Heping Street
Chaoyang District, Beijing 100013
P.R. China
Tel: 86-10-84264119
e-mail: bjfslhh@sohu.com
URL: www.coalcdm.org

Persons who has participated in the baseline and monitoring study:
Dr. Zhang Min
Dr. Lv Xin

## 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:

January 7, 2006 (Full operation)

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

18years

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

#### C.2.1. Renewable crediting period

Not applicable

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

Not applicable

##### C.2.1.2. Length of the first crediting period:

Not applicable

#### C.2.2. Fixed crediting period:

Fixed crediting period at ten (10) years

| C.2.2.1. Starting date: |
|---|

22/12/2007

| C.2.2.2. Length: |
|---|

10years

## SECTION D. Environmental impacts

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

Jiuxin Coke Plant (including the project activity) has undergone and passed a complete Environmental Impact Assessment Study in line with the legal and regulation requirements of the Chinese Government. The approval letter for the project activity has been issued by Shanxi EPA already.

The project site is inside Jiuxin Coke Plant which is far away from the surrounding villages. The original air pollutants in the project area are mainly $SO_2$ and $TSP_s$ from the industrial pollution sources. These tow pollutants are respectively 54.67% and 73.81% higher than the "National Ambient Air Quality Standard – Category II "(with 0.15mg/$Nm^3$ for $SO_2$ and 0.3mg/$Nm^3$ for $TSP_s$). There is almost no noise pollution in the project area as no big noise source exists in the surroundings.

The possible environmental impacts caused by the project activity and the related control measures are shown below:

1. Air pollution and its control
On its full operation the project is expected to generate 68,796MWh of electricity per year. It is estimated that 25,730 tce of standard coal will be saved. It will lead to reductions of air pollutant emissions which are equal to 515 tonnes of $SO_2$, 266 tonnes of $NO_x$ and 15 tonnes of $TSP_s$. The project activity will have a positive effect on local air quality.

Dust is the main air pollutant during the construction period. It can be controlled by water spray.

2. Noise pollution and its control
Major source of noise pollution during the operation period is from the generation system. But the noise level will be lower than 100dB(A).

Noise pollution will also be kept below the national noise permission level by proper design and control measures. Acoustic cases will be installed outside the generators and silencers will be provided at the outlet pipe in order to reduce the noise level. Control rooms and offices will be protected from noise by using isolating, sealing and adsorbing materials. The results of EIA show that the noise level within the boundary of the project site can meet the requirement of Category I of "Standard for Noise at Boundary of Industrial Enterprises （GB12348-90）". The noise level of the nearest village—the Tanzhen village can meet the requirement of the "Standard of Environmental Noise of Urban Area-Category I (GB3096-93)" (55dB(A) on daytime and 45dB(A) in the night). It is considered that the project operation will not have significant impact on the surrounding sound environment.

The noise pollution during the construction period is mainly from the running of the construction machines. As the construction is only on daytime and the construction period is quite short, the noise pollution impact to the local villages could be controlled effectively.
3. Water pollution and its control
The enclosed water recycle will be adopted for the cooling of the generation system. As zero discharge can be attained, it will not have any adverse impact to the ground and surface water.

4. Impact to ecological environment and its control
The destruction of ground vegetation and the dump of construction trash will affect the ecological environment of this area. Measures will be taken to reduce the impacts as much as possible, such as reducing the civil works area by reasonable design, re-planting after the construction period, keeping green index as high as possible and dumping the construction trash carefully.

5. Land use and its impact to local residents
The project is located in an abandoned river-basin. There are no compulsory purchase of agriculture land and no resettlement of farmers. Three nearby villages are far enough from the project site and further be protected by hills. Therefore neighbourhood will not be affected by this project.

**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:**

All environmental impacts will be under control and will have no significant impacts to the environment.

## SECTION E. Stakeholders' comments

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

The project owner has sought the stakeholders' comments for the project activity as follows:
1. Discussions with the local government, such as the Economy and Trade Bureau, the Environmental Protection Agency, the Price Bureau and the Electric Power Supply Bureau since the second half of 2004.
2. An open public meeting participated by local villagers who live nearby.
3. A survey made by questionnaire to local villagers who live nearby.

The public meeting was held in April 30, 2005. Participants include 6 staff from China Coal and Coke Jiuxin Limited and 16 local residents who live in the nearby three villages. The objective of this open public meeting is to make the local residents understand the project activity and to call for their comments. Mr. Yang Xiangsheng, the Deputy General Manager of China Coal and Coke Jiuxin Limited gave a brief introduction of the project activity, the social and environmental benefits that would be brought by the project activity and the environmental impacts that might be caused by the project activity. The Crowd attending the meeting raised several questions which focused on the occupation of farmland, noise pollution, air pollution and water pollution that might be caused by the project.
The questionnaire of the survey is shown in Table E.1-1

**Table E.1-1 Questionnaire**

| |
|---|
| 1. How do you feel with the current life and environment situations?<br>Happy( ) Unhappy( ) Acceptable( ) |
| 2. Do you have any knowledge of power generation with Coke Oven Gas?<br>Yes( ) No( ) not very much( ) |
| 3. What positive effects do you think the project will bring to your daily life?<br>Improving the air quality( ) Increasing the occupational opportunity ( ) Improving the standard of living( ) |
| 4. What negative effects do you think the project will being to your daily life?<br>Noise： Big( ) Small ( ) No( )<br>Land use： Big( ) Small ( ) No( )<br>Disturbance to TV/Cell phone：Big( ) Small( ) No( ) |
| 5. What do you think about the environmental impacts of the project activity?<br>Big ( ) Small( ) No( ) |
| 6. What do you think about the effects of the project activity to local economic development?<br>big( ) Small( ) No( ) |
| 7. Generally speaking, are you supportive to the construction of the project?<br>Yes( ) No( ) Indifferent( ) |
| 8. Comments and other requirements to the project activity： |

30 questionnaires have been sent to local residents and all have been returned. All the returned questionnaires are valid. Stakeholders for the project include 30 farmers of local villages, at age below 40 years old (more than 30%) and with education level above junior high school.

**Table E.1-2 Basic information of stakeholders**

| | |
|---|---|
| Gender | Male (19) Female(11) |
| Age | 25 and below(7) 26-40(20) 40 and above(3) |
| occupation | Farmer(30) |
| Educational level | Junior high school (19) Senior high school/technical secondary school(9) Junior college and above(2) |
| Villages | Puzitang (10) Zhijiazhuang(12) Guanjiazhuang(8) |

**E.2. Summary of the comments received:**

1. The local government departments have been all supportive to the project because the project is considered to have benefits on resource saving and sustainable development.
2. The answers to the questions and concerned raised by the attendants of the public meeting are listed below:

   1). About purchasing new agricultural land

   According to the feasibility study and the preliminary design, the project area is located inside the existing Jiuxin Coke Plant. No more new agricultural land will be purchased for the project activity.

   2). Impact to the local environment

   The local air quality will be improved by the implementation of the project activity. The project will also help in reducing the global warming by realizing GHG emission reductions.

   Noise pollution will also be kept below the national noise permission level by proper design and control measures.

   As zero discharge can be attained, it will not have any adverse impact to the ground and surface water.

   3).Occupational opportunities

Around 50 full-time occupational opportunities will be provided during the operation period of the project activity.

The open public meeting gave the local residents attending the meeting a god opportunity to understand the project activity. And finally they showed their unanimous support to the project.

3. The survey results by the questionnaire
The survey results are shown in Table E.2-1.

**Table E.2-1 survey results**

| |
|---|
| 1. How do you feel with the current life and environment situations?<br>Happy (13.3%) Unhappy (30%) Acceptable (56.7%) |
| 2. Do you have any knowledge of power generation with Coke Oven Gas?<br>Yes (13.3%) No( 33.3% ) Not very much(53.3%) |
| 3. What positive effects do you think the project will bring to your daily life?<br>Improving the air quality (33.3%) Increasing the occupational opportunity (73.3%)<br>Improving the standard of living (20%) |
| 4. What negative effects do you think the project will being to your daily life?<br>Noise： Big (20%) Small (66.7%) No (13.3%)<br>Land use： Big (13.3%) Small (63.3%) No (23.3%)<br>Disturbance to TV/Cell phone：Big (3.33%) Small (33.3% ) No (63.3% ) |
| 5. What do you think about the environmental impacts of the project activity?<br>Big ( / ) Small ( 90% ) No( 10%) |
| 6. What do you think about the effect of the project activity to local economic development?<br>big( 86.7% ) Small(13.3% ) No( / ) |
| 7. Generally speaking, are you supportive to the construction of the project?<br>Yes (96.7%) No( / ) Indifferent( 3.3% ) |
| 8. Comments and other requirements to the project activity： |

All of the investigated people are supportive to the project. Most of them agree that the project will have no big environmental impacts and will play an important role in local economic development such as providing occupational opportunities and improving the standard of living. Many of the investigated people hope the project will be constructed and implemented successfully. Noise pollution has been considered as the most severe environmental problem.

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

The local government and all residents are all supportive to the project and there are no adverse comments have been received. Therefore, there is no need to modify the project due to the comments received.

**Annex 1**

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

| | |
|---|---|
| Organization: | China Coal and Coke Jiuxin Limited |
| Street/P.O.Box: | Puzitang, Tanzhen village, Lingshi county, Shanxi Province P. R. China |
| Building: | |
| City: | Jinzhong |
| State/Region: | Shanxi province |
| Postfix/ZIP: | 031307 |
| Country: | P. R. China |
| Telephone: | 86-354-7915830 |
| FAX: | 86-354-7915820 |
| E-Mail: | weiyouc@cnccoke.com |
| URL: | http://www.zmjh.com |
| Represented by: | Wei Youcun |
| Title: | General Manager |
| Salutation: | Mr. |
| Last Name: | Wei |
| Middle Name: | |
| First Name: | Youcun |
| Department: | |
| Mobile: | |
| Direct FAX: | 86-354-7915820 |
| Direct tel: | 86-354-7915830 |
| Personal E-Mail: | weiyouc@cnccoke.com |

| | |
|---|---|
| Organization: | Carbon Asset Management Sweden AB |
| Street/P.O.Box: | Drottninggatan 92-94 |
| Building: | |
| City: | Stockholm |
| State/Region: | |
| Postfix/ZIP: | |
| Country: | Sweden |
| Telephone: | +46 850688551 |
| FAX: | +46 8346080 |
| E-Mail: | nvz@tricorona.se |
| URL: | |
| Represented by: | Niels Von Zweigbergk |
| Title: | |
| Salutation: | Mr. |
| Last Name: | Von Zweigbergk |
| Middle Name: | |
| First Name: | Niels |
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## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from UNFCCC Annex I countries for this project.

## Annex 3
## BASELINE INFORMATION

1. The constitution of low-cost/must run resources of total power generation of the North China Power Grid

**Table A3-1 Power generation of the North China Power Grid in 2004**

| Provincial Sub-Grids | Power Generation ($10^8$ kWh) | | | | |
|---|---|---|---|---|---|
| | Hydro | Nuclear | Other | Fuel-fired | Sub-total |
| Beijing | 3.47 | 0 | 0 | 185.79 | 189.26 |
| Tianjin | 0 | 0 | 0 | 339.52 | 339.52 |
| Hebei | 5.25 | 0 | 0.4 | 1249.7 | 1255.35 |
| Shanxi | 20.32 | 0 | 0 | 1049.26 | 1069.58 |
| Inner Mongolia | 8.13 | 0 | 2.18 | 804.27 | 814.58 |
| Shandong | 0.41 | 0 | 0.16 | 1639.18 | 1639.75 |
| Sub-total | 37.58 | 0 | 2.74 | 5267.72 | 5308.04 |
| Proportion of low-cost/must run resources in total grid generations | 0.76% | | | | |

Data Source: China Electric Power Year Book 2005, page473- 474

**Table A3-2 Power generation of the North China Power Grid in 2003**

| Provincial Sub-Grids | Power Generation ($10^8$ kWh) | | | | |
|---|---|---|---|---|---|
| | Hydro | Nuclear | Other | Fuel-fired | Sub-total |
| Beijing | 6.79 | 0 | 0 | 186.08 | 192.87 |
| Tianjin | 0.09 | 0 | 0 | 321.91 | 322 |
| Hebei | 5.04 | 0 | 0.37 | 1082.61 | 1088.02 |
| Shanxi | 18.9 | 0 | 0 | 939.62 | 958.52 |
| Inner Mongolia | 6.97 | 0 | 1.44 | 651.06 | 659.47 |
| Shandong | 0.19 | 0 | 0 | 1395.47 | 1395.65 |
| Sub-total | 37.98 | 0 | 1.81 | 4576.75 | 4616.53 |
| Proportion of low-cost/must run resources in total grid generations | 0.86% | | | | |

Data Source: China Electric Power Year Book 2004, page708-709

**Table A3-3 Power generation of the North China Power Grid in 2002**

| Provincial Sub-Grids | Power Generation ($10^8$ kWh) | | | | |
|---|---|---|---|---|---|
| | Hydro | Nuclear | Other | Fuel-fired | Sub-total |
| Beijing | 4.66 | 0 | 0 | 178.86 | 183.52 |
| Tianjin | 0.12 | 0 | 0 | 272.63 | 272.75 |
| Hebei | 4.1 | 0 | 0.36 | 1009.7 | 1014.16 |
| Shanxi | 18.78 | 0 | 0 | 822.56 | 841.34 |
| Inner Mongolia | 6.74 | 0 | 1.34 | 513.82 | 521.91 |
| Shandong | 0.15 | 0 | 0 | 1241.62 | 1241.77 |
| Sub-total | 34.55 | 0 | 1.7 | 4039.19 | 4075.45 |
| Proportion of low-cost/must run resources in total grid generations | 0.89% | | | | |

Data Source: China Electric Power Year Book 2003, page 584-585

**Table A3-4 Power generation of the North China Power Grid in 2001**

| Provincial Sub-Grids | Power Generation ($10^8$ kWh) | | | | |
|---|---|---|---|---|---|
| | Hydro | Nuclear | Other | Fuel-fired | Sub-total |
| Beijing | 2.75 | 0 | 0 | 173.91 | 176.65 |
| Tianjin | 0.09 | 0 | 0 | 221.66 | 221.75 |
| Hebei | 3.12 | 0 | 0.17 | 928.65 | 931.94 |
| Shanxi | 16.8 | 0 | 0 | 694.19 | 711 |
| Inner Mongolia | 6.2 | 0 | 1.09 | 458.21 | 465.5 |
| Shandong | 0.31 | 0 | 0 | 1104.04 | 1104.35 |
| Sub-total | 29.27 | 0 | 0 | 3580.66 | 3611.19 |
| Proportion of low-cost/must run resources in total grid generations | 0.85% | | | | |

Data Source: China Electric Power Year Book 2002, page 616-617

**Table A3-5 Power generation of the North China Power Grid in 2000**

| Provincial Sub-Grids | Power Generation ($10^8$ kWh) | | | | |
|---|---|---|---|---|---|
| | Hydro | Nuclear | Other | Fuel-fired | Sub-total |
| Beijing | 9.47 | 0 | 0 | 179.49 | 188.96 |
| Tianjin | 0.138 | 0 | 82 | 216.21 | 216.43 |
| Hebei | 4.7 | 0 | 0.19 | 839.53 | 844.42 |
| Shanxi | 16.12 | 0 | 0 | 604.75 | 620.87 |
| Inner Mongolia | 5.59 | 0 | 0.88 | 432.75 | 439.22 |
| Shandong | 0.31 | 0 | 0 | 1000.54 | 1000.85 |
| Sub-total | 36.33 | 0 | 1.152 | 3273.27 | 3310.75 |
| Proportion of low-cost/must run resources in total grid generations | 1.13% | | | | |

Data Source: China Electric Power Year Book 2001, page 666-667

2. The calculation of $EF_{OM,}$ of the North China Power Grid

**Table A3-6 $CO_2$ emissions of the North China Power Grid in 2002**

| Fuels | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Sub-total | $EF_{CO2}$ | OXID | NCV | $CO_2$ emissions ($tCO_2e$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | (tc/TJ) | (%) | (MJ/t,km$^3$) | K=G*H*I*J*44/12/10000 (mass unit) |
| | | A | B | C | D | E | F | G=A+B+C +D+E+F | H | I | J | K=G*H*I*J*44/12/1000 (volume unit) |
| Raw coal | $10^4$t | 691.84 | 1052.74 | 4988.01 | 4037.4 | 3218 | 5162.86 | **19150.84** | 25.8 | 98 | 20908 | 371208174.5 |
| Cleaned coal | $10^4$t | | | | | | 80.71 | **80.71** | 25.8 | 98 | 26344 | 1971179.968 |
| Other washed coal | $10^4$t | 3.43 | | 65.2 | 135.56 | | 106.32 | **310.51** | 25.8 | 98 | 8363 | 2407436.829 |
| Coke | $10^4$t | | | | | | | **0** | 29.5 | 98 | 28435 | 0 |
| Coke oven gas | $10^8$m$^3$ | 0.17 | 1.71 | | 0.75 | 0.16 | 0.04 | **2.83** | 13 | 99.5 | 16726 | 224500.0238 |
| Other coal gas | $10^8$m$^3$ | 15.82 | | 7.34 | | 10.35 | | **33.51** | 13 | 99.5 | 5227 | 830739.3673 |
| Crude oil | $10^4$t | | | | | | 14.98 | **14.98** | 20 | 99 | 41816 | 454769.0717 |
| Gasoline | $10^4$t | | | | | | 0.65 | **0.65** | 18.9 | 99 | 43070 | 19206.87269 |
| Diesel | $10^4$t | 0.26 | 2.35 | 4.12 | | 1.6 | 10.02 | **18.35** | 20.2 | 99 | 42652 | 573896.3513 |
| Fuel oil | $10^4$t | 13.94 | 0.04 | 1.22 | | 0.42 | 20.33 | **35.95** | 21.1 | 99 | 41816 | 1151411.233 |
| LPG | $10^4$t | | | | | | | **0** | 17.2 | 99.5 | 50179 | 0 |
| Refinery gas | $10^4$t | | | 0.27 | | | | **0.27** | 18.2 | 99.5 | 46055 | 8256.698951 |
| Natural gas | $10^8$m$^3$ | | 0.55 | | | 0.02 | | **0.57** | 15.3 | 99.5 | 38931 | 123867.2104 |
| Other Petroleum products | $10^4$t | | | | | | | **0** | 20 | 99 | 38369 | 0 |
| Other coking products | $10^4$t | | | | | | | **0** | 25.8 | 98 | 28435 | 0 |
| Other energy | $10^4$tce | | | | | 1.1 | 15.92 | **17.02** | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | Total | 378973438.1 |

Data source:
China Energy Statistical Yearbook 2000-2002;
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Table 1-2 on page1.6 and table 1-4 on page 1.8, chapter 1.

**Table A3-7 Fuel-fired electricity generation of the North China Power Grid in 2002**

| Sub-grids | Electricity generation (MWh) | Self- consumption rate ( % ) | Electricity supply (MWh) |
|---|---|---|---|
| Beijing | 17886000 | 7.95 | 16464063 |
| Tianjin | 27263000 | 7.08 | 25332779.6 |
| Hebei | 100970000 | 6.72 | 94184816 |
| Shanxi | 82256000 | 7.98 | 75691971.2 |
| Inner Mongolia | 51382000 | 7.93 | 47307407.4 |
| Shandong | 124162000 | 6.79 | 115731400.2 |
| **Total** | | | 374712437.4 |

Data source: China Electric Yearbook 2003

**Table A3-8 Simple OM of the North China Power Grid in 2002**

| | |
|---|---|
| Import of power form Northeast China Power Grid (MWh) | 2905200 |
| Emission factor of Northeast China Power Grid ($tCO_2e/MWh$) | 1.0302474 |
| $CO_2$ emissions of the imported power($tCO_2e$) | 2993074.8 |
| Total $CO_2$ emissions of the North China Power Grid ($tCO_2e$) | 381966513 |
| Total electricity supply of the North China Power Grid (MWh) | 377617637 |
| Simple OM of the North China Power Grid ($tCO_2e/MWh$) | 1.0115166 |

**Table A3- 9 $CO_2$ emissions of the North China Power Grid in 2003**

| Fuels | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Sub-total | $EF_{CO2}$ | OXID | NCV | $CO_2$ emissions ($tCO_2e$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | (tc/TJ) | (%) | ($MJ/t,km^3$) | K=G*H*I*J*44/12/10000 (mass unit) |
| | | A | B | C | D | E | F | G=A+B+C +D+E+F | H | I | J | K=G*H*I*J*44/12/1000 (volume unit) |
| Raw coal | $10^4t$ | 714.73 | 1052.74 | 5482.64 | 4528.5 | 3949.32 | 6808 | **22535.94** | 25.8 | 98 | 20908 | 436822883.4 |
| Cleaned coal | $10^4t$ | | | | | | 9.41 | **9.41** | 25.8 | 98 | 26344 | 229820.3878 |
| Other washed coal | $10^4t$ | 6.31 | | 67.28 | 208.21 | | 450.9 | **732.7** | 25.8 | 98 | 8363 | 5680747.688 |
| Coke | $10^4t$ | | | | | 2.8 | | **2.8** | 29.5 | 98 | 28435 | 84397.73393 |
| Coke oven gas | $10^8m^3$ | 0.24 | 1.71 | | 0.9 | 0.21 | 0.02 | **3.08** | 13 | 99.5 | 16726 | 244332.1814 |
| Other coal gas | $10^8m^3$ | 16.92 | | 10.63 | | 10.32 | 1.56 | **39.43** | 13 | 99.5 | 5227 | 977500.8431 |
| Crude oil | $10^4t$ | | | | | | 29.68 | **29.68** | 20 | 99 | 41816 | 901037.7869 |
| Gasoline | $10^4t$ | | | | | | 0.01 | **0.01** | 18.9 | 99 | 43070 | 295.490349 |
| Diesel | $10^4t$ | 0.29 | 1.35 | 4 | | 2.91 | 5.4 | **13.95** | 20.2 | 99 | 42652 | 436286.327 |
| Fuel oil | $10^4t$ | 13.95 | 0.02 | 1.11 | | 0.65 | 10.07 | **25.8** | 21.1 | 99 | 41816 | 826325.7251 |
| LPG | $10^4t$ | | | | | | | **0** | 17.2 | 99.5 | 50179 | 0 |
| Refinery gas | $10^4t$ | | | 0.27 | | | 0.83 | **1.1** | 18.2 | 99.5 | 46055 | 33638.40313 |
| Natural gas | $10^8m^3$ | | 0.5 | | | | 1.08 | **1.58** | 15.3 | 99.5 | 38931 | 343351.2148 |
| Other Petroleum products | $10^4t$ | | | | | | | **0** | 20 | 99 | 38369 | 0 |
| Other coking products | $10^4t$ | | | | | | | **0** | 25.8 | 98 | 28435 | 0 |
| Other energy | $10^4tce$ | 9.83 | | | | | 39.21 | **49.04** | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | Total | 446580617.2 |

Data source:
China Energy Statistical Yearbook 2004;
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Table 1-2 on page1.6 and table 1-4 on page 1.8, chapter 1.

**Table A3-10 Fuel-fired electricity generation of the North China Power Grid in 2003**

| Sub-grids | Electricity generation (MWh) | Self- consumption rate ( % ) | Electricity supply (MWh) |
|---|---|---|---|
| Beijing | 18608000 | 7.52 | 17208678 |
| Tianjin | 32191000 | 6.79 | 30005231 |
| Hebei | 108261000 | 6.5 | 101224035 |
| Shanxi | 93962000 | 7.69 | 86736322 |
| Inner Mongolia | 65106000 | 7.66 | 60118880 |
| Shandong | 139547000 | 6.79 | 130071759 |
| **Total** | | | 425364906 |

Data source: China Electric Yearbook 2004

**Table A3-11 Simple OM of the North China Power Grid in 2003**

| | |
|---|---|
| Import of power form Northeast China Power Grid (MWh) | 4244380 |
| Emission factor of Northeast China Power Grid ($tCO_2e/MWh$) | 1.09603 |
| $CO_2$ emissions of the imported power($tCO_2e$) | 4651967.8 |
| Total $CO_2$ emissions of the North China Power Grid ($tCO_2e$) | 451232585 |
| Total electricity supply of the North China Power Grid (MWh) | 429609286 |
| Simple OM of the North China Power Grid ($tCO_2e/MWh$) | 1.0503325 |

**Table A3-12 $CO_2$ emissions of the North China Power Grid in 2004**

| Fuels | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Sub-total | $EF_{CO2}$ | OXID | NCV | $CO_2$ emissions ($tCO_2e$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | (tc/TJ) | (%) | ($MJ/t,km^3$) | K=G*H*I*J*44/12/10000 (mass unit) |
| | | A | B | C | D | E | F | G=A+B+C+D+E+F | H | I | J | K=G*H*I*J*44/12/1000 (volume unit) |
| Raw coal | $10^4t$ | 823.09 | 1410 | 6299.8 | 5213.2 | 4932.2 | 8550 | **27228.29** | 25.8 | 98 | 20908 | 527776527.1 |
| Cleaned coal | $10^4t$ | | | | | | 40 | **40** | 25.8 | 98 | 26344 | 976919.8208 |
| Other washed coal | $10^4t$ | 6.48 | | 101.04 | 354.17 | | 284.22 | **745.91** | 25.8 | 98 | 8363 | 5783167.065 |
| Coke | $10^4t$ | | | | | 0.22 | | **0.22** | 29.5 | 98 | 28435 | 6631.250523 |
| Coke oven gas | $10^8m^3$ | 0.55 | | 0.54 | 5.32 | 0.4 | 8.73 | **15.54** | 13 | 99.5 | 16726 | 1232766.915 |
| Other coal gas | $10^8m^3$ | 17.74 | | 24.25 | 8.2 | 16.47 | 1.41 | **68.07** | 13 | 99.5 | 5227 | 1687509.064 |
| Crude oil | $10^4t$ | | | | | | | **0** | 20 | 99 | 41816 | 0 |
| Diesel | $10^4t$ | 0.39 | 0.84 | 4.66 | | | | **5.89** | 20.2 | 99 | 42652 | 184209.7825 |
| Fuel oil | $10^4t$ | 14.66 | | 0.16 | | | | **14.82** | 21.1 | 99 | 41816 | 474656.87 |
| LPG | $10^4t$ | | | | | | | **0** | 17.2 | 99.5 | 50179 | 0 |
| Refinery gas | $10^4t$ | | 0.55 | 1.42 | | | | **1.97** | 18.2 | 99.5 | 46055 | 60243.32197 |
| Natural gas | $10^8m^3$ | | 0.37 | | 0.19 | | | **0.56** | 15.3 | 99.5 | 38931 | 121694.1015 |
| Other Petroleum products | $10^4t$ | | | | | | | **0** | 20 | 99 | 38369 | 0 |
| Other coking products | $10^4t$ | | | | | | | **0** | 25.8 | 98 | 28435 | 0 |
| Other energy | $10^4tce$ | 9.41 | | 34.64 | 109.73 | 4.48 | | **158.26** | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | Total | 538304325.3 |

Data source:
China Energy Statistical Yearbook 2005;
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook, Table 1-2 on page1.6 and table 1-4 on page 1.8, chapter 1.

**Table A3-13 Fuel-fired electricity generation of the North China Power Grid in 2004**

| Sub-grids | Electricity generation (MWh) | Self- consumption rate ( % ) | Electricity supply (MWh) |
|---|---|---|---|
| Beijing | 18579000 | 7.94 | 17103827 |
| Tianjin | 33952000 | 6.35 | 31796048 |
| Hebei | 124970000 | 6.5 | 116846950 |
| Shanxi | 104926000 | 7.7 | 96846698 |
| Inner Mongolia | 80427000 | 7.17 | 74660384 |
| Shandong | 163918000 | 7.32 | 151919202 |
| **Total** | | | 489173110 |

Data source: China Electric Yearbook 2005

**Table A3-14 Simple OM of the North China Power Grid in 2004**

| | |
|---|---|
| Import of power form Northeast China Power Grid (MWh) | 4514550 |
| Emission factor of Northeast China Power Grid ($tCO_2e/MWh$) | 1.22042 |
| $CO_2$ emissions of the imported power($tCO_2e$) | 5509647.1 |
| Total $CO_2$ emissions of the North China Power Grid ($tCO_2e$) | 543813972 |
| Total electricity supply of the North China Power Grid (MWh) | 493687660 |
| Simple OM of the North China Power Grid ($tCO_2e/MWh$) | 1.1015345 |

$$EF_{OM} = \frac{(EF_{OMsimple,2002} \times GEN_{2002} + EF_{OMsimple,2003} \times GEN_{2003} + EF_{OMsimple,2004} \times GEN_{2004})}{GEN_{Total}} = 1.0584962 \text{ tCO}_2\text{e/MWh}$$

2. The calculation of $EF_{BM}$ of the North China Power Grid

**Step 1. Calculating the share of $CO_2$ emissions of different fuel-fired power plants in the total $CO_2$ emissions**

**Table A3-15 The share of $CO_2$ emissions of different fuel-fired power plants in the total $CO_2$ emissions**

| Fuels | Unit | Beijing | Tianjin | Hebei | Shanxi | Shandong | Inner Mongolia | Total | NCV ( MJ/t,km$^3$ ) | COEF (tc/TJ) | OXID (%) | $CO_2$ emissions ($tCO_2e$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G=A+B+C +D+E+F | H | I | J | K=G*H*I*J*44/12/100 |
| Raw coal | $10^4$t | 823.09 | 1410.00 | 6299.80 | 5213.20 | 8550.00 | 4932.20 | 27228.29 | 20908 kJ/kg | 25.80 | 0.98 | 527,776,527 |
| Cleaned coal | $10^4$t | 0 | 0 | 0 | 0 | 40.00 | 0 | 40 | 26344 kJ/kg | 25.80 | 0.98 | 976,920 |
| Other washed coal | $10^4$t | 6.48 | 0 | 101.04 | 354.17 | 284.22 | 0 | 745.91 | 8363 kJ/kg | 25.80 | 0.98 | 5,783,167 |
| Coke | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0.22 | 0.22 | 28435 kJ/kg | 29.50 | 0.98 | 6,631 |
| **Sub-total** | | | | | | | | | | | | **534,543,245** |
| Crude oil | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41816 kJ/kg | 20.00 | 0.99 | 0 |
| Gasoline | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43070 kJ/kg | 18.90 | 0.99 | 0 |
| Kerosene | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43070 kJ/kg | 19.60 | 0.99 | 0 |
| Diesel | $10^4$t | 0.39 | 0.84 | 4.66 | 0 | 0 | 0 | 5.89 | 42652 kJ/kg | 20.20 | 0.99 | 184,210 |
| Fuel oil | $10^4$t | 14.66 | 0 | 0.16 | 0 | 0 | 0 | 14.82 | 41816 kJ/kg | 21.10 | 0.99 | 474,657 |
| Other petroleum products | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38369 kJ/kg | 20.00 | 0.99 | 0 |
| **Sub-total** | | | | | | | | | | | | **658,867** |
| Natural gas | $10^7$m$^3$ | 0 | 3.7 | 0 | 1.9 | 0 | 0 | 5.6 | 38931 kJ/m$^3$ | 15.30 | 0.995 | 121,694 |
| Coke oven gas | $10^7$m$^3$ | 5.5 | 0 | 5.4 | 53.2 | 87.3 | 4.0 | 155.4 | 16726 kJ/m$^3$ | 13.00 | 0.995 | 1,232,767 |
| Other coal gas | $10^7$m$^3$ | 177.4 | 0 | 242.5 | 82.0 | 14.1 | 164.7 | 680.7 | 5227 kJ/m$^3$ | 13.00 | 0.995 | 1,687,509 |
| LPG | $10^4$t | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50179 kJ/kg | 17.20 | 0.995 | 0 |
| Refinery gas | $10^4$t | 0 | 0.55 | 1.42 | 0 | 0 | 0 | 1.97 | 46055 kJ/kg | 18.20 | 0.995 | 60,244 |
| **Sub-total** | | | | | | | | | | | | **3,102,214** |
| **Total** | | | | | | | | | | | | **538,304,326** |

Data source：“ China Energy Statistic Yearbook 2005”

Based on table A3-15 and formula B.7, B.8 and B.9, $\lambda_{Coal}$ =99.30% , $\lambda_{Oil}$ =0.12% , $\lambda_{Gas}$ =0.58%.

**Step.2. Calculating the Emission Factor of fuel-fired power technology**

The best efficiencies and emission factors of the coal, oil and gas fired power technology are listed in Table A3-16

**Table A3-16 The best efficiencies and emission factors of the fuel fired technologies**

| | Power supply efficiency | $COEF_{Fuel}$ (tc/TJ) | OXID | Emission factor ($tCO_2$/MWh) |
|---|---|---|---|---|
| | A | B | C | D=3.6/A/1000*B*C*44/12 |
| Coal-fired power technology | 36.53% | 25.8 | 0.98 | 0.9136 |
| Gas-fired power technology | 45.87% | 15.3 | 0.995 | 0.4381 |
| Oil-fired technology | 45.87% | 21.1 | 0.99 | 0.6011 |

$EF_{Fuel-fired} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =99.30% × 0.9136 + 0.58% × 0.4381 + 0.12% × 0.6011

= 0.9105($tCO_2e$/MWh)

**Step. 3. Calculating the $EF_{BM}$ of the North China Power Grid**

**Table A3-17 The installed capacity of the North China Power Grid in 2004**

| Installed capacity | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Total |
|---|---|---|---|---|---|---|---|---|
| Fuel-fired power | MW | 3458.5 | 6008.5 | 19932.7 | 17693.3 | 13641.5 | 32860.4 | 93594.9 |
| Hydro-power | MW | 1055.9 | 5 | 783.8 | 787.3 | 567.9 | 50.8 | 3250.7 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind power and others | MW | 0 | 0 | 13.5 | 0 | 111.8 | 12.4 | 137.7 |
| Total | MW | 4514.4 | 6013.5 | 20730 | 18480.5 | 14321.2 | 32923.6 | 96983.2 |

Data source: China Electric Power Yearbook 2005

**Table A3-18 The installed capacity of the North China Power Grid in 2002**

| Installed capacity | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Total |
|---|---|---|---|---|---|---|---|---|
| Fuel-fired power | MW | 3407.5 | 6245.5 | 16745.7 | 14327.8 | 9778.7 | 25102.4 | 75607.6 |
| Hydro-power | MW | 1038.5 | 5 | 775.9 | 795.3 | 592.1 | 50.8 | 3257.6 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind power and others | MW | 0 | 0 | 13.5 | 0 | 76.6 | 0 | 90.1 |
| Total | MW | 4446 | 6250.5 | 17535.1 | 15123.1 | 10447.4 | 25153.1 | 78955.2 |

Data source: China Electric Power Yearbook 2003

**Table A3-19 The installed capacity of the North China Power Grid in 2001**

| Installed capacity | Unit | Beijing | Tianjin | Hebei | Shanxi | Inner Mongolia | Shandong | Total |
|---|---|---|---|---|---|---|---|---|
| Fuel-fired power | MW | 3412.5 | 5632 | 16474.9 | 13415.8 | 8898.3 | 20957.7 | 68791.3 |
| Hydro-power | MW | 1058.1 | 5 | 742.6 | 795.9 | 566.2 | 56.2 | 3224 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind power and others | MW | 0 | 0 | 9.9 | 0 | 46.7 | 0 | 56.6 |
| Total | MW | 4470.6 | 5637 | 17227.4 | 14211.8 | 9511.2 | 21013.9 | 72071.9 |

Data source: China Electric Power Yearbook 2002

**Table A3-20 $EF_{BM}$ of the North China Power Grid**

| | Installed capacity | | | The increment of installed capacity from 2001 to 2004 | The Share of increased installed capacity of fuel-fired power in the whole increased installed capacity |
|---|---|---|---|---|---|
| | 2001 | 2002 | 2004 | | |
| | A | B | C | D=C-A | |
| Fuel-fired power ( MW ) | 68791.3 | 75607.6 | 93594.9 | 24803.6 | 99.57% |
| Hydro-powe ( MW ) | 3224 | 3257.6 | 3250.7 | 26.7 | 0.11% |
| Nuclear power ( MW ) | 0 | 0 | 0 | 0 | 0.00% |
| Wind power ( MW ) | 56.6 | 90.1 | 137.7 | 81.1 | 0.32% |
| **Total ( MW )** | **72071.9** | **78955.2** | **96983.2** | **24911.3** | **100.00%** |
| As percentage of the installed capacity in 2004 | 74.31% | 81.41% | 100% | | |

Based on the above tables , $EF_{BM}$=0.9105×99.57%=0.9066 $tCO_2$/MWh.

**Table A3-21 Cash flow (Equity) of the project activity without CDM revenues (in million US dollars)**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cash inflows | | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.29 |
| 1.1 | Revenue (saved electricity cost) | | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 |
| 1.2 | Balance of fixed assets | | | | | | | | | | | | | | | | | | | |
| 1.3 | Collection of liquidity | | | | | | | | | | | | | | | | | | | 0.11 |
| 2 | Cash outflows | 3.69 | 6.12 | 6.00 | 4.58 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2.1 | Equity | 3.44 | 0.11 | | | | | | | | | | | | | | | | | |
| 2.2 | Repayment of principal | | 2.97 | 3.14 | 1.92 | | | | | | | | | | | | | | | |
| 2.3 | Repayment of interest | 0.25 | 0.50 | 0.32 | 0.12 | | | | | | | | | | | | | | | |
| 2.4 | Operating costs | | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2.5 | Operation guarantee fee | | 1.07 | 1.07 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.6 | Sales taxe and associate charges | | | | | | | | | | | | | | | | | | | |
| 2.7 | Income tax | | | | | | | | | | | | | | | | | | | |
| 3 | Net cash flows | -3.69 | -2.94 | -2.81 | -1.40 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.82 |
| 4 | Accumulated net cash flows | -3.69 | -6.63 | -9.44 | -10.84 | -9.13 | -7.42 | -5.70 | -3.99 | -2.28 | -0.56 | 1.15 | 2.86 | 4.58 | 6.29 | 8.00 | 9.72 | 11.43 | 13.14 | 14.97 |
| 5 | Equity IRR ( % ) | 10.10% | | | | | | | | | | | | | | | | | | |
| | Net present value | -1.78 | | | | | | | | | | | | | | | | | | |

**Table A3-22 Cash flow (Equity) of the project activity with CDM revenues ( in million US dollars)**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cash inflows | | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.83 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.29 |
| 1.1 | Revenue (Saved electricity cost) | | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 | 3.18 |
| 1.2 | Revenue from CDM | | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | | | | | | | | |
| 1.3 | Balance of fixed assets | | | | | | | | | | | | | | | | | | | |
| 1.4 | Collection of liquidity | | | | | | | | | | | | | | | | | | | 0.11 |
| 2 | Cash outflows | 3.69 | 6.12 | 6.00 | 4.58 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2.1 | Equity | 3.44 | 0.11 | | | | | | | | | | | | | | | | | |
| 2.2 | Repayment of principal | | 2.97 | 3.14 | 1.92 | | | | | | | | | | | | | | | |
| 2.3 | Repayment of interest | 0.25 | 0.50 | 0.32 | 0.12 | | | | | | | | | | | | | | | |
| 2.4 | Operating costs | | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 | 1.47 |
| 2.5 | Operation guarantee fee | | 1.07 | 1.07 | 1.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2.6 | Income tax | | | | | | | | | | | | | | | | | | | |
| 3 | Net cash flows | -3.69 | -2.30 | -2.17 | -0.76 | 2.36 | 2.36 | 2.36 | 2.36 | 2.36 | 2.36 | 2.36 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.82 |
| 4 | Accumulated net cash flows | -3.69 | -5.99 | -8.16 | -8.92 | -6.56 | -4.21 | -1.85 | 0.51 | 2.86 | 5.22 | 7.57 | 9.29 | 11.00 | 12.71 | 14.43 | 16.14 | 17.85 | 19.57 | 21.39 |
| 5 | Equity IRR (%) | 16.04% | | | | | | | | | | | | | | | | | | |
| | Net present value | 1.71 | | | | | | | | | | | | | | | | | | |

## Annex 4
## MONOTORING INFORMATION

The monitoring diagram for the project activity is shown in Figure A.4-1.

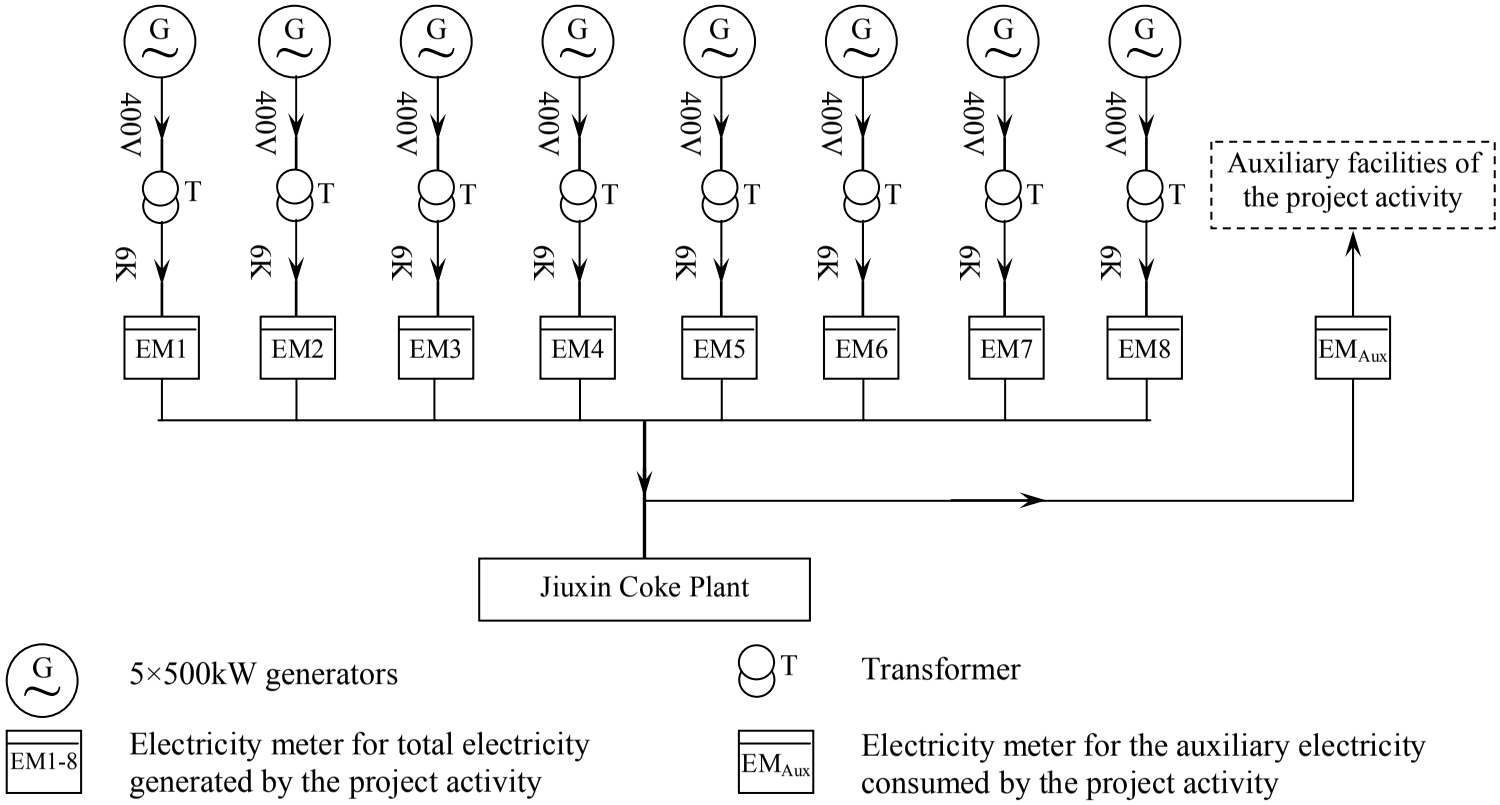


**Figure A4-1 The monitoring diagram of the project activity**

The electricity meters (Model: DSSD666) which are used in the monitoring system of the project activity are manufactured by Zhejiang Zhengtai Instrument and Device Limited. The accuracy class of the electricity meters is 0.5S.