**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:

>>

**Antai Group Waste Gas Recovery for Power Generation Project**
(Version 1, 29/4/2009)

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

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Antai Group Co., Ltd. (hereafter referred as "AGC") is a large manufacturer of iron, steel, and steel products headquartered in Shanxi Province of China. The Project Activity is a waste coal gas recovery and utilization for power generation project developed by Antai Group Co., Ltd. The objective of the project is to fully recover and utilize the waste coal gas for electricity and steam cogeneration and to reduce fossil fuel-based energy consumption and decrease air pollution. The waste gas comes primarily from the facility's blast furnaces, with some additional surplus gas from steel converters and coke ovens.

The project includes installation of 2×25MW extracted-condensing steam turbine units, 4×75t/h medium-temperature and medium-pressure gas-fired boilers and relevant auxiliary equipments. The project's total installed capacity will be 50MW. The net power supply is 264GWh and the annual steam generation is estimated as 536.25TJ. The electricity and the steam generated by the proposed project would be totally consumed in the production process of Antai Group Company.

In the absence of the project, a large amount of combustible waste gas generated by AGC iron & steel and machine coke production is flared. In the same time, all electricity demand by AGC is imported from the North China Power Grid (NCPG). Therefore, the power generated by the project activity would displace electricity imported from the North China Power Grid, which is dominated by fossil fuel-fired power plants, and also replace heat provided by an existing or new fossil fuel based boilers, finally reduce an estimated 312,828tons of $CO_2$e per year.

Besides the GHG emission reductions, the Project would contribute to local and national sustainable development through:

- Reduction of air pollutants of coal fired power plants such as $SO_2$ and TSP;
- Reduction of fossil fuel-based energy consumption, thus improving energy efficiency;
- Reduction of water consumption by using air cooling generator units, conforming to national energy saving policies;
- Mitigation of power demand load of local grid;
- Creating about 154 employment opportunities for the local community;
- Promoting implementation of similar activities in the region.

### A.3. Project participants:

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| Name of Party involved (*) (Host) indicates a host | Private and/or public entity (ies) Project participants (*) | Kindly indicate if the Party involved wishes to be |
|---|---|---|

| Party) | (As applicable) | considered as project participant (Yes/No) |
|---|---|---|
| People's Republic of China (Host) | Antai Group Co., Ltd (Project Owner) | No |
| Switzerland | South Pole Carbon Asset Management Ltd. (Purchaser of VERs) | No |

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

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

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#### 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.:

>>Yi'an Town, Jiexiu City

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

>>

Antai Group Co., Ltd (AGC) is located within the Yi'an Town, which is 10km northeast away from the Jiexiu City, Shanxi Province, China. The project is settled in the second industry zone of ACG. The location of the project is shown in the map Figure A.1 ~ A.3.


Figure A1.Map of China


Figure A2. Map of Shanxi Province

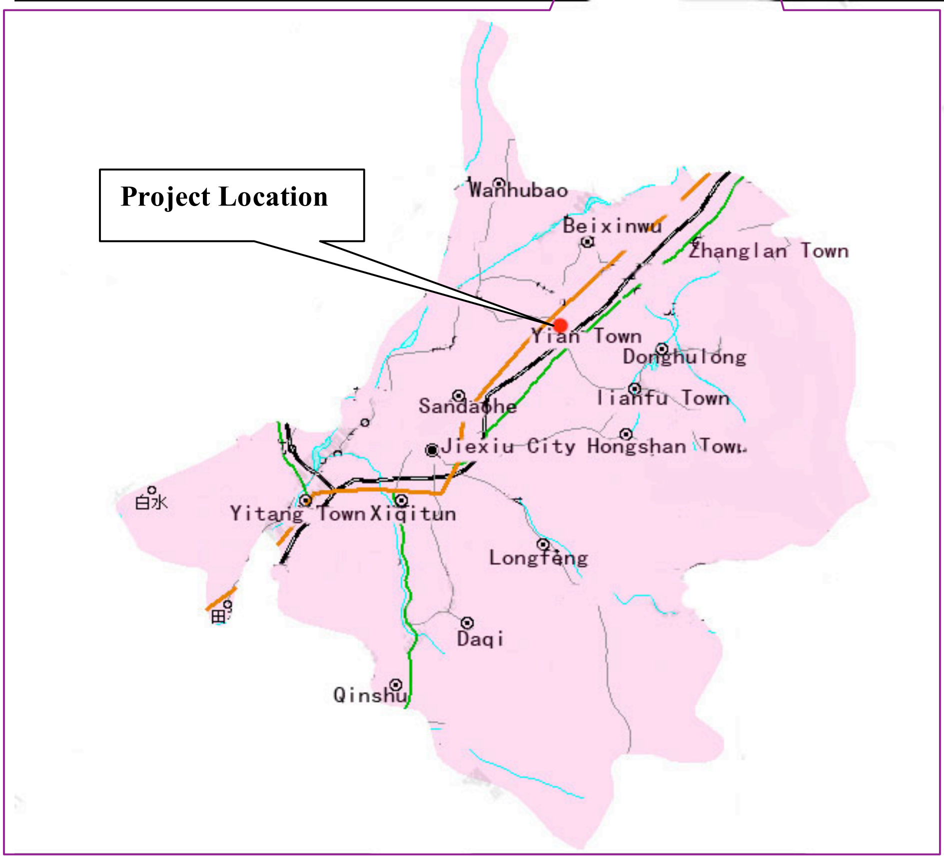


Figure A3. Map of Jiexiu City showing the project location

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

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

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

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Waste gases including blast furnace gas (BFG), coke oven gas (COG) and converter gas (CG), generated by 2×450 $m^3$ blast furnaces, 2 million tons coke ovens and 2×60 ton converters, will be pre-cleaned in respective plants and then mixed in given proportion (BFG:COG:CG=9:1:0.6), fed through coal gas pipes to 4×75t/h gas fired boilers where the mixed gas is fired to heat the water in the boiler to high temperature and high pressure steam, then driving 2×25MW steam turbine generator units to generate power to and steam is also extracted from the turbine to be utilized in the iron & steel production process. Flue gas generated in the gas firing process will be delivered to a 100m high stack (d=3.2m) to be released to the atmosphere. The Project equipment consists of the waste gas recovery system and the steam turbine generation system, as shown in the following diagram:

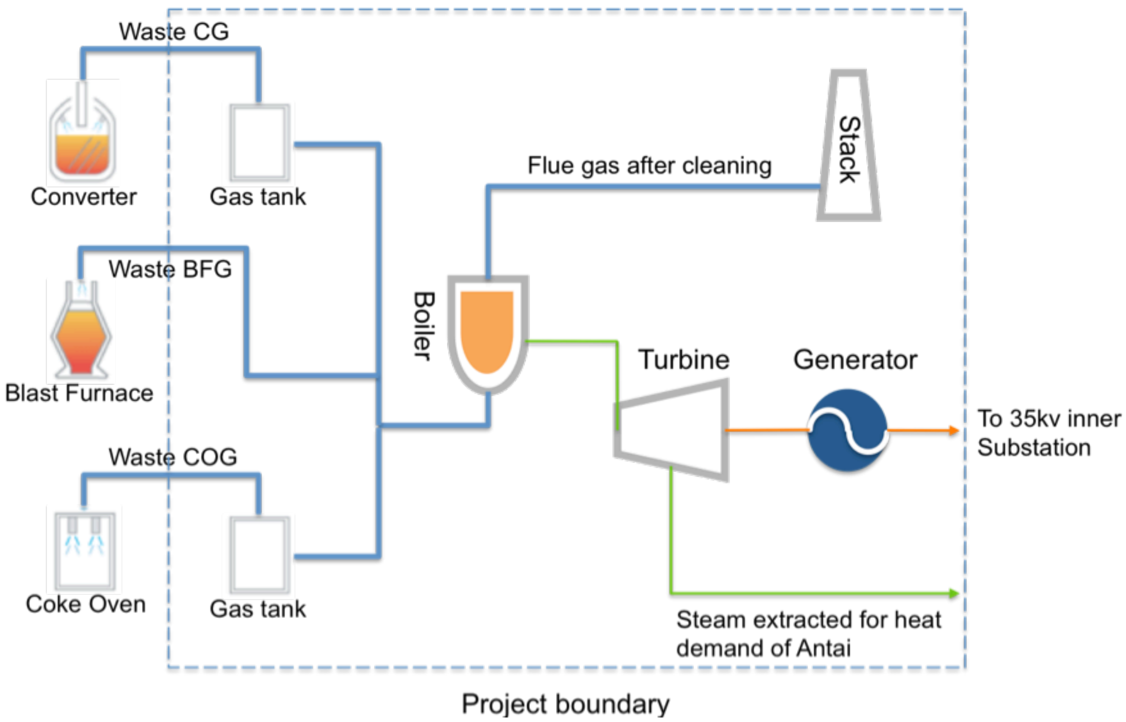


**Figure A.3 Project boundary and thermodynamic system of the project activity**

The 2×25MW generator units adopt direct air cooling system which could save 70% water consumption compared to water cooling system. The electricity generated will be delivered out by two 31.5MVA transformers equipped with two 35KV bus lines to AGC 110kV substation.

| Name | Specifications | Amount | Manufacturer |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Boiler | Model: CG-75/3.82-$Q_2$<br>Capacity: 75t/h<br>Steam pressure: 3.82MPa<br>Steam temperature: 450℃ | 4 | Sichuan Boiler Plant |
| Turbine | Model: CZK25/0.924-3.43<br>Capacity:25MW<br>Temperature: 435℃<br>Rotation speed rate: 3000r/min | 2 | East Turbine Plant |
| Generator | Type: QFW-25-2<br>Rated Voltage: 10.5kV<br>Rated rotate speed: 3000r/min<br>Power factor: 0.8<br>Cooling mode: air cooling | 2 | Jinan Generate Equipment Plant |

The operation, controlling, most monitoring and data logging for the system will be made by one set of distributed control system (DCS). The net electricity meter has been installed at the 35kv power distribution room to measure the net quantity of power supplied to the recipient plants.

The steam which is supplied to recipient would be condensed to water with atmosphere temperature. Therefore the net quantity heat supplied to recipient plants is expressed as the enthalpy between the steam supplied and the condensate water, both in energy units. Meters used to monitor heat supply to recipient plants include flow meters, thermometers and manometers.

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

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The Project will use a fixed crediting period of 10 years. The estimated annual emission reductions are 312,828t $CO_2$e/a, or 3,128,280 $CO_2$e over the entire crediting period, as shown below.

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

| **Year** | **The estimation of annual emission reductions (tCO2e)** |
|---|---|
| 2008 | 312,828 |
| 2009 | 312,828 |
| 2010 | 312,828 |
| 2011 | 312,828 |
| 2012 | 312,828 |
| 2013 | 312,828 |
| 2014 | 312,828 |
| 2015 | 312,828 |
| 2016 | 312,828 |
| 2017 | 312,828 |
| The estimation of total emission reductions in the first crediting | **3,128,28** |
| Total number of crediting years | 10 |
| The estimation of annual average emission reductions in the first crediting period | **3,128,280** |

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

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No public funding from parties included in Annex I of the convention is used to finance 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:

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**Title:** "*Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects*"

**Reference:** UNFCCC Approved consolidated baseline and monitoring methodology ACM0012, Version 03.1

**Sectoral Scope:** 01-Energy industries (renewable-/ non-renewable sources).
04-Manufacturing industries

The ACM0012 methodology refers to the Version 01 of the "*Tool to calculate the emission factor for an electricity system*" and Version 05.3 of the "*Tool for the Demonstration and Assessment of Additionality*".

For detailed information on the methodology and related tools 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 approved consolidated methodology ACM0012 Version 03 is applicable to the project due to following reasons summarized in Table B.1 and B.2 below:

**Table B.1 Type Applicability of the Methodology to the Project**

| Type | Applicable Conditions of the Methodology | Conditions of the Proposed Project |
|---|---|---|
| Type-1 | All the waste energy in identified WECM stream/s, that will be utilized in the project activity, is, or would be flared or released to atmosphere in the absence of the project activity at the existing or new facility. The waste energy is an energy source for: Cogeneration; or Generation of electricity; or Direct use as process heat source; or For generation of heat in element process (e.g. steam, hot water, hot oil, hot air); or For generation of mechanical energy. | The proposed project utilized all the waste gas from steel making and coking production for Cogeneration. Therefore, the project activity is applicable for Type-1 category; |
| Type-2 | An existing industrial facility, where the project activity is implemented, that captures and utilizes a portion of the waste gas stream(s) considered utilized in the project activity | No waste gas is captured to be utilized prior to the implementation of proposed project |

**Table B.2 Applicability of the Methodology to the Project**

| Serial No. | Applicable Conditions of the Methodology | Conditions of the Proposed Project |
|---|---|---|
| 1 | If the project activity is based on the use of waste pressure to generate electricity, | **N/A.** The proposed project utilized the waste energy based on the burn of waste |

| | | |
|---|---|---|
| | electricity generated using waste pressure should be measurable; | gas, not waste pressure |
| 2 | Energy generated in the project activity may be used within the industrial facility or exported from the industrial facility; | **Passed.** Energy generated in the project activity will be used within the industrial facility of Antai Group Co., Ltd |
| 3 | The electricity generated in the project activity may be exported to the grid or used for captive purposes; | **Passed.** The electricity generated by the Project activity is used within the industrial facility of AGC for captive purpose (substitute part of the electricity purchased from the North China Power Grid for the iron & steel production process) |
| 4 | Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility; | **Passed.** Electricity in the project activity will be generated by the owner of the industrial facility. |
| 5 | Regulations do not constrain the industrial facility that generates waste energy from using fossil fuels prior to the implementation of the project activity; | **Passed.** At present, no regulations constrain the industrial facility generating waste gas or heat from using fossil fuels in China. |
| 6 | The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility; | **Passed.** The Project utilizes the waste gas produced by existing blast furnaces, coke ovens, and converters of AGC for generation, and there is no expansion planned. |
| 7 | The waste gas/pressure utilized in the project activity was flared or released into the atmosphere in the absence of the project activity at existing facility. This shall be proven by either direct measurements, or energy balance, or energy bills, or process, or on site checks by DOE prior to project implementation. | **Passed.** In the absence of the project activity the waste gas is released into the atmosphere. The plant owner will provide the original schemes of the plant process to the DOE. |
| 8 | The emission reductions are claimed by the generator of energy using waste energy; | **Passed.** The owner of the industrial facility itself is the generator and will claim credits from the proposed project. |
| 9 | In cases where the energy is exported to other facilities, an official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source; | **Passed.** The electricity and steam would be utilized by the project owner themselves and would not be exported to other facilities |
| 10 | For those facilities and recipients included in | **Passed.** The credit period of 10 years is |

| | | |
|---|---|---|
| | the project boundary, that prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: The remaining lifetime of equipments currently being used; and Credit period. | chosen because it is shorter than the remaining lifetime of equipments currently being used. |
| 11 | Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for. | **Passed.** The waste gas released under abnormal operation of the plant is not accounted for. |

It may therefore be concluded that the project meets all applicability criteria of the methodology ACM0012 version 3 and so this methodology is applicable to the proposed Project.

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

>>

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

1. The industrial facility where waste energy is generated. For the proposed project, it is the 2×450m$^3$ blast furnaces, 2 million tons coke ovens and 2×60 ton converters where BFG, COG and CG are generated in Antai Group Co., Ltd .

2. The facility where process heat/steam/electricity/mechanical energy in element process are (generator of process heat/steam/electricity/mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary. For this proposed Project, the boundary includes the facility where electricity and steam are generated, including the boilers, turbines and the generator and all other auxiliary equipment of this proposed Project.

3. The facility/s where the process heat in the element process/steam/electricity/mechanical energy is used. (the recipient plant(s)) and/or grid where electricity is exported, if applicable. For this case, the facility where electricity and steam used is the AGC power and heat system. For this specific project, the facility where electricity used is AGC Power System, which is connected to the North China Power Grid. Based on the “Tool to calculate the emission factor for an electricity system” version 1, the spatial extent of the project is the power plants that are physically connected through transmission and distribution lines to the project activity. As China has published a delineation of the project electricity system and connected electricity system, we use the North China Grid as the project electricity system, which includes Inner Mongolia Autonomous Region, Heibei province, Shandong province, Shanxi province, Tianjin, and Beijing.

Overview of emission sources included in or excluded from the project boundary is provided in the following table B.3:

**Table B.3 Summary of Gases and Sources Included in the Project Boundary**

| | Source | Gas | Included/ Excluded | Justification / Explanation |
|---|---|---|---|---|
| **Baseline** | | $CO_2$ | **Included** | Main emission source |

| | | | | |
|---|---|---|---|---|
| | Electricity generation, grid or captive source | $CH_4$ | Excluded | Excluded for simplification. This is conservative |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative |
| | Fossil fuel consumption in boiler for thermal energy | $CO_2$ | **Included** | Main emission source |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative |
| | Fossil fuel consumption in cogeneration plant | $CO_2$ | Excluded | No cogeneration in Baseline |
| | | $CH_4$ | Excluded | No cogeneration in Baseline |
| | | $N_2O$ | Excluded | No cogeneration in Baseline |
| | Baseline emissions from generation of steam used in the flaring process, if any | $CO_2$ | Excluded | There is no emission from generation of steam used in the flaring process. |
| | | $CH_4$ | Excluded | There is no emission from generation of steam used in the flaring process. |
| | | $N_2O$ | Excluded | There is no emission from generation of steam used in the flaring process. |
| **Project Activity** | Supplemental fossil fuel consumption at the project plant | $CO_2$ | Excluded | There is no supplemental fossil fuel. |
| | | $CH_4$ | Excluded | There is no supplemental fossil fuel. |
| | | $N_2O$ | Excluded | There is no supplemental fossil fuel. |
| | Supplemental electricity consumption | $CO_2$ | Excluded | Considered in the calculation of baseline emissions, the supplemental electricity is included in the auxiliary electricity consumption |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |
| | Electricity import to replace captive electricity, which was generated using waste gas in absence of project activity | $CO_2$ | Excluded | Only in case captive electricity in the baseline is replaced by import electricity |
| | | $CH_4$ | Excluded | Only in case captive electricity in the baseline is replaced by import electricity |
| | | $N_2O$ | Excluded | Only in case captive electricity in the baseline is replaced by import electricity |
| | Project emissions from cleaning of gas | $CO_2$ | Excluded | Electricity was consumed in gas cleaning equipment in the baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored |
| | | $CH_4$ | Excluded | Electricity was consumed in gas cleaning equipment in the baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored |
| | | $N_2O$ | Excluded | Electricity was consumed in gas |

| | | | | |
|---|---|---|---|---|
| | | | | cleaning equipment in the baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored |

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

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

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

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

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

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

For the use of waste energy, ACM0012 provides four alternatives for consideration. The proposed project activity here discusses them in following Table B.4 below:

**Table B.4 Discussion of Alternatives of Use of Waste Heat/Pressure**

| ID | Alternatives from ACM0012 | Justification/Explanation | Plausible/ Not |
|---|---|---|---|
| W1 | WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized | Directly venting waste gas to the atmosphere without incineration is in conflict with the relevant item in the Gas Security Regulations for Industrial Enterprises GB6222-2005, which requires that waste gas to be flared before being vented. The waste gas in the Project consists of blast furnace gas, coke oven gas and converter gas, which are highly toxic and explosive. For safty reasons, the waste gas is flared by a specified incineration facility. Thus W1 is excluded from further consideration. | N |
| W2 | WECM is released to the atmosphere (for example after incineration) or waste heat is released to the | This baseline scenario option is in compliance with relevant Chinese laws and regulations and is also the status quo of the Project proponent in the pre-project scenario | Y |

| | | | |
|---|---|---|---|
| | atmosphere or waste pressure energy is not utilized; | | |
| W3 | Waste gas/heat is sold as an energy source | It is not applicable for residential users are to use waste gases generated from AGC facility directly for safety reasons. Meanwhile, there are no other large industrial users in the local area. Therefore, the waste gas cannot be sold as an energy source. The scenario W3 is not plausible, and not a plausible baseline scenario. | N |
| W4 | Waste energy is used for meeting energy demand; | The major energy demand of AGC is electricity and steam and waste gas can be utilized for electricity and heat generation. This is project activity not undertaken as a VER project discussed in P2 below. Therefore, W4 is plausible. | Y |
| W5 | A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared; | The project is Type-1 project, there is no existing industrial facility where the project activity is implemented, that captures and utilizes a portion of the waste gas considered in the project. Therefore, this is not recommended as part of the baseline scenario for the project. | N |
| W6 | All the waste gas produced at the industrial facility is captured and used for export electricity generation | The project is Type-1 project, there is no existing industrial facility where the project activity is implemented, that captures and utilizes a portion of the waste gas considered in the project. Therefore, this is not recommended as part of the baseline scenario for the project. | N |

For power generation, the baseline alternatives presented in ACM0012 are discussed below in Table B.5:

**Table B.5 Discussion of Alternatives of Power Generation**

| ID | Alternatives from ACM0012 | Justification/Explanation | Plausible/ Not |
|---|---|---|---|
| P1 | Proposed project activity not undertaken as a CDM project activity; | The proposed project activity not undertaken as a VER project is not against any laws or regulations of China. According to the *Feasibility Study Report*, the project activity is technically feasible (although poses poor economical factors). Hence, P1 is a plausible alternative. | Y |
| P2 | On-site or off-site existing/new fossil fuel fired cogeneration plant | The ratio between thermal energy and electricity of proposed project activity is 536.25TJ/(300TWh*3.6)=0.496 which is much | N |

| | | | |
|---|---|---|---|
| | | less than 100%. According to the "*Regulations of Cogeneration development in China*[1]", the thermal energy/electricity ratio for coal cogeneration plant with single unit below 50MW should be greater than 100%. The unit capacity of proposed project activity is 25M which is less than 50MW, therefore, construct a fossil fuel based cogeneration plant the same as project activity is against current regulation of China. P2 is not plausible. | |
| P3 | On-site or off-site existing/new renewable energy based cogeneration plant | There is no renewable energy resource available at the site of the proposed project; P3 is not an applicable alternative. | N |
| P4 | On-site or off-site existing/new fossil fuel based existing captive or identified plant | There is no existing fossil fuel based captive plant or identified plant that can directly provide electricity to plant owner; According to Chinese regulations, coal-fired power plants with capacity less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids, and the fossil fuel power units with less than 100MW is strictly regulated for installation[2]. Considering that the capacity of the proposed project activity is only 50 MW, a new fossil fuel based captive plant with equivalent amount of capacity is not allowed in China. As a conclusion, P4 is not plausible. | N |
| P5 | On-site or off-site existing/new renewable energy based existing captive or identified plant | As mentioned previously in P3, there is no renewable energy resource available at the site of the proposed project. P5 is not plausible. | N |
| P6 | Sourced Grid-connected power plants | This is current situation and common practice of iron & steel industry. The grid is North China Power Grid. P6 is plausible. | Y |
| P7 | Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the | Firstly, with lower efficiency units and same amount of waste gas, it cannot provide same amount electricity as the proposed project activity.<br><br>Secondly, the thermal system employed by the | N |

[1] This documents No. is [2000]1268, which is published by Nation planning committee, Nation Economic and Trade Commission, Nation Ministry of Construction and Nation EPA in 2000. The notification is available on the Internet: http://www.chinapower.com.cn/article/1012/art1012110.asp

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

| | | | |
|---|---|---|---|
| | project activity) | project activity is recommended by the professional design institute and it is considered as the best selection in terms of investment cost, stability and safety. Thus Antai Group Co. Ltd. did not consider any other thermal system that may have lower efficiency.<br><br>This scenario cannot therefore be regarded as a plausible baseline alternative. | |
| P8 | Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity) | Please refer to P7. This scenario cannot therefore be regarded as a plausible baseline alternative. | N |
| P9 | Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid | Previous to the implementation of project activity, no waste gas is captured for power generation. P9 is not plausible | N |
| P10 | Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce | Previous to the implementation of project activity, no waste gas is captured for power generation. P10 is not plausible | N |

| | | | |
|---|---|---|---|
| | electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export; | | |
| P11 | Existing power generating equipment is maintained and additional electricity generated by grid connected power plants. | No existing power generating equipment in AGC, all the electricity required by AGC is purchased from the North China Power Grid | N |

For power generation, the baseline alternatives presented in ACM0012 are discussed below in Table B.6:

**Table B.6** Discussion of Alternatives of Heat Generation

| ID | Alternatives from ACM0012 | Justification/Explanation | Plausible/ Not |
|---|---|---|---|
| H1 | Proposed project activity is not undertaken as a CDM project activity; | The proposed project activity not undertaken as a VER project is not against any laws or regulations of China. According to the *Feasibility Study Report*, the project activity is technically feasible (although poses poor economical factors). Hence, H1 is a plausible alternative. | Y |
| H2 | On-site or off-site existing/new fossil fuel based cogeneration plant; | The ratio between thermal energy and electricity of proposed project activity is 536.25TJ/(300TWh*3.6)=0.496 which is much less than 100%. According to the "*Regulations of Cogeneration development in China*[3]", the thermal energy/electricity ratio for coal cogeneration plant with single unit below 50MW should be greater than 100%. The unit capacity of proposed project activity is 25M which is less than 50MW, therefore, construct a fossil fuel based cogeneration plant the same as project activity is against current regulation of China. P2 is not plausible. | N |
| H3 | On-site or off-site existing/new renewable energy based cogeneration plant | There is no renewable energy resource available at the site of the proposed project; H3 is not an applicable alternative. | N |
| H4 | An existing or new fossil fuel based boilers | In the absence of the proposed project, the stable heat demand from the Iron & steel production process still exist. The fossil fuel | Y |

[3] This documents No. is [2000]1268, which is published by Nation planning committee, Nation Economic and Trade Commission, Nation Ministry of Construction and Nation EPA in 2000. The notification is available on the Internet: http://www.chinapower.com.cn/article/1012/art1012110.asp

| | | | |
|---|---|---|---|
| | | boiler can provide stable heat and is also financially attractive in the view of the project owner Thus H4 is part of the baseline scenario. | |
| H5 | An existing or new renewable energy or other waste energy based boilers | There is no renewable energy resource available at the site of the proposed project; H5 is not an applicable alternative. | N |
| H6 | Any other source such as district heat | There is no district heat supplier in the nearby area. H6 is not plausible and realistic alternatives | N |
| H7 | Other heat generation technologies (e.g. heat pumps or solar energy) | There is lack of resource to use heat pumps and it is difficult to use solar energy to provide stable heat for the industrial production demand. Besides, the new technology like the two technologies mentioned above require extremely high investment which makes them not feasible in the view of the project owner. H7 is not plausible and realistic alternatives | N |
| H8 | Steam/Process heat generation from waste energy, but with lower efficiency | Firstly, with lower efficiency units and same amount of waste gas, it cannot provide same amount heat as the proposed project activity.<br><br>Secondly, the thermal system employed by the project activity is recommended by the professional design institute and it is considered as the best selection in terms of investment cost, stability and safety. Thus Antai Group Co. Ltd. did not consider any other thermal system that may have lower efficiency. | N |
| H9 | Cogeneration with waste energy, but at a lower efficiency | Constructing a lower efficient cogeneration plant to provide steam is not in compliance with the current national energy saving and emission reduction policy. Hence it is not a part of baseline scenario. | N |

For mechanical energy generation, the methodology ACM0012 presents 5 alternatives for discussion. While for the specific case of the proposed project, they are all not applicable/plausible due to the following reasons discussed in Table B.7:

**Table B.7** Discussion of Alternatives of Mechanical Energy Generation

| ID | Alternatives from ACM0012 | Justification/Explanation | Plausible/ Not |
|---|---|---|---|
| M1-M5 | Alternatives from M1 to M5 in ACM0012 for Mechanical Energy | The proposed project activity does not involve mechanical energy generation; the alternatives for mechanical energy generation are not parallel to the | N |

| | | | |
|---|---|---|---|
| | generation | project activity. Hence, alternatives from M1 to M5, which are for Mechanical Energy generation, are not plausible. | |

Based on discussion above, the plausible alternatives are:

- W2: Waste pressure is released to the atmosphere
- W4: Waste gas/heat/pressure is used for meeting energy demand.
- P1: Proposed project activity is not undertaken as a VER project activity.
- P6: Sourced Grid-connected power plants.
- H1: Proposed project activity is not undertaken as a VER project activity
- H4: An existing or new fossil fuel based boilers

The plausible combinations of baseline options are summarized in Table B.8 as following:

**Table B.8 Plausible Combinations of Baseline Options**

| ID | Baseline Options | | | | Description of Combinations |
|---|---|---|---|---|---|
| | Waste Energy | Power | Heat | Mechanical energy | |
| B1 | W2 | P6 | H4 | / | Waste gas is flared and directly released to the atmosphere. Equivalent amount electricity is supplied by North China Power Grid and heat is provided by an existing or new fossil fuel based boilers. |
| B2 | W4 | P1 | H1 | / | Proposed project activity not undertaken as a VER project activity. |

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

The baseline fuel used in CCPG for power generation is available in abundance in China. Furthermore, there is abundant coal available in the local area according to our visiting, which could be utilized as fuel to provide heat. So, there is no fuel supply constrain.

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

Version 05.3 of "Tool for the demonstration and assessment of additionality" is used for the proposed project. According to the investment analysis in section B.5 below, the proposed project activity not undertaken as a VER project poses poor financial indicators such as an IRR of 8.69%, which is lower than the 13% benchmark.

As a conclusion, the proposed project activity not undertaken as a VER project is not financially attractive and hence not a feasible baseline option. Alternative B1, which is the continuation of the current practice, remains as the only alternative.

Please refer to section B.5 for more details.

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

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

**Baseline Scenario: Waste gas is flared and directly released to the atmosphere. Equivalent amount of electricity is supplied by North China Power Grid and heat is provided by an existing or new fossil fuel based boilers**.

**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):**

>>

Additionality of the Project is demonstrated based on Version 05.3 of "*Tool for the demonstration and assessment of additionality*".

**Previously announced projects screen (early consideration of** Carbon trade revenue**)**

The GS registration will increase the commercial attractiveness of the project, and make the project feasible by helping to overcome the investment barrier.

Table B.9 provides an overview of key events in the development of the project, which indicates that the benefits from Carbon revenue have been considered seriously at an early development stage of the project activity.

Table B.9 Overview of key events in the development of the project

| Series | Time | Key Event |
|---|---|---|
| 1 | 2000~2002 | From 2000, TU started the research regarding the feasibility of CDM projects in Shanxi province. Antai, which is one of the biggest iron & steel manufacture enterprise of Shanxi, also showed interest on CDM development and started the carbon market research by themselves. |
| 2 | 2nd Nov. 2002 | Project owner invited Japanese Mitsubishi Research Centre (MRC) and TU for further research on CDM. |
| 3 | 19th~20th Dec. 2002 | Experts of MRC and TU had a meeting with project owner, showing interest on the potential CDM projects development; |
| 4 | 14th~16th Jan. 2003 | Experts from TU introduced CDM to local government, seeking governmental support on CDM. |
| 5 | Nov. 2003 | Together with the Blast Furnace and Converter, Antai performed the EIA of project activity and also conducted the first round stakeholder consultation |
| 6 | 20th Jan, 2004 | EIA was approved by Shanxi EPA |
| 7 | April 2004 | Project owner had commissioned Shanxi Yidi Guanghua Power design institute to perform the Feasibility Study Report (FSR) of project activity; Project owner and TU from Japan had also introduced carbon market to the design institute, therefore in the FSR, carbon revenue was seriously considered. The financial analysis showed the project is only financially attractive with CDM revenue. |
| 8 | 20th May 2004 | The FSR was approved by Shanxi DRC |
| 9 | 30th May, 2004 | Board Decision |
| 10 | 13th June 2004 | The boiler contract was signed with Sichuan Boiler Company |

| | | |
|---|---|---|
| 11 | 12th Oct. 2004 | Experts of TU handled another visit of Antai to confirm the construction status of Blast furnace which generates waste blast furnace gas as fuel of the power plant and discuss the PDD development |
| 12 | 2005 | Due to complexity and difficulty in developing PDD of waste gas recovery project in 2004 and 2005, (ACM0004 was just published and calculation of emission factor was so complicated), the project owner encountered huge barrier on the CDM development; on the other hand, although TU had rich experience of CDM theory research, they didn't have any experience of PDD development. Finally, considering the construction of waste gas recovery power plant was delayed; therefore, the CDM development of project activity was postponed.<br><br>At the same time, in order to secure financial support from Carbon trade market, Antai continued to pay attention on carbon trade of China, their research centre kept doing research on the carbon market. |
| 13 | 17th Dec. 2005 | Shanxi DRC held CDM conference to promote the CDM projects in Shanxi province. Mrs. Huang, the head of engineer, represented Antai to attend this conference and submitted the project activity as potential CDM project to local DRC and tried to find some buyers and more professional consultant company to develop the waste gas recovery project. |
| 14 | 28th September 2006 | Finally, the project owner has signed the letter of intention for co-operation with Green galaxy, which is a professional consultant company. Green Galaxy tried to develop the project under CDM, however, they could not find a buyer and also could not afford the CDM development cost (Validation cost etc.). |
| 15 | January. 2007 | Project started test run |
| 16 | March 2008 | After quantity of research on carbon trade market, the project owner felt that the CDM market post 2012 was not very clear and the registration process would take a long time; in addition, the two units of project activity have already commissioned, they urgently needed external financial support. In order to pursue a long term and faster carbon revenue and considering the project activity has already commissioned, the project owner decided to change the CDM strategy to VER Market. Antai contacted Green galaxy, wanted Green galaxy to develop project as a VER project to get long-term and faster external financial support from carbon trade market |
| 17 | 15th Apr. 2008 | SPC signed VER purchase agreement with Antai |
| 18 | 22nd~23rd September 2008 | SPC conducted site visit of Antai to estimate the feasibility of Gold standard VER development |
| 19 | Oct. 2008 | Submission to GS Foundation for pre-feasibility assessment. |
| 20 | Feb. 2009 | Receive positive feedback from GS foundation and start validation process |

**Application of additionality tool (version 05.2)**

As per ACM0012, the additionality of the project activity will be demonstrated and assessed using the latest version of the "*Tool for the demonstration and assessment of additionality*" agreed by the CDM Executive Board. Version 5 of the tool is the latest one.

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

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

As stated in preceding section B.4, the alternatives to the project activity are combinations of options for using waste gas/heat and power generation. As a result, the plausible baseline scenario alternatives are:

**Scenario B1:** Waste gas is flared and directly released to the atmosphere. Equivalent amount of electricity is supplied by North China Power Grid and heat is provided by existing or new fossil fuel based boilers;
**Scenario B2:** Implementation of the proposed project without consideration of VER revenues.
B1 is also continuation of current situation.

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

***Sub-step 1b. Consistency with mandatory laws and regulations:***
Scenario B1, current operation of the plant is in compliance with mandatory legislation and regulations applicable in Shanxi Province and China.

Scenario B2, the proposed project activity undertaken without registered as a VER project is also in compliance with mandatory legislation and regulations. The plant owner has performed EIA and FSR for the power generation facility in Jan. 2004 and June. 2003 respectively; the plant has acquired approval of the EIA and FSR from local government.

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

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

***Step 2. Investment analysis***

Determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of verified emission reductions (VERs).

In this PDD, method (a) will be utilized, investment analysis determines whether the proposed project activity is economically or financially less attractive than alternative B1, identified in step 1, without the revenue from the sale of voluntary emission reductions (VERs). To conduct the investment analysis, the PDD uses the following sub-steps:

***Sub-step 2a. Determine appropriate analysis method***

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

Besides the revenue from the sale of VERs, the project activity does generate financial and economic benefits through reduction of electricity purchase from the grid and steam generated by fossil fuel. Therefore Option I “simple cost analysis” is not appropriate. Currently the plant owner does not have any

investment options other than the proposed project activity, hence Option II "investment comparison analysis" is not preferable; the PDD here applies Option III "benchmark analysis" to perform the investment analysis and demonstrate that the proposed project activity is not likely to be the most financially attractive option.

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

The proposed project uses project IRR as the financial indicator and benchmark is derived from government-approved benchmark where such benchmarks are used for investment decisions; the official benchmark IRRs are publicly available. According to "*The Economic Assessment Method and Parameters for Construction Projects (version 03)*[4]", the iron and steel sector benchmark IRR is 13%.

The key figures and project IRR with and without revenue from VERs are listed in the following Table B.7. Without VERs revenue, the equity IRR of the proposed project is 8.69%, lower than the benchmark IRR. While considering VERs revenue, the IRR of the proposed project is 13.75%, higher than the benchmark.

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

| Series | Parameter | Unit | Value | Source |
|---|---|---|---|---|
| 1 | Total investment | 10000RMB | 25843.75 | FSR |
| 1.1 | Investment of Fixed Assets | 10000RMB | 25779.55 | FSR |
| 1.2 | Working capital | 10000RMB | 214 | FSR |
| 1.2.1 | Working capital from bank loan | 10000RMB | 149.8 | FSR |
| 1.2.1.1 | Working capital Interest Rate | % | 5.58 | FSR |
| 1.2.2 | Working capital owned by PO | 10000RMB | 64.2 | FSR |
| 1.3 | Interests of Construction Period | 10000RMB | 0 | FSR |
| 2 | Annual average revenue | 10000RMB | 8857.2 | FSR |
| 2.1 | Annual power supply | MWh | 26400 | FSR |
| 2.2 | Electricity purchase tariff | RMB/kWh | 0.316 | FSR |
| 2.3 | Annual coal saving from steam | 10000t | 2.86 | FSR |
| 2.4 | Coal purchase tariff | RMB/t | 180 | FSR |
| 3 | Tax | | | |
| 3.1 | VAT | % | 17% | FSR |
| 3.2 | City's Public Utilities Surtax | % of VAT | 7% | FSR |
| 3.3 | Surtax of Education Funds | % of VAT | 3% | FSR |
| 3.4 | Income Tax | % | 33% | FSR |
| 3.5 | Accumulation Fund | % | 5% | FSR |
| 4 | Average OM cost | 10000RMB | 4939.9 | Calculation |
| 5 | Average total profit | 10000RMB | 2508.4 | Calculation |
| 6 | Average income tax | 10000RMB | 827.8 | Calculation |
| 7 | Average net profit | 10000RMB | 1680.7 | Calculation |
| 8 | VER | t | 312,828 | Calculation |
| 9 | GS VER price | Euro | 4.5 | Estimation |

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

| | | | | |
|---|---|---|---|---|
| 10 | IRR | | | |
| 10.1 | IRR (After income tax) | % | 8.68% | Calculation |
| 10.2 | IRR (With VER after income tax) | % | 13.75% | Calculation |

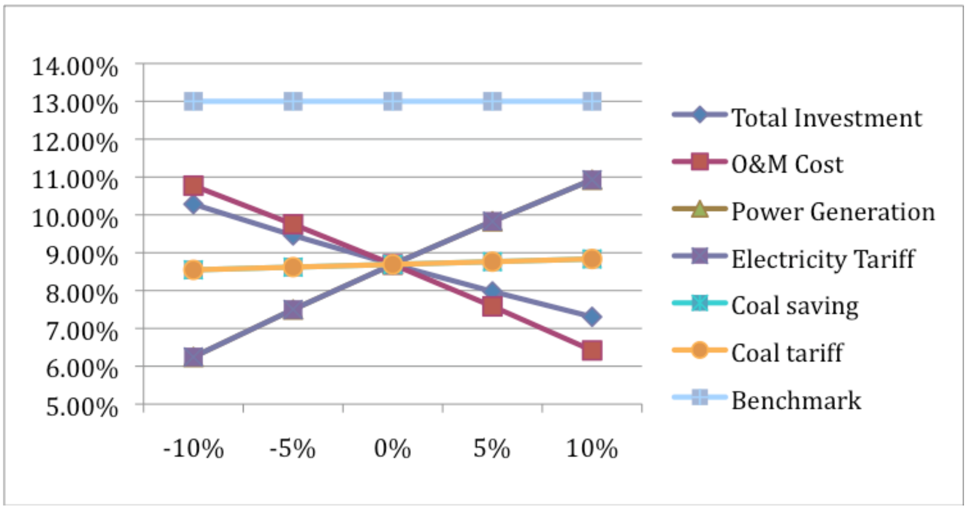
***Sub-step 2d. Sensitivity analysis:***

Purpose of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The variables chosen for sensitivity analysis are total investment, cost of operation and maintenance (O&M), power generation, electricity tariff, coal saving amount and coal purchase tariff.

Variations in IRR driven from fluctuation of total investment, O&M cost, power generation, electricity tariff, coal saving amount and coal purchase tariff are summarized in Table B.8 as following:

**Table B.8 Sensitive Analysis of IRR**

| Variable | Total Investment | O&M Cost | Power Generation | Electricity Tariff | Coal saving | Coal tariff |
|---|---|---|---|---|---|---|
| -10% | 10.51% | 10.76% | 6.24% | 6.24% | 8.54% | 8.54% |
| -5% | 9.56% | 9.74% | 7.49% | 7.49% | 8.61% | 8.61% |
| 0% | 8.68% | 8.68% | 8.68% | 8.68% | 8.68% | 8.68% |
| 5% | 7.87% | 7.58% | 9.82% | 9.82% | 8.76% | 8.76% |
| 10% | 7.10% | 6.41% | 10.92% | 10.92% | 8.83% | 8.83% |




The analysis shows that the IRR is more sensitive to the power generation and electricity tariff, while it is less sensitive to coal saving amount and coal purchase tariff. The IRR is always less than the benchmark of 13% when the two parameters fluctuate in the range of -10% to +10%.

Outcome of Step 2:
Since after the sensitivity analysis it is concluded that the proposed project activity is unlikely to be financially attractive, step 3 of “barrier analysis” is not required by the additionality tool.

***Step 3. Barrier analysis***
N/A

***Step 4. Common practice analysis***
***Sub-step 4a – Analyze other activities similar to the proposed project activity***

"*Tool for the demonstration and assessment of additionality*" indicates that Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

The project activity is located in the middle of Shanxi Province. Shanxi is a province-level administrative region. It is one of the biggest industry provinces of China. Shanxi has 156,000 square kilometers area and 34.1 million populations until 2007, which is comparable in size and population to most countries. Therefore, it is reasonable to select Shanxi as the region to analyze the occurrence similar projects.

The project activity is a very special waste gas recovery project. It utilizes the mixed gas which includes BFG, COG and CG to co-generate electricity and steam. The technology of proposed project activity is different with projects which utilizes only one kind of waste gas above, because if the percentage of each gas is changed the heat value of mixed gas will also be changed. Therefore, so far no project activity of this scale and similar type can be observed in Shanxi province. The project activity was the only one of its kind to be implemented in Shanxi province.

Therefore, considering the number of waste gas power cogeneration projects, it is considered that the similar activities are not widely observed and commonly carried out in Shanxi Province.

***Sub-step 4b – Discuss any similar options that are occurring***
As the description above, the project activity was the only one of its kind to be implemented in Shanxi province. Furthermore, The proposed project not undertaken as a VER project activity is not financial attractive. This reinforces the evidence that the proposed project faces barriers that require VER support to be overcome.

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

In conclusion, the proposed VER project activity is additional.

**B.6. Emission reductions:**

**B.6.1. Explanation of methodological choices:**

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**1. Baseline Emissions**

As per ACM0012, the baseline emissions for the year *y* shall be determined as follows:

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

Where:

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

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

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

$BE_{flst,y}$ baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO2e per year). This is relevant for those project activities where in the baseline steam is used to flare the waste gas. In this project, no fossil fuel used to flare the waste gas, hence $BE_{flst,y}=0$.

As discussed in Section B.4 and B.5, the baseline options for the project activity are W2, P6, and H4 which in the methodology is labeled in Scenario 1. Thus we have identified Scenario 1 as the applicable scenario for the calculation of baseline emissions as electricity is obtained from the NCPG, heat from newly built coal-based steam boiler.

As per the methodology, equation (*1a*) applies for calculation of $BE_{En,y}$:

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

$BE_{Elec,y}$ are baseline emissions from electricity during the year y in tons of CO2

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

The waste gas of this project activity is belong to Type-1 category, as per the methodology:

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

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y})$$

Where:

$BE_{elec,y}$ are baseline emissions due to displacement of electricity during the year *y* in tons of $CO_2$

$EG_{i,j,y}$ is the quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from $i^{th}$ source (*i* can be either grid or identified source) during the year *y* in MWh, and

$EF_{elec,i,j,y}$ is the CO2 emission factor for the electricity source *i* (*i*=gr (grid) or *i*=is (identified source)), displaced due to the project activity, during the year *y* in tons CO2/MWh

$f_{wcm}$ Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy. If the boiler providing steam for electricity generation uses both waste and fossil fuels, this factor is estimated using equation (1d) of ACM0012. If the steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1d/1e) of ACM0012. For the project activity, this fraction is 1 because the electricity and steam generation are purely from use of the waste mixed gas.

$f_{cap}$ Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than that generated in base year. The value is estimated using equations (1f), or (1f-1) or (1f-2), or (1g), (1g-1) or (1h)

**Calculation of $EF_{elec,i,j,y}$**

For the proposed project, the displaced electricity is supplied by a connected grid system (NCPG).

According to ACM0012, the CO2 emission factor of the electricity $\boldsymbol{EF_{elec,i,j,y}}$ shall be determined following the guidance provided in the version 1 "Tool to calculate the emission factor for an electricity system".

***Step 1. Identify the relevant electric power system***

As per delineation of Chinese national electric system published by *National Development and Reform Commission*, which is also Chinese DNA, the relevant electric power system is *North China Power Grid*. The Project's electricity generation unit is connected to the *Shanxi Power Grid* via local grid network, and thus finally to the *North China Power Grid*. The *North China Power Grid* is a large regional grid, which consists of six sub-grids *Inner Mongolia Autonomous Region, Hebei province, Shandong province, Shanxi province, Tianjin, and Beijing Power Grid*. There is substantial inter-grid power exchange among the above-mentioned sub-grids of the *North China Power Grid*. The *North China Power Grid* can be clearly identified as regional grid and information on the characteristics of this grid is publicly available. [5]

To determine the operating margin emission factor, use the simple operating margin emission rate of the exporting grid, determined as described in step 3 (a) to calculate the $CO_2$ emission factor(s) for net electricity imports ($EF_{grid,import,y}$) from a connected electricity system within the same host country(ies).

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

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

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

As per *"Tool to calculate the emission factor for an electricity system"* (Version 1), any of the four methods can be used. "Dispatch Data Analysis" method is not selected herein, because dispatch data are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

The Simple OM method has been chosen instead. This is possible because low cost/ must run resources account for less than 50% of the power generation in the grid in most recent years. From 2003 to 2006, according to gross annual power generation statistics for the *North China Power Grid*, the ratio of power generated by hydro-power and other low cost/compulsory resources was: 0%, 0.81%, 0.75%, and 0.51% for 2003, 2004, 2005, and 2006, respectively, Therefore, it can be shown that low-cost/compulsory resources constitute less than 50% of total grid generation in the *North China Power Grid*. Thus, the simple OM method is applicable.[6]

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

[6] *China Energy Year Book, 2003-2007*

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

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

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

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

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

The calculation equation of the Simple OM is as follows:

$$EF_{Grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum_{m} EG_{m,y}} \qquad \text{Equation (1)}$$

Where:

| | |
|---|---|
| $EF_{grid,OMsimple,y}$ | Simple operating margin CO2 emission factor in year *y* (tCO2/MWh) |
| $FC_{i,m,y}$ | Amount of fossil fuel type *i* consumed by power plant/unit m in year *y* (mass or volume unit) |
| $NCV_{i,y}$ | Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit) |
| $EF_{CO2,i,y}$ | CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ) |
| $EG_{m,y}$ | Net electricity generated and delivered to the grid by power plant/unit *m* in year *y* (MWh) |
| *m* | All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units [7] |

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

| | |
|---|---|
| *i* | All fossil fuel types combusted in power plant / unit m in year y |
| *y* | Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2 |

The Operating Margin emission factors for 2004, 2005 and 2006 are calculated separately and then the three-year average is calculated as a full-generation-weighted average of the emission factors. For details please refer to Annex 3. The result of the Operation Margin Emission Factor calculation is 1.1169 $tCO_2e/MWh$.

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

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

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

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

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

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[8] the following deviation in methodology application:

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

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

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

*Option 1.* For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of

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

the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

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

***Step 5. Calculate the build margin emission factor***

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

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

*Sub-step 1*

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

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad \text{Equation (2)}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad \text{Equation (3)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}} \qquad \text{Equation (4)}$$

Where,

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

$COEF_{i,j,m}$ is the $CO_2$ emission coefficient of fuel $i$ ($tCO_2e$/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants m and the oxidation percentage of the fuel in year(s) y,
*Coal, Oil* and *Gas* stands for solid, liquid and gas fuels respectively.

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

$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv} \qquad \text{Equation (5)}$$

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

A coal-fired power plant with a total installed capacity of 600 MW is assumed to be the best commercially available technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 329.94 gce/kWh, which corresponds to an efficiency of 37.28% for electricity generation.

For gas and oil power plants a 200MW power plant with a specific fuel consumption of 252 gce/kWh, which corresponds to an efficiency of 48.81% for electricity generation, is selected as the best commercially available technology in terms of efficiency.

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

*Sub-step 3*: Calculate the Build Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \cdot EF_{Thermal} \qquad \text{Equation (6)}$$

Where,

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

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

Detailed calculations are provided in Annex 3.

The result of the Build Margin emission factor calculation is 0.8687 $tCO_2e$/MWh.

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

The data sources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants for the years 2004 to 2006
   Source: *China Electric Power Yearbook* (2005-2007)
2. Fuel consumption and the net caloric value of thermal power plants the years 2004 to 2006
   Source: *China Energy Statistics Yearbook* (figures are for 2005-2007)
3. Carbon emission factor and carbon oxidation factor of each fuel
   Source: *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook*, P1.23 and P1.24 in Chapter one.

***Step 6. Calculate the combined margin emissions factor***

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

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \qquad \text{Equation (7)}$$

The operating margin emission factor ( $EF_{grid,OM,y}$) of China Southern Grid is 1.1169 $tCO_2e/MWh$ and the build margin emission factor ( $EF_{grid,BM,y}$) is 0.8687 $tCO_2e/MWh$. The defaults weights are used as specified in the emission factor tool: $w_{OM} = 0.5$; $w_{BM} = 0.5$

The result of the Baseline Emission Factor ( $EF_y$ ) calculation is 0.9928$tCO_2e/MWh$.

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

$$BE_{Ther,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (HG_{i,j,y} + (MG_{i,j,y,tur} / \eta_{mech,tur})) * EF_{Heat,j,y}$$

Where:

$BE_{Ther,y}$ Baseline emissions from thermal energy (as steam) during the year y in tons of CO2

$HG_{i,j,y}$ Net quantity of heat supplied to the recipient plant j by the project activity during the year y in TJ (In case of steam this is expressed as difference of energy content between the steam supplied to the recipient plant and the condensate returned by the recipient plant(s) to element process of cogeneration plant. In case of hot water/oil this is expressed as difference in energy content between the hot water/oil supplied to and returned by the recipient plant(s) to element process of cogeneration plant). This includes steam supplied to recipients that may be used for generating mechanical energy

$f_{wcm}$ Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy. If the boiler providing steam for electricity generation uses both waste and fossil fuels, this factor is estimated using equation (1d) of ACM0012. If the steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1d/1e) of ACM0012. For the project activity, this fraction is 1 because the electricity generation is purely from use of the waste mixed gas.

$f_{cap}$ Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than that generated in

base year. The value is estimated using equations (1f), or (1f-1) or (1f-2), or (1g), (1g-1) or (1h)

***$EF_{Heat,j,y}$*** The CO2 emission factor of the element process supplying heat that would have supplied the recipient plant j in absence of the project activity, expressed in tCO2/TJ and calculated as follows:

***$MG_{i,j,y,tur}$*** Mechanical energy generated and supplied to the recipient j, which in the absence of the project activity would receive power from a steam turbine i, driven by steam generated in a fossil fuel boiler. Refer monitoring table for the guidance to estimate this parameter. For this project, none mechanical energy is generated, ***$MG_{i,j,y,tur}$*** =0

$\eta_{mech,tur}$ The efficiency of the baseline equipment (steam turbine) that would provide mechanical power in the absence of the project activity

***$EF_{Heat,j,y}$*** is calculated as follows:

$$EF_{Heat,j,y} = \sum_i ws_{i,j} \frac{EF_{CO2,i,j}}{\eta_{EP,i,j}}$$

Where:

***$EF_{CO2,i,j}$*** The CO2 emission factor per unit of energy of the baseline fuel used in i$^{th}$ boiler used by recipient j, in tCO2/TJ, in absence of the project activity

$\eta_{EP,i,j}$ Efficiency of the i$^{th}$ element process that would have been supplied heat to j$^{th}$ recipient in the absence of the project activity

***$ws_{i,j}$*** Fraction of total heat that is used by the recipient j in the project that in absence of the project activity would have been supplied by the i$^{th}$ boiler

Efficiency of the element process ($\eta_{EP,i,j}$) shall be one of the following:

i. Assume a constant efficiency of the element process and determine the efficiency, as a conservative approach, for optimal operation conditions i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc), representative or favorable ambient conditions (ambient temperature and humidity); or
ii. Highest of the efficiency values provided by two or more manufacturers for element process with specifications similar to that would have been required to supply the recipient with heat that it receives from the project activity; or
iii. Maximum efficiency of 100%;
iv. Estimated from load v/s efficiency curve(s) established for each element process(es) through measurement and described in Annex 1. Follow international standards for estimation of efficiency of individual element process.

In a conservative way, here we use the maximum efficiency of 100%.

**Capping of baseline emissions**

As a measure of conservativeness, ACM0012 requires that baseline emissions should be capped. Three methods are outlined in the methodology for calculating this. For the proposed project, the blast furnace was totally completed in the early 2008, there is no 3 years historical data available. Therefore method one is not applicable. On the other side, in the iron and steel manufacture process, the blast furnace and converter would consume part of BFG and CG which generated by themselves; and based on different

operating mode, the consumption amount is also different, hereby the proposed project activity is a "Case-2 type project" under the Method 3 as the energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases $f_{cap}$ should be the ratio of actual energy recovered under the project activity (direct measurement) divided by the maximum theoretical energy recoverable using the project activity waste heat recovery equipment. For estimating the theoretical recoverable energy, manufacturer's specifications can be used. Alternatively, technical assessment can be conducted by independent qualified/certified external process experts such as chartered engineers.

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

Where:

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

The proposed project generates both electricity and heat, there are two kinds of final output, and in baseline, the ER generated from electricity and heat are calculated respectively. Therefore we would calculate $f_{cap}$ for electricity and heat respectively.

From FSR which is conducted by Shanxi Yidi Power Design Institute, the maximum electricity recovered from the mixed waste gas is 264,000MWh; and the maximum heat recovered from the mixed waste gas is 536.25TJ. i.e. $Q_{OE,BL,elec}$=264,000MWh and $Q_{OE,BL,heat}$=536.25TJ.

We apply a value of 1 for both electricity and heat in subsequent calculations of emission reductions. The project entity will monitor electricity and heat output ($Q_{OE,y,elec}$ and $Q_{OE,y,heat}$) of the proposed project activity in accordance with the methodology and $f_{cap}$ will be updated ex-post in case the actual electricity and heat output exceeds the electricity and heat output which is theoretically available on the basis of the current baseline conditions.

**2. Project Emissions (PEy)**

The GHG emissions induced by the project activity can be calculated according to the following formula:

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

Where:

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

According to the Feasibility Study Report of the Project, no additional fuel will be used as auxiliary fuel, $PE_{AF,y}$ =0; For the proposed project activity, waste gas will be cleaned in the absence of the project

activity, so it should not be regarded as the project emission caused by the project activity, thus $PE_{EL,y}$ is zero.

Also the auxiliary amount of electricity consumed by the project activity is deducted when to determine the baseline emission. So, the project emission is zero.

**3. Leakage**
There is no equipment transfer from/to another site involved in proposed project activity. Hence, there is no leakage in project activity.

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

The following data and parameters are mentioned in the ACM0012 methodology, but are related to the calculation of the grid emission factor in accordance with the "Tool to calculate the emission factor for an electricity system"

| **Data / Parameter:** | $F_{i,j,y}$ |
|---|---|
| Data unit: | $10^4$t/$10^8$m$^3$ |
| Description: | The amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y |
| Source of data used: | China Energy Statistical Yearbook 2004-2006 |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official released statistical data; publicly accessible and reliable data source |
| Any comment: | |

| **Data / Parameter:** | $OXID_j$ |
|---|---|
| Data unit: | % |
| Description: | Oxidation factor of power generation fuel |
| Source of data used: | IPCC |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default value is used because no national specific data is publicly issued |
| Any comment: | |

| **Data / Parameter:** | $NCV_i$ |
|---|---|
| Data unit: | kj/kg or kj/ m$^3$ |
| Description: | The net calorific value per mass or volume unit of a fuel i |

| | |
|---|---|
| Source of data used: | China Energy Statistical Yearbook 2006 |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official released statistical data; publicly accessible and reliable data source |
| Any comment: | |

| **Data / Parameter:** | ***$EF_{CO2,i}$*** |
|---|---|
| Data unit: | tC/TJ(which can be converted to $tCO_2e/TJ$) |
| Description: | The $CO_2$ emission factor per unit of energy of the fuel i |
| Source of data used: | Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook |
| Value applied: | 94.6 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | In the baseline scenario, coal is identified as the baseline fuel. And according to the default value from IPCC 2006, the CO2 emission factor of coal is 94.6 tCO2/TJ. |
| Any comment: | |

| **Data / Parameter:** | ***$GEN_{j,y}$*** |
|---|---|
| Data unit: | MWh |
| Description: | The electricity generation by thermal power source *j* in year *y* of each province connected to NCPG |
| Source of data used: | China Electrical Power Yearbook 2004~2006 |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official released statistical data; publicly accessible and reliable data source |
| Any comment: | |

| **Data / Parameter:** | $e_{j,y}$ |
|---|---|
| Data unit: | % |
| Description: | The internal use rate of thermal power source *j* in each province connected to NCPG. |
| Source of data used: | China Electrical Power Yearbook 2004~2006 |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of | Official released statistical data; publicly accessible and reliable data source |

| | |
|---|---|
| measurement methods and procedures actually applied : | |
| Any comment: | |

| **Data / Parameter:** | $CAP_{i,j,y}$ |
|---|---|
| Data unit: | MW |
| Description: | The installed capacity of power sources i of province j in the years y |
| Source of data used: | China Electric Power Yearbook 2002~2007 |
| Value applied: | See Annex 3 for details |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data publicly accessible and reliable data source |
| Any comment: | |

The following data and parameters are to determine $f_{cap}$

| **Data / Parameter:** | $Q_{OE,BL,elec}$ |
|---|---|
| Data unit: | MW |
| Description: | Electricity output that can be theoretically produced (in appropriate unit), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity. |
| Source of data used: | Feasibility Study Report |
| Value applied: | 264,000MW |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The data is from the feasibility study report and supplied by on-site specialists |
| Any comment: | This is to determine the $f_{cap,elec}$ |

| **Data / Parameter:** | $Q_{OE,BL,heat}$ |
|---|---|
| Data unit: | TJ |
| Description: | Heat output that can be theoretically produced (in appropriate unit), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity. |
| Source of data used: | Feasibility Study Report |
| Value applied: | 536.25TJ |
| Justification of the | The data is from the feasibility study report and supplied by on-site specialists |

| | |
|---|---|
| choice of data or description of measurement methods and procedures actually applied: | |
| Any comment: | This is to determine the $f_{cap,heat}$ |

| **Data / Parameter:** | $\eta_{BL}(\eta_{EP,i,j}, \eta_{plant,j}, \eta_{Cogen})$ |
|---|---|
| Data unit: | % |
| Description: | Baseline efficiency of the element process /captive power plant/cogeneration plant |
| Source of data used: | |
| Value applied: | 100% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | To be conservative |

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

>>

**Step 1: Baseline Emissions (*BEy*)**

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

$BE_y = BE_{En,y} = BE_{Elec,y} + BE_{Ther,y}$

According to the feasibility study report, the annual power supply to the recipients is 264,000MWh. The CO2 emission factor of the North China Power Grid is 0.9928 tCO2e/MWh; $f_{wcm} = f_{cap,elec} = 1$

$$BE_{Elec,y} = f_{cap,elec} * f_{wcm} * EG * EF_{Elec} = 262{,}099t$$

According to the feasibility study report, the annual heat supply to the recipients is 536.25TJ; to use IPCC default data, $EF_{CO2}$=94.6tCO2/TJ; in a conservative way, here we use the maximum efficiency $\eta_{EP}$ of 100%.

$$BE_{Ther,y} = f_{cap,heat} * f_{wcm} * HG * \frac{EF_{CO2}}{\eta_{BL}} = 50{,}729t$$

$BE_y$ = 262,099+50,729=312,828tCO2

**Step 2: Project emission**

There is no combustion of auxiliary fuel to supplement waste gas and waste gas will be cleaned in the absence of the project activity, so it should not be regarded as the project emission caused by the project

activity, so $PE_y$ = 0tCO2e

**Step 3: Leakage**
According to the methodology, the leakage is zero, i.e., $Ly$= 0

**Step 4: Emission reduction**

$ER_y = BE_y - PE_y$ =312,828tCO2

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

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

| Year | Estimation of project activity emissions (tones of CO2 e) | Estimation of baseline emissions (tones of CO2 e) | Estimation of leakage (tones of CO2 e) | Estimation of overall emission reductions (tones of CO2 e) |
|---|---|---|---|---|
| 2008 | 0 | 312,828 | 0 | 312,828 |
| 2009 | 0 | 312,828 | 0 | 312,828 |
| 2010 | 0 | 312,828 | 0 | 312,828 |
| 2011 | 0 | 312,828 | 0 | 312,828 |
| 2012 | 0 | 312,828 | 0 | 312,828 |
| 2013 | 0 | 312,828 | 0 | 312,828 |
| 2014 | 0 | 312,828 | 0 | 312,828 |
| 2015 | 0 | 312,828 | 0 | 312,828 |
| 2016 | 0 | 312,828 | 0 | 312,828 |
| 2017 | 0 | 312,828 | 0 | 312,828 |
| **Total** (tones of CO2e) | **0** | **3,128,280** | **0** | **3,128,280** |

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

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

| **Data / Parameter:** | $EG_y$ ($Q_{OE,y,elec}$) |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity production by the project activity in cogeneration plant during the year *y* |
| Source of data to be used: | Data used in the PDD is obtained from the Feasibility Study Report of the project. Actual value will be obtained from relevant meters. |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 264,000 |

| | |
|---|---|
| Description of measurement methods and procedures to be applied: | measured by electric meter, Continuously and aggregated monthly |
| QA/QC procedures to be applied: | $EG_y$ will be measured at transformer station with ammeters. Ammeters would be properly maintained with regular testing and calibration schedules developed as per the technical specification requirements to ensure accuracy |
| Any comment: | |

| **Data / Parameter:** | ***$HG_y$ ($Q_{OE,y,heat}$)*** |
|---|---|
| Data unit: | TJ |
| Description: | Net quantity of heat supplied to the recipient plant by the project activity during the year *y* in TJ. |
| Source of data to be used: | Data used in the PDD is obtained from the Feasibility Study Report of the project. Actual value will be obtained from relevant meters. |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 536.25 |
| Description of measurement methods and procedures to be applied: | The quantity of the heat will be measured by the flow meter, thermometer and manometer. The data from meters will be recorded in detail. |
| QA/QC procedures to be applied: | This data item is calculated value using other data items. No QA/QC required |
| Any comment: | |

| **Data / Parameter:** | **S** |
|---|---|
| Data unit: | t/h |
| Description: | Steam supplied to the recipient plants by the proposed project activity during the year y |
| Source of data to be used: | Measurement records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | |
| Description of measurement methods and procedures to be applied: | Data are measured continuously;<br>The steam quantity is accumulatively recorded monthly; |
| QA/QC procedures to be applied: | The flow meter will undergo maintenance/calibration subject to national standard. Flow meters will be calibrated by Qualified institution or entity once a year and calibration documents will be kept by AGC. Monthly Sales records |

| | |
|---|---|
| | would be kept by AGC. |
| Any comment: | |

| **Data / Parameter:** | $T_s$ |
|---|---|
| Data unit: | ℃ |
| Description: | Temperature of steam supplied to the recipient plants by the proposed project activity during the year y |
| Source of data to be used: | Measurement records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | |
| Description of measurement methods and procedures to be applied: | Thermometer is used to measure onsite steam temperature; The temperature is recorded every an hour; Temperature is archived in paper and in the electronic way. The hourly values for the day are averaged out to compute the daily average values. The average monthly values are arrived at by averaging out the daily reported values for the month. And the averaged monthly values will be used for estimating the enthalpy for the steam. |
| QA/QC procedures to be applied: | The thermometer meter will undergo maintenance/calibration subject to national standard. Thermometer will be calibrated by Qualified institution or entity once a year and calibration documents will be kept by AGC. |
| Any comment: | |

| **Data / Parameter:** | $P_s$ |
|---|---|
| Data unit: | MPa |
| Description: | Pressure of steam supplied to the recipient plants by the proposed project activity during the year y |
| Source of data to be used: | Measurement records |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | |
| Description of measurement methods and procedures to be applied: | Manometer is used to measure onsite steam pressure; The pressure is recorded every an hour; Pressure data is recorded both in paper and in the electronic way. The hourly values for the day are averaged out to compute the daily average values. The average monthly values are arrived at by averaging out the daily reported values for the month. And the averaged monthly values will be used for estimating the enthalpy for the steam. |
| QA/QC procedures to be applied: | The manometer meter will undergo maintenance/calibration subject to national standard. Manometer will be calibrated by Qualified institution or entity once a year and calibration documents will be kept by AGC. |
| Any comment: | |

Inapplicable data and parameters

The following data and parameters are mentioned in the ACM0012 methodology as data and parameters to be monitored, but are not applicable to this particular project activity:

| **Data / Parameter:** | ***FF*** |
|---|---|
| Data unit: | $NM^3$ or ton |
| Description: | Quantity of fossil fuel type *i* combusted to supplement waste gas in the project activity during the year *y*, in energy or mass units |
| Source of data: | Not applicable. The project design does not include the firing of fossil fuels. Therefore no value is applied in the calculation of emission reductions due to the project activity and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | ***WS*** |
|---|---|
| Data unit: | |
| Description: | Fraction of total heat that is used by the recipient j in the project that in absence of the project activity would have been supplied by the $i_{th}$ boiler. |
| Source of data to be used: | Not applicable. The proposed project activity does involve supply of heat to the recipient in the baseline. Therefore no value is applied in the calculation of emission reductions due to the project activity and monitoring is not required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | $EF_{CO2,COG}$ |
|---|---|
| Data unit: | Tones $CO_2$/ TJ |
| Description: | $CO_2$ emission factor per unit of energy of the fuel that would have been used in the baseline cogeneration plant. |
| Source of data to be used: | Not applicable. The baseline situation does not involve a cogeneration plant. Therefore no value is applied in the calculation of emission reductions due to the project activity and monitoring is not required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | $EF_{CO2,j}$ |
|---|---|

| | |
|---|---|
| Data unit: | Tones $CO_2$/ TJ |
| Description: | $CO_2$ emission factor of fossil fuel ($tCO_2$/TJ) that would have been used at facility '*j*' for flaring the waste gas. |
| Source of data to be used: | Not applicable. The proposed project activity does not involve the flaring of waste gas at the facility in the baseline. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | $Q_{i,k}$ |
|---|---|
| Data unit: | $Nm^3$ / h |
| Description: | Amount of individual fuel (waste gas and other fuel(s)) i consumed at the energy generation unit during hour h |
| Source of data: | Not applicable. The proposed project activity does not consume fuels at the energy generation. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | $ST_{whr,y}$ |
|---|---|
| Data unit: | kCal/kg or kJ/kg |
| Description: | Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header |
| Source of data to be used: | Not applicable. The proposed project activity does not involve the utilization of a common steam header with multiple sources. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| **Data / Parameter:** | $ST_{other,y}$ |
|---|---|
| Data unit: | kCal/kg or kJ/kg |
| Description: | Energy content of the steam generated in other boilers fed to turbine via common steam header |
| Source of data to be used: | Not applicable. The proposed project activity does not involve the utilization of a common steam header with multiple sources. Therefore no value is applied and no monitoring is required. |
| Measurement procedures | Not applicable |

| | |
|---|---|
| (if any): | |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| | |
|---|---|
| **Data / Parameter:** | $EC_{PJ,y}$ |
| Data unit: | MWh |
| Description: | Additional electricity consumed in year *y*, for gas cleaning equipment, as a result of the implementation of the project activity. |
| Source of data to be used: | Not applicable. The proposed project activity does not involve gas cleaning. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| | |
|---|---|
| **Data / Parameter:** | $FC_{EL,CP,k,y}$ |
| Data unit: | Mass or volume unit |
| Description: | Quantity of fuel type *k* combusted in the captive power plant at the project site in year *y* where *k* are the fuel types fired in the captive power plant at the project site in year *y* |
| Source of data to be used: | Not applicable. The proposed project activity does not involve captive power in the baseline scenario. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| | |
|---|---|
| **Data / Parameter:** | $NCV_k$ |
| Data unit: | GJ / mass or volume unit |
| Description: | Net calorific value of fuel type *k* where *k* are the fuel types fired in the captive power plant at the project site in year *y* |
| Source of data to be used: | Not applicable. The proposed project activity does have captive power generation capacity and all electricity consumption by the project will be supplied by the public electricity grid. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| Data / Parameter: | $EF_{CO2,k}$ |
|---|---|
| Data unit: | $tCO_2$/GJ |
| Description: | Emission factor of fuel type *k* where *k* are the fuel types fired in the captive power plant at the project site in year *y* |
| Source of data to be used: | Not applicable. The proposed project activity does not involve captive power in the baseline scenario. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| Data / Parameter: | $EC_{CP,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Quantity of electricity generated in the captive power plant at the project site in year *y* |
| Source of data to be used: | Not applicable. The proposed project activity does not involve captive power in the baseline scenario. Therefore no value is applied and no monitoring is required. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

Data and parameters that are available at validation

| Data / Parameter: | $NCV_i$ |
|---|---|
| Data unit: | TJ / $NM^3$ or ton |
| Description: | Net calorific value of the fossil fuel *i* |
| Source of data to be used: | For this and other descriptions relating to this parameter, see the description in Section B.6.2, Data and parameters that are available at validation. |
| Measurement procedures (if any): | Not applicable |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

| Data / Parameter: | $EF_{elec,i,j,y}$ (also referred to as $EF_{elec,y}$) |
|---|---|
| Data unit: | $tCO_2$ / MWh |
| Description: | $CO_2$ emission factor for the electricity source i (i=gr (grid) or i=is (identified source), displaced due to the project activity, during the year *y* in tons $CO_2$/MWh |
| Source of data to be used: | Calculated in accordance with the latest approved version of ACM0002 on the basis of the latest available statistics and IPCC default values. |

| | |
|---|---|
| Measurement procedures (if any): | Calculated on an ex-ante basis. The emission factor will not be updated during the crediting period. |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | No further QA/QC procedures are considered necessary. |
| Any comment: | For this and other descriptions relating to this parameter, see the description in Section B.6.2, Data and parameters that are available at validation. |

| **Data / Parameter:** | $EF_{CO2,EL,y}$ (in the context of this project activity, identical $EF_{elec,y}$) |
|---|---|
| Data unit: | $tCO_2$ / MWh |
| Description: | $CO_2$ emission factor for electricity consumed by the project activity in year *y*. |
| Source of data to be used: | Calculated in accordance with the latest approved version of "Tool to calculate the emission factor for an electricity system" on the basis of the latest available statistics and IPCC default values. |
| Measurement procedures (if any): | The project only consumes electricity from the grid and the emission factor has been calculated ex-ante and will not be updated during the crediting period. |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | No further QA/QC procedures are considered necessary. |
| Any comment: | For this and other descriptions relating to this parameter, see the description in Section B.6.2, Data and parameters that are available at validation. |

| **Data / Parameter:** | $EF_{CO2,i}$ |
|---|---|
| Data unit: | Tonnes $CO_2$ / TJ |
| Description: | $CO_2$ emission factor per unit of energy or mass of the fuel type *i* |
| Source of data to be used: | Data used are based on IPCC default values, multiplied by 44/16. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories. |
| Measurement procedures (if any): | The $CO_2$ emission factor is used in the calculation of the baseline emissions. The baseline emission factor is calculated ex-ante and will not be updated during the crediting period. Therefore monitoring of this parameter is not applicable. |
| Monitoring frequency | Not applicable |
| QA/QC procedures to be applied: | Not applicable |
| Any comment: | |

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

>>

This Monitoring plan will set out a number of monitoring tasks in order to ensure that all aspects of projected greenhouse gas (GHG) emission reductions for the project activity are controlled and reported. This requires an ongoing monitoring of the project to ensure performance according to its design and that claimed Verified Emission Reductions (VERs) are actually achieved.

The monitoring plan of the project activity is a guidance document that provides the set of procedures for preparing key project indicators, tracking and monitoring the impacts of the project activity. The monitoring plan will be used throughout the defined crediting period for the project to determine and provide documentation of GHG emission impacts from the project activity. This monitoring plan fulfils the requirement set out by the Kyoto Protocol that emission reductions projects under the VER have real,

measurable and long-term benefits and that the reductions in emissions are additional to any that would occur in the absence of the certified project activity.

**1. Monitoring Targets**

**(1) Monitoring of Net Electricity supply to the recipients plants**

Electricity meters are installed at the 35kv power distribution room to measure the net quantity of power supplied to the recipient plants. The meters will be operated and maintained by AGC. The data measured by meters will be archived in the electronic way. And the data will be recorded monthly.

**(2) Monitoring of Heat Supply to recipient plants**

The steam which are supplied to recipient would be condensed to water with atmosphere temperature. Therefore the net quantity heat supplied to recipient plants are expressed as the enthalpy between the steam supplied and the condensate water, both in energy units. Meters used to monitor heat supply to recipient plants include flow meters, thermometers and manometers.

Flow meters, thermometers and manometers are installed at the extracting outlet of the steam turbine. All of the metering equipments will be properly calibrated and checked annually for accuracy.

The data of steam flow will be aggregated and recorded monthly. The data of temperature and pressure will be recorded hourly. The hourly value of the temperature and pressure will be averaged out and used for estimation the daily temperature and pressure. And the daily value of the temperature and pressure will be averaged out and used for estimation the monthly temperature and pressure. All the data will be archived in the electronic way.

**2. Monitoring Procedures**

**(1) Measurement**

Data for electricity supply and heat supply will be measured by calibrated meters. The accumulated data on electricity meters and data on flow meters, thermometers and manometers will be recorded according to monitoring Methodology. All the data will be archived electronically and kept at least two years after the last crediting period.

**(2) Identification**

The trained operators will identify the data whether it is reasonable in 24 hours. And they will go on a tour of inspection focusing on all the meters. If the operator finds out the data isn't credible, emergency plan will be used. The method of data identification and the detailed procedure are defined on VER Operational Manual.

**(3) Calculation**

The Emission Reduction Calculation will be executed by computer in the designed Excel sheet with the data archived, based on the defined formula of ACM0012. The calculation will be executed every month by VER manager.

**(4) Achievement**

The operators will achieve the identified data and save them into computer.

**3. Quality Assurance and Quality Control**

**(1) For measurement equipments——Calibration of Meters**

All of meters will be calibrated once a year by qualified institution or entity after calibration, calibration reports will be provided by qualified institution or entity and kept by AGC Group. This will be in the charge of VER manager. The process of Meter calibration should be reported. Backup electricity meters,

flow meters, thermometer and manometer which have been calibrated will be prepared for replacement of each meter in case any of them doesn't work.

**(2) For Monitoring Process——Computer Execution with Human Supervision**
The Monitoring Process will be arranged and supervised by persons, meanwhile executed by computer, which will avoid artificial errors. The operation report forms should be archived. If the abnormal situation happens, the emergency plan will be started up. And all the monitoring meters will be checked monthly to prevent erroneous measurements.

**(3) For Emergency Situation——Backup Meters and Conservative Method**
When main meters are on calibration or out of work, backup meters are to be used and the data in the calibration or malfunction period measured by backup meters are used to calculate the emission reduction. The starting time and the ending time should be recorded carefully; and the report needs to be archived and provided to DOE.

For monitoring the net electricity supply to the recipients:
When monitoring data of the meters in the power distribution room are not available, the data of backup meters installed in the power distribution room will be cross checked and used in the emission reductions calculation and the starting time and the ending time should be identified and recorded carefully. The report needs to be archived and provided to DOE.
When the data from backup meter are not available, the difference from the power generation and the electricity consumed by auxiliary equipment for cross check and used in the emission reductions calculation. The starting time and ending time should be identified and recorded carefully and the report needs to be archived and provided to DOE.

For monitoring the net heat supply to the recipients:
When the monitoring data of flow meters are not available, the data of the calibrated meters installed in the recipients will be used for emission reductions calculation. The starting time and the ending time should be recorded carefully; and the report needs to be archived and provided to DOE.
When the monitoring data of temperature or pressure are not available, the data of the minimum in the latest month will be used and the starting time and the ending time should be recorded carefully; and the report needs to be archived and provided to DOE.

When the waste gas provision is paused and the starting and ending time should be recorded carefully and the emission reductions during this period will not be included.

**(4) For Human Resource Management——Training Plan**
The training course should be performed according to the methodology ACM0012, *"Monitoring Plan"*, *"VER Operational Manual"* and conducted appropriately by VER consultants. Relative documentation or other materials such as: the training plan, training materials, training report or test paper should be archived and provided to DOE. The contents and procedures of quality assurance and quality control is an on-going process which will be updated in the crediting period.

**4. Management Structure**

The project developer will establish a dedicated VER team to take the responsibility of collecting data, supervising and verifying the procedure of measurement and record. The team member will receive the

training and technical support from the project consulting company. The operational and management structure of the VER workgroup is shown in the following table B.11.

**Table B.11 Management Structure**

| Name | Organization | Responsibility |
|---|---|---|
| Mrs. Huang Jinhua | AGC | Mrs. Huang Jinhua is the general engineer of AGC. She has extended knowledge about Kyoto Protocol and is the project company's VER authority and takes the responsibility of overall project management. |
| Miss Xiao | AGC | Miss Xiao of AGC. She is the supervisor of the operation team. She provides review to the monitoring report made by the operators. She is also responsible of validation and registration of the project. She is responsible for training of monitoring personnel. Training courses will be held for monitoring staff about basic knowledge and operational procedures of all monitors and the data processing system. Previously, South Pole Carbon Asset Management Ltd. has provided sufficient training about Kyoto, VER and requirements of them. |
| Mr. Yong Hanlin | South Pole Carbon Asset Management Ltd. | South Pole Carbon Asset Management Ltd. Will provide review of reported data before they are submitted to DOE for validation or verification. |

The monitoring staffs are responsible for recording and archiving the monitoring data in line with the monitoring manual. They ensure normal operation of the equipments and perform necessary maintenance. Report will be made in case of emergency or abnormal situations. Automatic monitoring systems are installed for both plants. Readings of all meters and status of equipments are collected automatically. Operators only need to collect data from screen display and make a hardcopy backup of the data.

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

>>

Name of persons determining the baseline and monitoring methodology:

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## SECTION C. Duration of the project activity / crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

>>
13/06/2004 (this date marked the purchase agreement of boiler)

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

>>
20 years

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

#### C.2.1. Renewable crediting period:

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

>>
N/A

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

>>
N/A

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

##### C.2.2.1. Starting date:

>>
01/01/2008 or 2 years before the registration date, whichever is the earlier.

##### C.2.2.2. Length:

>>
10 years

## SECTION D. Environmental impacts

>>

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

>>
The environmental impacts analysis report of the Project was finished by Shanxi Coal Industry Management Bureau Environment Protection Institute in November, 2003 and was approved by Environmental Protection Bureau of Shanxi Province in January 20, 2004. The major conclusions are presented as follows:

Waste Gas Discharge

The fuel of the Project is mixed combustible waste gas(including coke oven gas, blast furnace gas and converter gas) generated from steel making and coking production facilities. The following measures will be taken to avoid air pollution:

1) Waste gas used in the project should be cleaned before combustion.
2) Exhaust smoke gas should be emitted through a 100m-high chimney.

Therefore, the dust and $SO_2$ concentration of the flue gas, which will be released to the atmosphere via a high stack, is rather low and would comply with the national "*Emission standard of air pollutants for coal-burning oil-burning gas-fired boilers*"(GB13271-2001).

Waste Water Discharge

The generator units of the project activity incorporate direct air cooling equipment, which could save water by 60~70%. Cooling water for industrial facilities will be recovered as supplement for circulating water.
All the discharge water will be collected and treated together in the recovery pool of the plant, which could meet the requirement of "*Discharge Standard of Waste Pollutants for Ion and Steel Industry (GB13456-92)*" and "*Integrated wastewater discharge standard (GB8978-1996)*". Sewage from living life will be first treated in the cesspool and then be drained into the waste water system of the company for a second-grade biological treatment. Therefore, the construction of the power plant would have little impacts on local water system.

Noise

Noise isolation hoods will be installed in steam turbine. The control room of the Project will be noise isolated. The pump will be set in a specific pump house with a rubber connector in the outlet of the pump. The noise level in the control room will be less than 70dB (A), which complies with the "*Code for Noise Control Design of Industrial Enterprise(GB12348-90)s*" of China.

Additionally, further effort will be made by the Project to make the green area proportion of the plant 20%. The idle land in the plant will be taken fully advantage of for planting trees and flowers to improve environmental quality and reduce pollution. A specific department will be established to take charge of environment management of the plant. All the pollution discharged will be monitored periodically by the environmental monitoring station.

In conclusion, the Project will not have any significant environment impacts. On the contrary, by reducing fossil energy consumption for power generation, the Project will yield environmental benefits.

**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:**

>>

According to the EIA approved by the Environmental Protection Bureau of Shanxi Province, the impacts of the Project are not considered to be significant.

## SECTION E. Stakeholders' comments

>>

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

>>

During November of 2003, Shanxi Coal Industry Management Bureau Environment Protection Institute developed the public investigation by the way of questionnaires. Work members of the Institute designed the questionnaire and issued them randomly. At the time of issuing questionnaires, the investigators introduced basic information about the project such as the construction contents, characteristics of the project, and so on to people who were investigated. 550 copies of questionnaire were sent out and all were recovered, the recovery ratio is 100%.

*General description of surveyed people*

The surveyed people including village cadres, workers, farmers and so on are mainly residents of Dongzhanquan Village, Yian Town, Liujia Village, and Xidaqi Village around the project area. More information can be seen from the following table E.1:

**Table E.1 of constituents of surveyed people**

| Location | Num. | Gender | | Age | | Occupation | | | Education Degree | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | male | female | ≤35 | >35 | cadre | worker | farmer | Technical Secondary School | High School | Middle School | Primary School |
| Dongzhanquan Village | 450 | 375 | 75 | 112 | 338 | 0 | 0 | 450 | 10 | 35 | 129 | 276 |
| Yian Town | 59 | 54 | 5 | 20 | 39 | 3 | 28 | 28 | 7 | 8 | 44 | 0 |
| Xidaqi Village | 24 | 21 | 3 | 5 | 19 | 3 | 2 | 19 | 1 | 3 | 20 | 0 |
| Liujiazhai Village | 17 | 17 | 0 | 12 | 5 | 1 | 0 | 16 | 0 | 4 | 13 | 0 |
| Total | 550 | 467 | 83 | 149 | 401 | 7 | 30 | 513 | 18 | 50 | 206 | 276 |

*Contents of the questionnaire and result statistics*

**Table E.2 of main contents of the questionnaire and result statistics on public opinion**

| Contents concerned | Opinions | Num. | Proportion(%) |
|---|---|---|---|
| Attitude to the construction of the project activity | Support | 518 | 94.2 |
| | Oppose | 2 | 0.4 |
| | Don't care | 30 | 5.4 |
| Current status of the residential environment | Serious pollution and exasperate environment | 6 | 1.1 |
| | Middle pollution and weak environment | 337 | 61.3 |
| | Good | 207 | 37.6 |
| Main environmental problems in the area | Air | 221 | 40.2 |
| | Water | 78 | 14.2 |

| | | | |
|---|---|---|---|
| | Solid waste | 24 | 4.4 |
| | Noise | 227 | 41.2 |
| The degree of impact of environmental pollution on human health | Serious | 6 | 1.1 |
| | General | 190 | 34.5 |
| | Don't care | 354 | 64.4 |
| Effects of the project on promoting local economy | Positive | 550 | 100 |
| | General | 0 | 0 |
| | No effect | 0 | 0 |
| | Negative | 0 | 0 |
| Environment protection proceedings Antai Group has to pay attention | Strengthen pollution treatment | 465 | 84.5 |
| | Adopt advanced technology | 60 | 10.9 |
| | Improve management | 22 | 4 |
| | Others | 3 | 0.6 |

On 25th March 2009, the project proponents have held the second round local stakeholder consultation. Fro detail information, please see the second round local stakeholder consultation report.

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

>>

After analyzing the investigation results above we conclude that most people (94.2%) support the construction of the project for the following advantages of the project:

- Due to the energy efficiency nature of the Antai Waste Gas Recovery and Generation Project, the project would optimize industrial resource use and help to fulfil the national sustainable development strategy.
- The Project would reduce greenhouse gas emissions, therefore mitigating climate change.
- Project implementation would enhance local environmental quality and offer social benefits such as job creation within the community, diffusion of a desirable technology, and diversification of local energy mix.

And a few of them have doubts because of the following problem:

24 pieces of questionnaires were sent out and collected during the second round meeting on 25th March 2009. The questionnaires are all prepared in compliance with Gold Standard Manual. The questions all have been translated into Chinese. From questionnaires collected in the meeting, no negative rating was found.

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

>>

Considering the possible environmental problems that some people were worried about, the project entity designed effective prevention measures in their project planning document and the EIA (environmental impact assessment) report which can be seen in Section D.

After further talking with local residents, especially those who have doubts, and by explaining to them the resolving measures carefully, the project entity at last got full support from local stakeholders. Recently the project owner has expressed their intention to take full advantage of the VER opportunity to facilitate healthy Project operation.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project owner

| | |
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The Buyer

| | |
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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

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