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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Waste heat power generation project at Hunan Anshi Xingyuan Power Generation Co., Ltd.

Version 4.0

Date: 01/11/2007

A.2. Description of the project activity:

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Project introduction:

The proposed waste heat power generation project (hereinafter referred to as “the proposed project”) is constructed by Hunan Anshi Xingyuan Power Generation Co., Ltd. The waste gas used in the proposed project is supplied by another company, i.e. Loudi Xingxing Coking Co., Ltd. who set up a 300,000 tpa new clean type coke oven in 2005. The waste gas generated by the clean type coke oven does not contain any volatiles and combustible gases because all the volatiles and combustible gases are burned in the coke oven to provide heat energy for the coking process, which is one of the main characteristics of this new type coke oven.

The waste gas generated from the new clean type coke oven has a designed flow rate of 160,800 Nm^3/h and a designed temperature of 950 ^oC -1,050 ^oC. The waste gas mainly contains CO_2, N_2, O_2 and H_2O. In absence of the proposed project, the waste gas would be directly released to the atmosphere without being utilized, which is in compliance with all laws and policies in China as there is no law that prohibits emission of high temperature waste gas.[1]

The purpose of the proposed project is to recover and utilize the sensible heat of the waste gas to generate electricity. Part of the electricity generated from the proposed project will be supplied to Anshi Group whose current electricity consumptions have been derived from the Central China Power Grid and the rest part will be sold to Central China Power Grid, thus all the electricity provided by the proposed project will substitute the equivalent electricity of Central China Power Grid, which is dominated by fossil-fuel fired power plants.

The proposed project will set up two 35t/h waste heat recovery boilers. Sensible heat of the waste gas from the coke oven would be extracted by the boilers and the waste gas would be let out to the atmosphere at 180 ^oC after is passes through the boilers. The 70t/h steam produced by the boilers would be fed to a 12MW steam turbine generator for power generation.

In absence of the proposed project, equivalent quantity of electricity would be supplied by Central China Power Grid which is dominated by fossil fuel-fired power plants and the waste gas would be released directly to the atmosphere. Working hours of the proposed project is about 8280 hours annually and

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[1] Harm of the Thermal Pollution and Its Management Advices, Wang Xinlan, http://www.syepi.com/hbkx/default.asp?cmd=show&id=713

electricity generated from the proposed project is expected to substitute about 53,300 MWh of the power from Central China Power Grid annually and the expected GHG emission reductions of the proposed project is 51,360 tCO_2e per annum.

Project contribution to sustainable development

The proposed project will produce social and environmental benefits and contribute to the sustainable development of the local area through the following aspects:

Environmental wellbeing

The proposed project will substitute the equivalent electricity of Central China Power Grid and reduce the fossil-fuel based power generation and the GHG emissions related to it. Furthermore, the proposed project will contribute to mitigating the pollutions from the local fossil-fuel fired power plants. Meanwhile, with utilizing the waste heat from the waste gas for power generation, it will avoid releasing the high temperature gas and then reduce the thermal pollution nearby.

Social wellbeing

Employment would be generated during the construction phase of the proposed project. During the operation stage, 50 permanent jobs[2] will be generated. For the construction and operation of the project, some persons would be trained and income of the local citizens would be increased. Without the project activity, no such employment or training would be generated.

A.3. Project participants:

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Table 1: Project participants table

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Hunan Anshi Xingyuan Power Generation Co., Ltd.	No
Switzerland	Vitol S.A.	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):

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People's Republic of China

[2] Feasibility study of the waste heat power generation project at Hunan Anshi Xingyuan Power Generation Co., Ltd.

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

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Hunan Province

A.4.1.3. City/Town/Community etc:

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Lianbin West Street, Loudi City

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

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The project is located at Lianbin West Street, Loudi City, which is in the central part of Hunan Province in southeast China. Transport of the project site is convenient and the project can be approachable from the freeway and the railway nearby. The project site is about 200km from Changsha, the capital city of Hunan Province.

The coordinates of the project site are:

Longitude: 111^{o}58’03’’ E

Latitude: 27^{o}44’10’’ N

Geographical location of the project is shown below:

Figure 1 Location of the project site

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

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The project activity involves waste heat based power generation and falls under the Category 1: Energy Industries (renewable / non-renewable sources)

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

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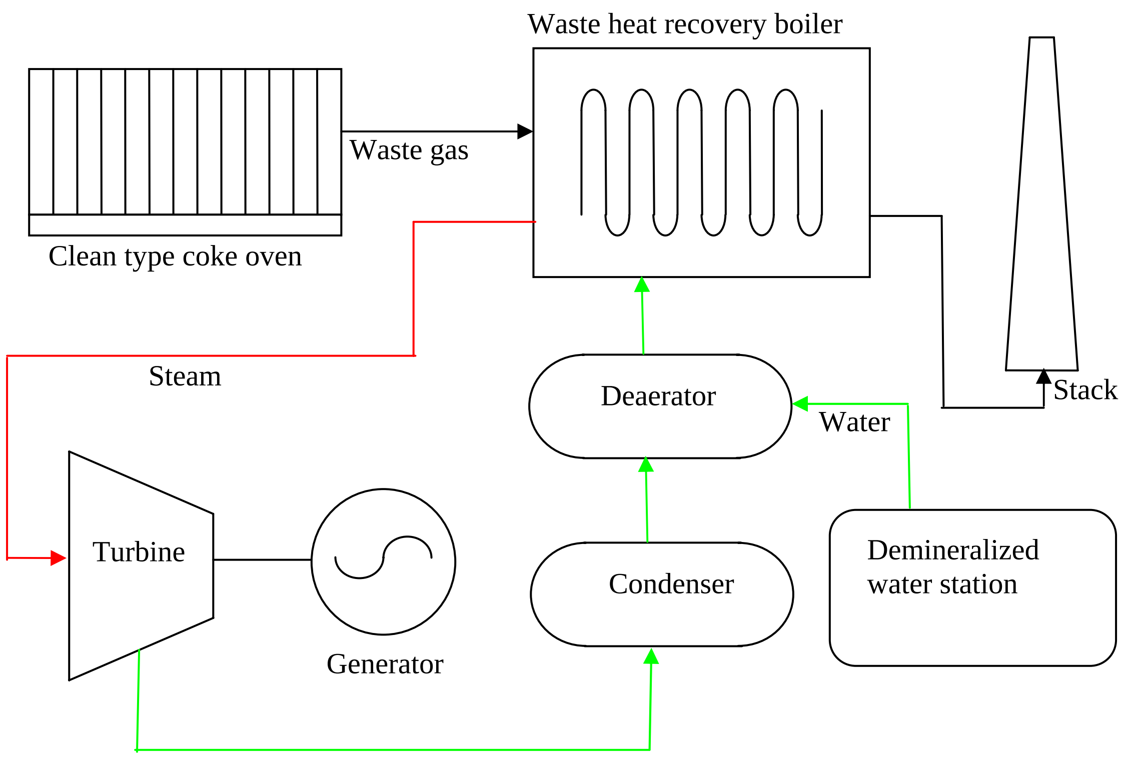
Project technology introduction:

The proposed project is utilizing the sensible heat of the waste gas for power generation. The waste gas is generated from the new clean type coke oven and contains mainly nitrogen and carbon dioxide and does not contain any volatiles. Unlike traditional coking procedures, this new clean type coke oven is running under negative pressure, which avoids the spillage of any volatiles generated during the coking process. More importantly, in this coke oven, ALL the gases are burned to supply heat for the coking process before they are released to the atmosphere, which results in a stable off-gas without any volatiles. In the proposed project, waste heat recovery boilers are used to extract the sensible heat of the waste gas to produce steam, and the steam is then used to drive the steam turbine generator for power generation. The waste heat recovery boilers adopted in the proposed project are mid-temperature and mid-pressure type, and the steam turbine is of condensing type. The installed capacity of the generator is 12MW.

The process flow chart of the proposed project is shown below.

Figure 2 Process flow chart



The project activity consists of the following units:

- Two 35t/h waste heat recovery boilers;
- Steam turbine;
- Electricity generator;
- Power transmission system.

The technical specifications are as follows:

Waste heat recovery boiler
Type: Q100/900-35-3.82/450
Steam output: 35t/h
Steam pressure: 3.82MPa
Steam temperature: 450^{o}C
Boiler efficiency: 85%

Steam turbine
Type: N12-35
Capacity: 12MW
Rated speed: 3000r/min

Electricity generator:
Type: QF-J12-2
Rated capacity: 12MW
Voltage: 6.3KV
Efficiency :> 97%

The power generated from the proposed project will be stepped up from 6.3KV to 110KV before delivered to Central China Power Grid to reduce the transmission losses.

Although the equipments used in the project are technologically mature individually, the application of the waste heat recovery based power generation system in the project context has some difficulties and uncertainties, because the new clean type coke oven, where the waste gas is generated, is a new technology which is not widely used throughout China. The coke oven supplying waste gas to the proposed project is the only one of its kind in Hunan Province. The difficulties faced by the project proponent include:

- Lack of knowledge in the power generation sector
- Lack of competent human resources and managerial expertise for the implementation of power generation project
- Lack of guarantee for the stable waste gas supply from the coke oven

which are detailed in Section B.5 below.

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

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The proposed project is expected to reduce GHG emissions by 513,600 tCO_2e over the fixed 10-year crediting period as shown in the table 2 below:

Table 2 Estimated amount of emission reductions

Year	Annual estimation of emission reductions

	in t CO_2 e
2007 (December)	4,280
2008	51,360
2009	51,360
2010	51,360
2011	51,360
2012	51,360
2013	51,360
2014	51,360
2015	51,360
2016	51,360
2017(January-November)	47,080
Total estimated reductions (t CO_2 e)	513,600
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (t CO_2 e)	51,360

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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Approved consolidated baseline and monitoring methodology ACM0004: “Consolidated baseline and monitoring methodology for waste gas and/or heat and/or pressure for power generation”, Version 2[3];

Approved consolidated baseline and monitoring methodology ACM0002: “Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources”, Version 6[4];

“Tool for the demonstration and assessment of additionality”, Version 3[5].

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

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The methodology ACM0004 applies to electricity generation project activities:

- ♦ that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil fuels;
- ♦ where no fuel switch is done in the process, where the waste heat or pressure or the waste gas is produced, after the implementation of the project activity

The proposed project activity meets all the above applicability requirements of ACM0004, as shown below:

- ♦ The proposed project uses the sensible heat of the waste gas to generate electricity and this electricity would be supplied to Anshi Group and Central China Power Grid, which means the generated electricity will displace equivalent electricity of Central China Power Grid which includes fossil-fuel power plants.
- ♦ No fuel switch will occur in the process where the waste gas is produced, which is the clean type coke oven, after the implementation of the proposed project.

The methodology covers both new and existing facilities. The facility supplying waste gas to the proposed project is an existing facility. Therefore, the methodology ACM0004 is applicable to the proposed project.

According to the methodology ACM0004, if the baseline scenario is determined to be grid power supply, the Emission Factor for displaced electricity is calculated as in ACM0002. Because the electricity generated from the proposed project will displace the power supply of Central China Power Grid, thus ACM0002 is applicable to this project activity.

According to ACM0004, the additionality of the project activity shall be demonstrated and assessed using the latest version of the “***Tool for the demonstration and assessment of additionality***” agreed by the

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[3] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

[5] http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

CDM Executive Board. Therefore, the "***Tool for the demonstration and assessment of additionality***" is applicable to the proposed project activity.

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

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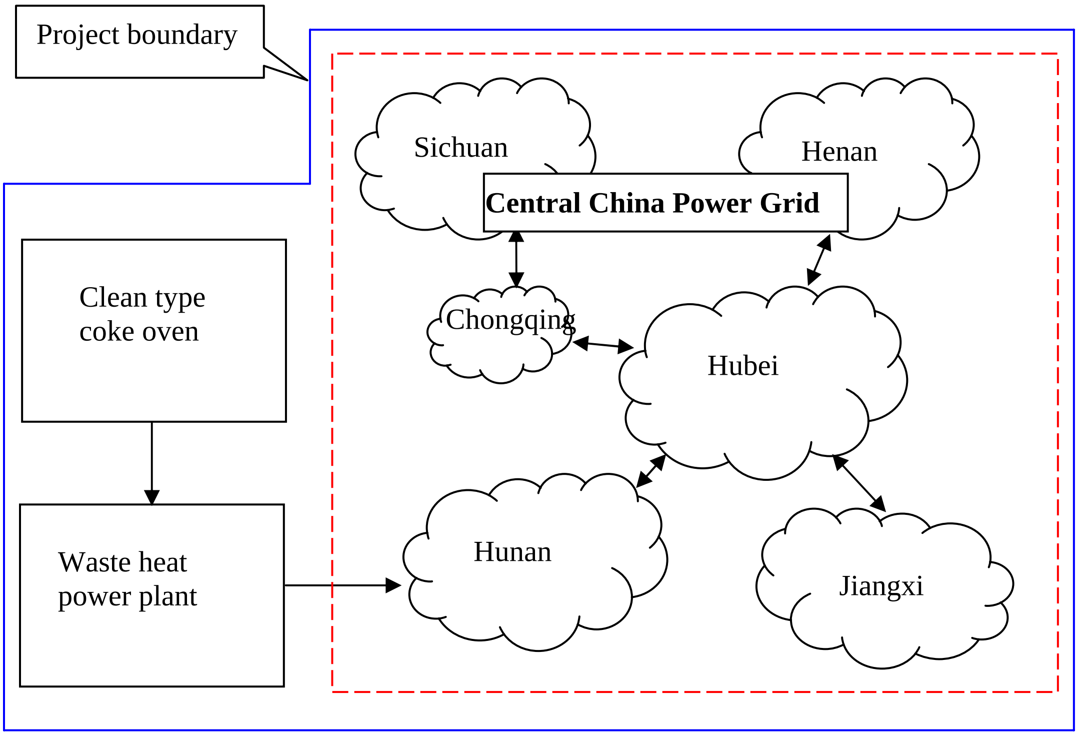
As per ACM0004, the spatial extent of the project boundary comprises the waste heat or gas sources, captive power generating equipment, any equipment used to provide auxiliary heat to the waste heat recovery process, and the power plants connected physically to the electricity grid that the proposed project activity will affect.

The project boundary of the proposed project shall cover the clean type coke oven, the whole waste heat power generation plant and all the power plants connected with Central China Power Grid which covers Henan, Hubei, Hunan, Jiangxi, Sichuan and Chongqing provinces/municipality as shown in figure 3:

Figure 3 Project boundary



Emission sources and gases included in the boundary are shown in the table below:

Table 3 Overview on emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/explanation
Baseline	Fossil fuel-fired power generation plants connected with Central China Power Grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project	On-site fossil fuel	CO_2	Excluded	No usage of auxiliary fossil fuel in the

Activity	consumption due to project activity			proposed project, thus no emissions in this part
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

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

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As per methodology ACM0004, the baseline scenario alternatives should include all possible options that provide or produce electricity for in-house consumption and/or sale to grid and/or other consumers.

The possible alternative baseline scenarios in absence of the proposed CDM project are as follows:

Alternative 1: The proposed project activity not undertaken as a CDM project activity;

Alternative 2: Import of equivalent electricity from the grid, which is the continuation of the pre-project scenario;

Alternative 3: Construct a new captive power plant with equivalent installed capacity using other energy sources than waste heat, such as coal, diesel, natural gas, hydro, wind etc;

Alternative 4: A mix of options 2 and 3;

Alternative 5: Other uses of the waste heat.

Alternative 1: The proposed project activity not undertaken as a CDM project activity

In this alternative, Hunan Anshi Xingyuan Power Generation Co., Ltd. may continue the construction of the 12MW waste heat power generation project to supply the electricity generated to Anshi Group and Central China Power Grid. This alternative complies with all the applicable laws and regulations. However, this alternative faces several barriers (as detailed in Section B.5 below) making it practically prohibitive. Therefore this alternative is not a baseline scenario.

Alternative 2: Import of equivalent electricity from the grid

In this alternative, the waste gas from the coke oven would be released to the atmosphere without utilization of the sensible heat and equivalent electricity would be supplied by Central China Power Grid. Thus no GHG emissions reduction would be achieved. This alternative complies with all the applicable laws and regulations and can be a baseline scenario.

Alternative 3: Construct a new captive power plant with equivalent installed capacity using other energy sources than waste heat, such as coal, diesel, natural gas, hydro, wind etc.

In this alternative, a captive power plant using other energy sources but waste heat would be built with equivalent amount of installed capacity.

According to the *Notice on Strictly Prohibiting the Installation of Fossil Fuel-fired Generators with the*

Capacity of 135 MW or Below issued by the General Office of the State Council on Apr 15th 2002[6], the construction of fossil fuel-fired power plants with capacity of less than 135 MW are strictly prohibited. As the proposed project has a capacity of 12 MW, which is lower than 135MW, it will be against the above-mentioned regulation to build a fossil fuel-fired captive power plant with equivalent installed capacity.

Although power plants using natural gas, hydro or wind are not prohibited to build and they are environmentally friendly, the unavailability of resources like natural gas, hydro or wind in the local area makes it impractical to build such power plants. The power supply of Hunan Province has been mainly from coal-fired power and hydro power. But 70% of the hydro power resources have been developed and the remaining resources are mainly in the Yuanshui River area[7]. The project is located far from the said Yuanshui River and there are no hydro resources available in the local area. Hunan Province has done a survey for the wind power resources and identified the areas with wind power resources. The project location is not in the identified areas.[8]

Therefore alternative 3 cannot be considered as the baseline scenario.

Alternative 4: A mix of options 2 and 3

Although alternative 2, import of the equivalent electricity from the grid is a potential baseline scenario, the fact that alternative 3 cannot be considered as an option automatically makes this alternative 4 impractical to become a qualified option of baseline scenario.

Alternative 5: Other uses of the waste heat and waste gas

In this alternative, waste heat can be supplied to householders or industry users nearby, which is in compliance with all the current Chinese mandatory laws and regulations. However, the industrial enterprises nearby either have self-sufficient heat supply (steel works) or have no need for heat, and the geographical conditions of Southern China does not require house heating for the local households which makes this alternative unfeasible. Therefore, this alternative cannot be considered as the baseline scenario.

According to methodology ACM0004, alternative base line scenarios that:

- do not comply with legal and regulatory requirements; or
- depend on key resources such as fuels, materials or technology that are not available at the project site

shall be excluded. Alternatives 3, 4 and 5 shall be excluded according to the above mentioned criteria.

Among the remaining two alternatives, i.e. alternative 1 and 2, alternative 1 faces prohibitive barriers as discussed in Section B.5 below, hence alternative 2 should be considered as the baseline scenario. In summary, the baseline scenario of this proposed project is to release the waste gas directly to the

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[6] Notice on Strictly Prohibiting the Installation of Fossil Fuel-fired Generators with the Capacity of 135 MW or Below from the General Office of the State Council, http://www.gov.cn/gongbao/content/2002/content_61480.htm

[7] How can the power shortage be solved in Hunan Province?, http://www.china5e.com/news/power/200405/200405110101.html

[8] Hunan Province will build 2 to 3 windfarm power plant, http://www.hnxw.cn/jingji/show2.asp?id=4242

atmosphere and get the necessary equivalent electricity from Central China Power Grid.

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

According to methodology ACM0004, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "***Tool for the demonstration and assessment of additionality***" agreed by the CDM Executive Board. "Tool for the demonstration and assessment of additionality" (Version 3) is used to demonstrate and assess the additionality of this project.

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

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

Referring to section B.4, the possible alternatives to the project are as follows:

Alternative 1: The proposed project activity not undertaken as a CDM project activity;

Alternative 2: Import of equivalent electricity from the grid, which is the continuation of the pre-project scenario;

Alternative 3: Construct a new captive power plant with equivalent amount of installed capacity using other energy sources than waste heat, such as coal, diesel, natural gas, hydro, wind etc;

Alternative 4: A mix of options 2 and 3;

Alternative 5: Other uses of the waste heat.

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

Laws and regulations including central government regulations, local regulations and department rules and disciplines can be found on the websites of the Energy Source Bureau of the National Development and Reform Commission[9] and the State Electricity Regulatory Commission[10].

According to the *Notice on Strictly Prohibiting the Installation of Fossil Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council on Apr 15th 2002[11], the construction of fossil fuel-fired power plants with capacity of less than 135 MW are strictly prohibited. As the proposed project has a capacity of 12 MW, which is lower than 135MW, it will be against the above-mentioned regulation to build a fossil fuel-fired captive power plant with equivalent installed capacity. Therefore, alternatives 3 and 4 can be eliminated from further consideration.

Chinese government has no mandatory policies or laws which require the utilization of the waste heat in

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9 http://nyj.ndrc.gov.cn

10 http://www.serc.gov.cn

11 Notice on Strictly Prohibiting the Installation of Fossil Fuel-fired Generators with the Capacity of 135 MW or Below from the General Office of the State Council, http://www.gov.cn/gongbao/content/2002/content_61480.htm

the waste gas, therefore, the project owner has no legal obligation to build the proposed project activity, which means alternative 1 and 2 are in compliance with all regulations and laws. Alternative 5 is also in compliance with all mandatory laws and regulations although it is not practically feasible.

As alternative 1, 2 and 5 are all in compliance with mandatory regulations, the project activity is not the only alternative among the alternatives that is in compliance with mandatory regulations.

Step2: Investment Analysis

Step 2 is not selected for the demonstration of the additionality of the proposed project.

Step 3: Barrier analysis

Step 3 is conducted to establish the additionality of the proposed project activity.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

The coke oven waste gas based waste heat power generation project, which is established by Hunan Anshi Xingyuan Power Generation Co., Ltd., is qualified with the additionality requirement due to many barriers which impede its construction and operation when applied to practice.

Barriers due to uncertain waste gas supply:

One of the key factors of the successful implementation of the proposed project is the sustained availability of qualified waste gas. The proposed project owner has reached the waste gas supply agreement with Loudi Xingxing Coking Co., Ltd. However, according to the agreement, the proposed project owner has no right to put up any requirements regarding the waste gas parameters; furthermore, Xingxing Coking Co., Ltd. will take no responsibility to ensure that the proposed project would be successfully running, which means the operation of the project at full rated power output is not guaranteed and out of the control of the project owner. The coke oven owner may change the operation conditions of the coke oven for whatever reasons at its sole discretion, which would influence the waste gas parameters which would in turn affect the steam parameters, which is a critical factor for the normal operation of the turbine. For example, if the coke market is getting bad, the coke oven owner may reduce its production load or even shut down the coke oven, which would mean that the waste gas parameters could be much lower than expectation or even the supply of waste gas could be cut off. In this case the steam parameters can be beyond the designed range and the turbine would have to run under low parameters or even shut down because of extreme steam parameters. This would not only have an impact on the expected economic benefits of the project but also do harm to the equipment and endanger the safe operation. In one word, the uncertainty of the waste gas supply will induce great risks to the proposed project's operation. With the registration as a CDM project, the revenues from the sales of CERs can effectively compensate the potential financial losses due to the uncertain waste gas supply and therefore helps the project owner to overcome the risks.

Technological barriers:

The project owner does not have any experience in the power generation sector. In order to build and run the proposed project, they need to recruit enough qualified human resources and arrange appropriate training for the staff. The lack of management and maintenance experience can lead to a high risk of equipment disrepair and malfunctioning or other underperformance of the plant.

Unlike other waste heat power generation projects, the proposed project uses the waste gas from a new clean type coke oven for power generation. This new clean type coke oven is a new technology developed in China only in recent years. Although this new technology has many advantages, there are also lots of problems to be resolved[12]. The instability associated with this new technology, like with any new technology, will result in high risk of technological failure, which will in turn impose a risk on the successful operation of the proposed project.

The design of the waste heat recovery boilers and power generation equipment of the proposed project was based on the designed waste gas parameters of the coke oven. However, due to the uncertainty of waste gas supply mentioned above, it can be reasonably foreseen that the waste gas parameters would be lower than expected and fluctuated greatly as the coke oven owner change the operation conditions of the coke oven. The change of the waste gas parameters would in the end result in the change of the steam parameters supplying to the turbine. Literature[13] shows that the fluctuations of steam parameters have big influence on the operation of the turbine and also have big harms. Especially, when the turbine runs under low steam parameters, it can increase the erosion of the turbine blade, which would significantly shorten the service life of the blade or result in the broke-down of the blade. The service life of some auxiliary equipment can also be affected. [14]

Investment barriers:

The proposed project encountered several investment barriers. First, as a private company, the project owner would prefer to invest into their major business instead of other fields which they don't have any experience. The major business of Anshi Group is coke production; most of the coke it produced has been sold to Lianyuan Steel Company, which is on border with Anshi Group. The coke demand of Lianyuan Steel Company has been increasing all the time, and it is a very good opportunity for Anshi Group to further increase their coke production capacity. On the other hand, Anshi Group does not have any experience in power generation sector and they have all the reasons to choose to invest in the known business instead of taking the risks to engage in unfamiliar sector.

Secondly, the proposed project is the only one of its kind in the local area (see the discussion below), which makes it very difficult to get necessary loan from the bank, because the bank does not have enough confidence in the successful operation of the project due to its special technical features. At the beginning of the construction of the proposed project, the needed capital for the construction was borrowed from company shareholders. A loan of RMB 20 million was received only after the project was commissioned.

Barriers due to prevailing practice:

The high-temperature waste gas used in the proposed project is generated from the new clean type coke oven, which is the first of its kind adopted in Hunan province. Therefore, there is no existing power generation operation using the waste gas from the clean type coke oven in the province. The vanity of successful operation samples around the local areas definitely brings the investors anxieties upon the proposed project which would discourage the enthusiasm of the investors.

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[12] The Present Situation and Development of the Heat Recovery Tamping and Cleaning Type Coke Oven, Chai Dongjun, Shanxi Science and Technology, 2004, No.6, page 96

[13] Effects of Steam Parameter Change on Steam Turbine Operation, Ma Zening and Ji Jiansheng, Xishan Science and Technology, 1999 No.8, Page 31-33

[14] Harms of running the turbine under low parameters or sliding parameters and countermeasures, Xu Chuanpu, East China Power, 1990 No.4, page 32-34

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

In alternative 2, the equivalent electricity would be supplied by the Central China Power Grid. Since there is no waste heat recovery equipment to be installed and implemented, it will not face the technological barriers or other barriers as described above.

Therefore the identified barriers would not prevent the implementation of the alternative 2.

Step 4: Common Practice analysis:

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

Since the distinguishing feature of the proposed project is that it uses the waste gas from the new clean type coke oven for power generation, a survey was carried out in the coking industry in Hunan Province with the following findings.

	Company name	Ownership	Type of coke oven	Capacity
1	Xianggang Coking Co., Ltd	State-owned	Traditional mechanical coke oven	1.5 million tpa
2	Liangang Coking Co., Ltd	State-owned	Traditional mechanical coke oven	1.3 million tpa
3	Zixing Coking Co., Ltd	State-owned	Traditional mechanical coke oven	500,000 tpa
4	Shaodong Coking Co., Ltd	State-owned	Traditional mechanical coke oven	450,000 tpa
5	Xingxing Coking Co., Ltd	Private	Traditional mechanical coke oven	100,000 tpa
			New clean type coke oven	300,000 tpa

From the above table, it can be seen that Xingxing Coking Co., Ltd. is the only company in Hunan Province who is using the new clean type coke oven. Therefore, the proposed project is also the only waste heat power generation project based on waste gas from new clean type coke oven.

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

As there is no other project similar to the proposed one, the proposed project is not a business as usual project.

Based on the above analysis, the proposed project is not the baseline scenario and is apparently additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions

According to the ACM0004, project emissions are applicable only if auxiliary fuels are fired for generation start-up, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler. The proposed project has no auxiliary fuels to be fired, so the Project Emission is 0.

Baseline Emissions

Baseline emissions are given as:

$$BE_{electricity,y} = EG_y \cdot EF_{electricity,y} \qquad (1)$$

Where:

EG_y	Net quantity of electricity supplied by the project during the year *y* in MWh, and
EF_y	CO_2 baseline emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2/MWh).

Since the baseline scenario of the proposed project is determined to be grid power supply (detailed in Section B.4), according to methodology ACM0004, the Emissions Factor for displaced electricity is calculated as in ACM0002.

According to methodology ACM0002, the baseline emission factor (EF_y) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following three steps.

STEP 1: Calculate the Operating Margin emission factor $(EF_{OM,y})$

Calculation of Operating Margin should be based on one of the four following methods according to ACM0002:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

Since the detailed dispatch information is not publicly available in China, the Dispatch Data Analysis method (c) can not be used for the calculation of OM.

As the low/cost must run resources constituted less than 50% of total electricity generation in China[15], the Simple OM (a) method is selected and the emission factor is calculated using the following data vintage:

- (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

The Simple OM emission factor ($EF_{OM,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving in the system, excluding low-operating cost and must-run power plants.

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \qquad (2)$$

Where:

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

[15] China Electric Power Yearbook 2005

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid;

$COEF_{i,j\,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year *y*;

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*;

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \cdot EF_{CO_2,i} \cdot OXID_i \qquad (3)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;

$OXID_i$ is the oxidation factor of the fuel;

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

Because the power plant level information is not publicly available, the average emission factor of each fuel type is used to calculate the $EF_{OM,y}$, which was agreed by the CDM EB in its reply to the request for clarification on the use of approved methodology AM0005 (replaced by ACM0002 already) in China.[16]

The Chinese DNA has published the calculation results of the emission factors of the main power grids in China by using the above method on its website.[17] The OM emission factor for the proposed project is calculated on the basis of the DNA calculation with only one change, i.e. the default values from Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories are replaced by corresponding values from 2006 IPCC Guidelines.

The OM emission factor of Central China Power Grid calculated as above is 1.2779 tCO_2/MWh (see Annex 3 for details).

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

According to ACM0002, the Build Margin emission factor is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*. The formula used to calculate the BM is as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (4)$$

Where:

[16] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

[17] Baseline Emission Factors of the power grids in China, Office of National Coordination Committee on Climate Change of NDRC, http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235

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

$COEF_{i,j\,y}$ is the CO_2 emission factor of fuel *i* (tCO_2 /tce), taking into account the carbon content of the fuels used by sample power plant *m* and the oxidation ratio of the fuel in year *y*

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by sample power plant *m*.

The ACM0002 provides two options for calculating BM:

Option 1. Calculate the BM emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.
Option 2. For the first crediting period, the BM emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above.

Option 1 is selected for the calculation of the BM emission factor for the proposed project.

Due to the unavailability of the relevant data, this calculation adopted the alternative method which has been approved by CDM EB[18] with the following steps:

Step 1: Calculate the proportion of the corresponding CO_2 emissions of solid, liquid and gas fuel in the total emissions of power generation using the most recent one year fuel consumption information available at the time of PDD submission.

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

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

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

Where:

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

$COEF_{i,j\,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / tce), taking into account the carbon content of the fuels used by province *j* and the oxidation ratio of the fuel in year *y*

COAL, OIL and GAS are the foot marks for solid, liquid and gas fuels;

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[18] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

Step 2: Calculate the emission factor of fossil-fuel fired power plants using the efficiency level of the best technology commercially available:

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

Where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding emission factors of the best commercially available coal, oil and gas fired technologies.

Step 3: Calculate the BM:

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (9)$$

Where:

CAP_{Total} is the total newly added 20% installation capacity, and $CAP_{Thermal}$ is the fossil-fuel fired installed capacity in the newly added 20% capacity.

The Chinese DNA has published the calculation results of the emission factors of the main power grids in China by using the above method on its website.[19] The BM emission factor for the proposed project is calculated on the basis of the DNA calculation with only one change, i.e. the default values from Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories are replaced by corresponding values from 2006 IPCC Guidelines.

The BM emission factor of Central China Power Grid calculated as above is 0.6494 tCO_2/MWh (see Annex 3 for details).

STEP 3. Calculate the baseline emission factor (*EF_y*)

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

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \quad (10)$$

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

Based on the emission factors calculated in step1 and 2, the baseline emission factor is

$$EF_y = 0.5 \times EF_{OM,y} + 0.5 \times EF_{BM,y} = 0.9636 \text{ tCO}_2\text{/MWh}$$

Leakage

No leakage is considered according to methodology ACM0004.

Emission Reduction

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions though substitution of electricity generation with fossil fuels (BE_y) and project

[19] Baseline Emission Factors of the power grids in China, Office of National Coordination Committee on Climate Change of NDRC, http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1235

emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

ER_y is the emissions reductions of the project activity during the year *y* in tons of CO_2,

BE_y is the baseline emissions due to displacement of electricity during the year *y* in tons of CO_2,

PE_y is the project emissions during the year *y* in tons of CO_2.

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

(Copy this table for each data and parameter)

Data / Parameter:	NCV_i
Data unit:	GJ/t
Description:	The net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook 2005, p365
Value applied:	A fuel series of data is to be used, see **Annex 3** for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the algorithm described in ACM0002
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	
Description:	The oxidation factor of the fuel *i*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories: p1.23
Value applied:	A fuel series of data is to be used, see **Annex 3** for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the algorithm described in ACM0002
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ
Description:	The CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories: p1.21-1.22
Value applied:	A fuel series of data is to be used, see **Annex 3** for details
Justification of the choice of data or	According to the algorithm described in ACM0002

description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	t or m^3
Description:	The amount of fuel *i* consumed by relevant power sources *j* in year *y*
Source of data used:	China Energy Statistical Yearbook, 2003, 2004, 2005
Value applied:	A time series of data is to be used, see **Annex 3** for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the algorithm described in ACM0002
Any comment:	

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	The electrical (MWh) generation by source *j* in year *y*
Source of data used:	China Electric Power Yearbook 2003, 2004, 2005
Value applied:	A time series of data is to be used, see **Annex 3** for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the algorithm described in ACM0002
Any comment:	

Data / Parameter:	$CAP_{thermal}$
Data unit:	MW
Description:	The thermal installed capacity in the newly added 20% capacity
Source of data used:	China Electric Power Yearbook
Value applied:	13880.1(see **Annex 3** for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The common alternative algorithm for the application of ACM0002 in China
Any comment:	

Data / Parameter:	CAP_{total}
Data unit:	MW

Description:	The total newly added 20% installed capacity
Source of data used:	China Electric Power Yearbook
Value applied:	19884.3 (see **Annex 3** for details)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The common alternative algorithm for the application of ACM0002 in China
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

As calculated in B.6.1, the baseline emission factor for Central China Power Grid is 0.9636 tCO_2/MWh.

According to the feasibility study of the proposed project, the estimated annual electricity net supply of the proposed project is 91.4GWh. However, due to the barriers mentioned in Section B.5, the actual electricity net supply of the project in the first 12 months after commissioning was only 53.3 GWh. In order to be conservative, the actual annual net power supply of 53.3 GWh is used to estimate the expected emission reductions.

So the baseline emissions (BE_y in tCO_2) is

$$BE_y = EG_y \times EF_y = 51360 \text{ tCO}_2$$

Because the project emission of the proposed project is zero, the ex-ante calculation of the emission reductions of the proposed project shall be:

$$ER_y = BE_y = 51360 \text{ tCO}_2$$

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

>>

With the estimated annual electricity net supply of 53.3 GWh, the proposed project is expected to reduce GHG emissions by 51,360 tonnes of CO_2e annually. During the years from 2007 to 2017, the GHG emissions would be reduced by 513,600 tCO_2e.

Table 4 Summary of the ex-ante estimation of emission reductions

Years	**Estimation of project activity emissions** (tonnes of CO_2 e)	**Estimation of baseline emissions** (tonnes of CO_2 e)	**Estimation of leakage** (tonnes of CO_2 e)	**Estimation of overall emission reductions** (tonnes of CO_2 e)
2007(Dec)	0	4,280	0	4,280
2008	0	51,360	0	51,360
2009	0	51,360	0	51,360

2010	0	51,360	0	51,360
2011	0	51,360	0	51,360
2012	0	51,360	0	51,360
2013	0	51,360	0	51,360
2014	0	51,360	0	51,360
2015	0	51,360	0	51,360
2016	0	51,360	0	51,360
2017(Jan-Nov)	0	47,080	0	47,080
Total (tonnes of CO_2 e)	0	513,600	0	513,600

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	$EG_{grid,110}$
Data unit:	MWh
Description:	Net electricity supplied to the grid by the proposed project through the 110kV power line
Source of data to be used:	Reading of the electricity meter installed on-site and DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The total net electricity supply by the proposed project is estimated to be 53,300 MWh based on the actual net supply in the first 12 months.
Description of measurement methods and procedures to be applied:	Electricity meters in consistency with national standards GB/T17883-1999 and DL/T614-1997 are installed on-site and DCS will measure the data. Daily records will be kept. The electricity meters are to be managed according to the industrial guideline DL/T448-2000.
QA/QC procedures to be applied:	Backup electricity meter is installed and running together with the main meter. Both meters will be calibrated annually according to the relevant standards. The amount can be crosschecked by the monthly confirmation sheet between the project owner and the power bureau.
Any comment:	

Data / Parameter:	$EG_{grid,10}$
Data unit:	MWh
Description:	Electricity imported from the grid (backup power supply) by the project activity through the 10 kV power line
Source of data to be used:	Reading of the electricity meter installed on-site and DCS
Value of data applied for the purpose of calculating expected	The total net electricity supply by the proposed project is estimated to be 53,300 MWh based on the actual net supply in the first 12 months.

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Electricity meters in consistency with national standards GB/T17883-1999 and DL/T614-1997 are installed on-site and DCS will measure the data. Daily records will be kept. The electricity meters are to be managed according to the industrial guideline DL/T448-2000.
QA/QC procedures to be applied:	Backup electricity meter is installed and running together with the main meter. Both meters will be calibrated annually according to the relevant standards. The amount can be crosschecked by the monthly confirmation sheet between the project owner and the power bureau.
Any comment:	

Data / Parameter:	$EG_{Anshi,10}$
Data unit:	MWh
Description:	Electricity supplied to Anshi facilities by the proposed project through the 10 kV power line
Source of data to be used:	Reading of the electricity meter installed on-site and DCS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The total net electricity supply by the proposed project is estimated to be 53,300 MWh based on the actual net supply in the first 12 months.
Description of measurement methods and procedures to be applied:	Electricity meters in consistency with national standards GB/T17883-1999 and DL/T614-1997 are installed on-site and DCS will measure the data. Daily records will be kept. The electricity meters are to be managed according to the industrial guideline DL/T448-2000.
QA/QC procedures to be applied:	Backup electricity meter is installed and running together with the main meter. Both meters will be calibrated annually according to the relevant standards. The amount can be crosschecked by the monthly confirmation sheet between the project owner and Anshi Group.
Any comment:	

Data / Parameter:	$EG_{Anshi,380}$
Data unit:	MWh
Description:	Electricity supplied to Anshi office building by the proposed project through 380 V power line
Source of data to be used:	Reading of electricity meter installed on-site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The total net electricity supply by the proposed project is estimated to be 53,300 MWh based on the actual net supply in the first 12 months.
Description of measurement methods	Electricity meters in consistency with national standards GB/T17883-1999 and DL/T614-1997 are installed on-site. Operator will record the reading of the

and procedures to be applied:	meter daily and all records will be kept. The electricity meters are to be managed according to the industrial guideline DL/T448-2000.
QA/QC procedures to be applied:	The electricity meter will be calibrated annually according to the relevant standards. The amount can be crosschecked by the monthly confirmation sheet between the project owner and Anshi Group.
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied by the proposed project to Anshi Group and Central China Power Grid.
Source of data to be used:	Calculated from the above parameters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The total net electricity supply by the proposed project is estimated to be 53,300 MWh based on the actual net supply in the first 12 months.
Description of measurement methods and procedures to be applied:	To be calculated from other parameters by using the following formula: $EG_y = EG_{grid,110}+EG_{Anshi,10}+EG_{Anshi,380} - EG_{grid,10}$
QA/QC procedures to be applied:	Not necessary
Any comment:	

B.7.2 Description of the monitoring plan:

A monitoring plan has been worked out as required by ACM0004 and the parameters to be monitored are shown in the table below:

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comments
1. $EG_{grid,110}$	Quantitative	Net electricity supplied to the grid through the 110kV power line	MWh/yr	On-line measurement	Continuously	100%	Electronic and paper	Credit period + 2 yrs	Meters installed on-site and DCS will measure the data. Daily report produced by operator. Can be crosschecked by the confirmation sheet with power bureau.
2. $EG_{grid,10}$	Quantitative	Electricity imported from the grid through 10kV power line	MWh/yr	On-line measurement	Continuously	100%	Electronic and paper	Credit period + 2 yrs	Meters installed on-site and DCS will measure the data. Daily report produced by operator. Can be crosschecked by the confirmation sheet with power bureau.
3. $EG_{Anshi,10}$	Quantitative	Electricity supplied to Anshi via 10kV power line	MWh/yr	On-line measurement	Continuously	100%	Electronic and paper	Credit period + 2 yrs	Meters installed on-site and DCS will measure the data. Daily report produced by operator. Can be crosschecked by the confirmation sheet with Anshi Group.

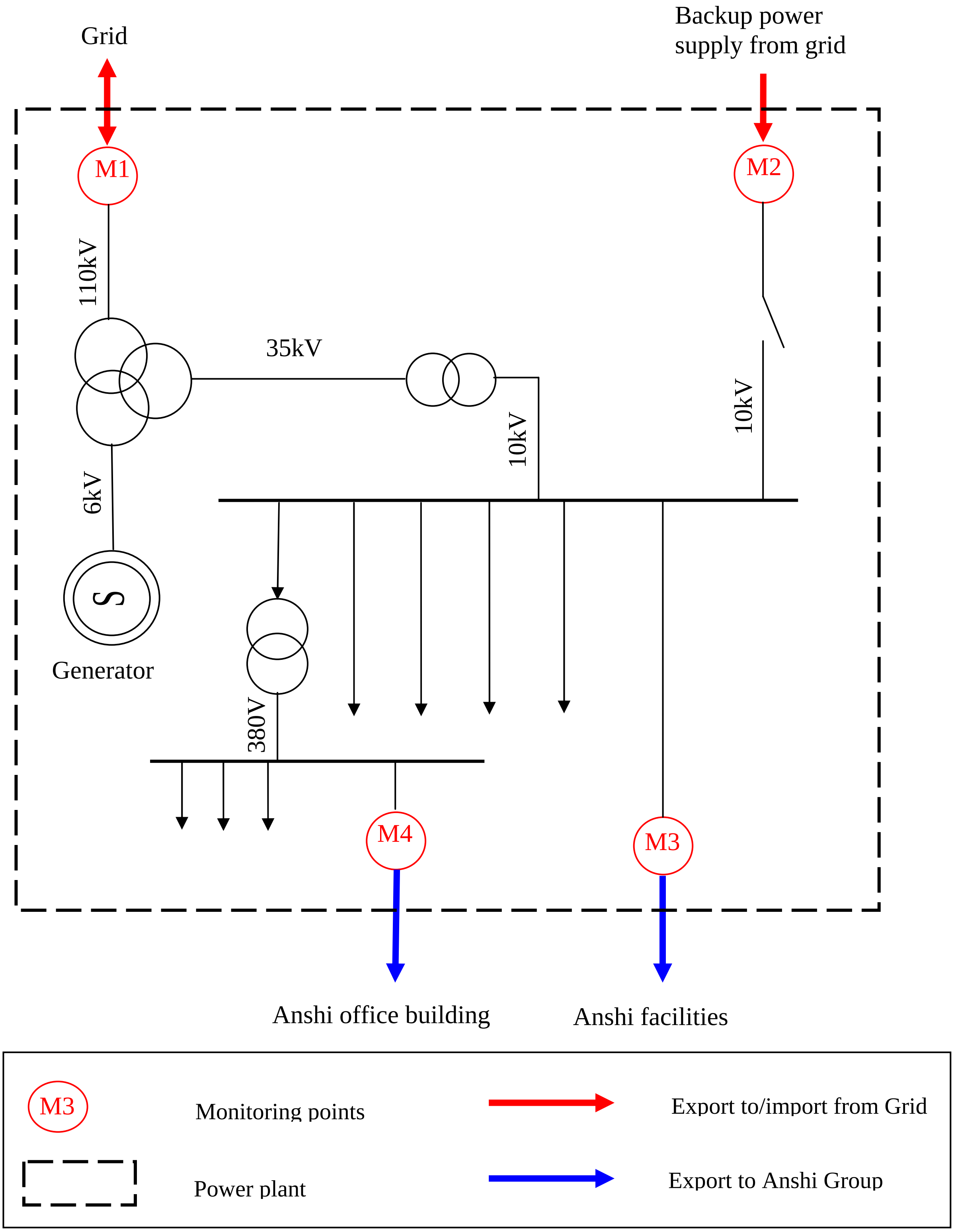
4. $EG_{Anshi,380}$	Quantitative	Electricity supplied to Anshi via 380V power line	MWh/yr	On-line measurement	Continuously	100%	Electronic and paper	Credit period + 2 yrs	Meters installed on-site and reading will be recorded daily by operator. Can be crosschecked by the confirmation sheet with Anshi Group.
5. EG_y	Quantitative	Net electricity supplied to the grid and Anshi Group	MWh/yr	Calculated ($EG_y = EG_{grid,110} + EG_{Anshi,10} + EG_{Anshi,380} - EG_{grid,10}$)	Continuously	100%	Electronic and paper	Credit period + 2 yrs	

QA/QC procedures for the parameters to be monitored are illustrated in the following table.

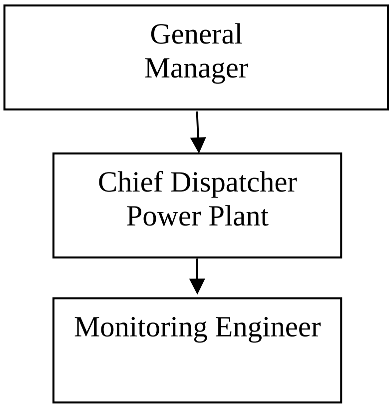
Data	Uncertainty level of data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation why QA/QC procedures are or are not being planned.
1.-4.	Low	Yes	This data will be used for the calculation of net electricity supply.
5.	Low	No	This data is calculated, so does not need QA procedures.

The monitoring positions of the parameters are shown in the following schematic diagram.

Figure 4 Monitoring positions of parameters



The project owner has setup an organizational structure for the monitoring of the parameters as follows. The General Manager will oversee the overall monitoring operation. The Chief Dispatcher will be responsible for the annual calibration of relevant electricity meters. The monitoring engineer will do the daily monitoring and produce daily report.



Since the power generation of the project is exported to both Anshi Group and the grid, both the export to Anshi Group and the net export to the grid need to be monitored. The export to Anshi Group is through 380 V and 10 kV lines, therefore separate meters (as shown in Figure 4 above, M3 is for 10 kV export and M4 is for 380 V export) are used to measure the export to Anshi Group through different lines. There are two connection points between the project plant and the grid. One is for export of power to the grid at 110 kV and the other is for the backup power supply for the plant at 10 kV. The net export to the grid should then be the net export through the 110 kV line (measured by M1 as shown in Figure 4) minus the backup power import from the grid (measured by M2 as shown in Figure 4). The total net power export of the project should be the total export to Anshi Group plus the net export to the grid (M1+M3+M4-M2).

Each measurement point (except M4) is equipped with two digital meters, working simultaneously as stand-by for each other. Besides, a power failure detect system is also equipped for the measuring system, which will send alert and record the hours of power cut. For the M1 parameter, same measurement system is also installed on the substation side for reference and possible standby.

Specific skilled persons will be appointed to record the readings of the meters, calculate all the measure points' electricity amount, and do the monthly and annually statistics. They will also check during work whether the meters are in normal working condition. Besides, the monitoring data will be stored both electronically and in a hard copy, which will be reported to and reviewed by company leaders weekly. Furthermore, at the end of every month, the local Electricity Power Bureau will verify the meters' readings of all the measure points together with the project owner and finish an electricity confirmation sheet with recognized signatures of each party, which can be used as a crosscheck.

The meters will be calibrated annually according to relevant standards and rules by qualified entities to ensure accuracy of the data to be monitored.

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

>>

The baseline study of the proposed project was completed in October, 2006.

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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:

>>

14/03/2005

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

>>

30 years

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

C.2.1. Renewable crediting period

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

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/12/2007. If the registration date of the project is later than this date, the starting date of the crediting period will be the registration date of the project.

C.2.2.2. Length:

>>

10 years

SECTION D. Environmental impacts

>>

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

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Environment Impact Assessment (EIA) report of the proposed project has been completed and approved by the Environment Bureaus of Hunan province and Loudi City. Conclusion of the EIA and measures to be taken to mitigate the impacts is documented below:

Construction phase:

During construction phase of the project, noise from movement of vehicles and solid waste pollution will be the main impacts.

Noise pollution:

Noise pollution would occur from movement of vehicle during construction phase of the project. The vehicles will be well maintained to generate less noise and noise elimination equipments will be installed.

Solid waste pollution:

During construction of the project, a small amount of solid waste would be produced. As the solid waste will be collected and delivered to the disposal site nearby, the impact from the solid waste will not be significant.

During the construction phase, more employment opportunities will be supplied to the residents nearby and more indirect jobs will be generated. Thus the proposed project will contribute to socio-economic development of the area.

Operation phase:

During the operation phase of the project activity, key issues identified related to the environment and the mitigate measurements are as follows:

Noise pollution:

During the operation phase, noise to be produced from the turbine and other moving machines will be the main environment impact of the project. To eliminate the noise pollution, the project proponent will take the following measures.

- Equipments will be well maintained to make them work in good condition and alleviate noise pollution;
- Housing equipments with more noise inside building;
- Installation of noise elimination equipment

With measures above, the noise will be in accordance with noise criterion and have no significant environmental impact.

Thermal pollution:

Under the operating of the waste heat based power generation equipment, waste gas at temperature of 180℃ will be released from outlet of the waste heat recovery boiler. But the project does not add the thermal pollution as this had have occurred without the project. In the absence of the project, waste heat at temperature of 950-1050℃ will be released. Through utilization of the waste heat the project will alleviate thermal pollution.

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:

>>

The project will not have significant impacts on the local environment generally.

SECTION E. Stakeholders' comments

>>

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

>>

In August, 2006, comments of the stakeholders near the proposed project have been collected by the project owner in the form of questionnaire.

1. Summary of stakeholders interviewed

Stakeholders interviewed were selected from different ages, different occupations and different education levels, which could well represent all stakeholders of the proposed project. Summary of the 25 stakeholders interviewed is listed on the Table 5 below:

Table 5 Summary of stakeholders interviewed

Item		Number of participants	Rate (%)
Age	16-30	1	4%
	31-40	12	48%
	41-50	5	20%
	51-60	7	28%
	>60	0	0
	Total	25	100%
Education	College or above	4	16%
	Junior college	4	16%
	Polytechnic or high school	12	48%
	Middle school or below	5	20%
	Total	25	100%
Occupation	Government staffs	1	4%
	Worker or technical personal	4	16%
	Enterprise management staff	9	36%
	Farmer	10	40%
	Teacher or researcher	1	4%
	Total	25	100%

2. Questionnaire form

A one page questionnaire was designed with the following sections:

1) Brief introduction of the project

2) Basic information of respondents

3) Major question issues

♦ How do you know about the project?

- What is the main environment impact and how will the project influence the environment?
- How will the project benefit the local area and how will the project improve development of the local economy?
- How will the project improve living of the stakeholders?
- What is your attitude towards construction of the project?

E.2. Summary of the comments received:

>>

The investigation had 100% response rate and summary of comments are shown below:

- 96% of the interviewed stakeholders showed that they know the proposed project and only one of them showed that he does not know the project;
- 60% of the stakeholders interviewed showed that the proposed project will have no impact on the environment. While 5 believed noise pollution will be caused due to the project and one think the project may influence human healthy.
- They showed different concerns of the environment problem due to operation of the project. 2 showed that air pollution will be the main environment problem due to the project, while 3 agreed on the surface water pollution and the others (80%) believed that there will be no negative environmental influence in operation of the project.
- 24 of the stakeholders showed that the project will benefit the local area by increasing job opportunities or improving economy and one believe that the project will benefit the local area by improving environmental quality. And all the stakeholders interviewed (100%) believed that the proposed project will contribute to the development of local economy.
- 100% of stakeholders interviewed believed the proposed project will have no impact on the everyday living.
- All the stakeholders interviewed agreed with construction of the proposed project and there was no opposition received.

It could be learnt from the summary of the survey that all stakeholders support construction of the project.

The survey forms are available from the project owner.

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

>>

Measures recommended in the EIA report were taken to mitigate the possible impact on the local environment, which will satisfactorily accommodate the stakeholders' concerns regarding noises. The monitoring report issued by the local environmental monitoring station on 12 September 2006 (Lou Huan Jian 2006 No.14) confirmed that all the pollutant emissions of the plant, including waste water, dust and noise, are within the applicable national standards.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3
BASELINE INFORMATION

The following information is used for the calculation of OM emission factor of Central China Power Grid.

Table A3-1 Fuel consumption and emission of Central China Power Grid in 2002

Fuel type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Carbon Emission Factor	Oxidation factor	Net calorific value	CO_2 Emission （tCO_2e）
									t C/TJ	%	MJ/t, MJ/10^3m^3	K=G*H*I*J*44/12/10000 (mass)
		A*	B*	C*	D*	E*	F*	G=A+B+C+D+E+F	H**	I**	J***	K=G*H*I*J*44/12/1000 (volume)
Raw coal	10^4 t	1062.63	4679.02	1710	1113.78	398.57	1964.32	**10928.32**	25.8	100	20908	216150891.6
Clean coal	10^4 t	2.72						**2.72**	25.8	100	26344	67786.27328
Other washed coal	10^4 t	3.66	26.49			249.99		**280.14**	25.8	100	8363	2216299.036
Coke	10^4 t		1.15					**1.15**	29.2	100	28435	35011.06767
Coke oven gas	10^8 m^3			1.11				**1.11**	12.1	100	16726	82370.5322
Other gas	10^8 m^3		2.16					**2.16**	12.1	100	5227	50091.3864
Crude oil	10^4 t		0.67	1.17			0.81	**2.65**	20	100	41816	81262.42667
Diesel oil	10^4 t	1	1.34	1.08	2.19	0.51	0.51	**6.63**	20.2	100	42652	209447.7642
Fuel oil	10^4 t	0.33	0.16	0.34	0.69		1.51	**3.03**	21.1	100	41816	98025.48536
LPG	10^4 t		0.02					**0.02**	17.2	100	50179	632.9244533
Refinery gas	10^4 t	0.49			1.9			**2.39**	15.7	100	46055	63364.46472
Natural gas	10^8 m^3						1.75	**1.75**	15.3	100	38931	382205.0925
Other petro products	10^4 t							**0**	20	100	38369	0
Other coking products	10^4 t							**0**	22	100	28435	0
Other energy	10^4 tsc		3.38					**3.38**	0	0	0	0
											Total	219437388

Data Source: *: China Energy Statistical Yearbook 2003

**: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol.2, page 1.23

***: China Energy Statistical Yearbook 2005, p365

Table A3-2 Fuel consumption and emission of Central China Power Grid in 2003

Fuel type	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**	**Carbon Emission Factor**	**Oxidation factor**	**Net calorific value**	**CO_2 Emission （tCO_2e）**
									t C/TJ	**%**	**MJ/t, MJ/10^3m^3**	**K=G*H*I*J*44/12/10000 (mass) K=G*H*I*J*44/12/1000 (volume)**
		A*	**B***	**C***	**D***	**E***	**F***	**G=A+B+C+D+E+F**	**H****	**I****	**J*****	
Raw coal	10^4 t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	**13851.66**	25.8	100	20908	273971539.9
Clean coal	10^4 t							**0**	25.8	100	26344	0
Other washed coal	10^4 t	2.03	39.63			106.12		**147.78**	25.8	100	8363	1169146.396
Coke	10^4 t				1.22			**1.22**	29.2	100	28435	37142.17613
Coke oven gas	10^8 m^3			0.93				**0.93**	12.1	100	16726	69013.1486
Other gas	10^8 m^3							**0**	12.1	100	5227	0
Crude oil	10^4 t		0.5	0.24			1.2	**1.94**	20	100	41816	59490.22933
Diesel oil	10^4 t	0.52	2.54	0.69	1.21	0.77		**5.73**	20.2	100	42652	181015.941
Fuel oil	10^4 t	0.42	0.25	2.17	0.54	0.28	1.2	**4.86**	21.1	100	41816	157228.9963
LPG	10^4 t							**0**	17.2	100	50179	0
Refinery gas	10^4 t	1.76	6.53		0.66			**8.95**	15.7	100	46055	237285.3386
Natural gas	10^8 m^3					0.04	2.2	**2.24**	15.3	100	38931	489222.5184
Other petro products	10^4 t							**0**	20	100	38369	0
Other coking products	10^4 t							**0**	22	100	28435	0
Other energy	10^4 tsc		11.04			16.2		**27.24**	0	0	0	0
											Total	276371084.6

Data Source: *: China Energy Statistical Yearbook 2004
**: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol.2, page 1.23
***: China Energy Statistical Yearbook 2005, p365

Table A3-3 Fuel consumption and emission of Central China Power Grid in 2004

Fuel type	Unit	Jiangxi A*	Henan B*	Hubei C*	Hunan D*	Chongqing E*	Sichuan F*	Total G=A+B+C+D+E+F	Carbon Emission Factor t C/TJ H**	Oxidation facor % I**	Net calorific value MJ/t, MJ/10^3m^3 J*	CO_2 Emission （tCO_2e） K=G*H*I*J*44/12/10000 (mass) K=G*H*I*J*44/12/1000 (volume)
Raw coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	**17144.1**	25.8	100	20908	339092605.3
Clean coal	10^4 t		2.34					**2.34**	25.8	100	26344	58316.13216
Other washed coal	10^4 t	48.93	104.22			89.72		**242.87**	25.8	100	8363	1921441.232
Coke	10^4 t		109.61					**109.61**	29.2	100	28435	3337011.415
Coke oven gas	10^8 m^3			1.68		0.34		**2.02**	12.1	100	16726	149899.5271
Other gas	10^8 m^3					2.61		**2.61**	12.1	100	5227	60527.0919
Crude oil	10^4 t		0.86	0.22				**1.08**	20	100	41816	33118.272
Gasoline	10^4 t		0.06			0.01		**0.07**	18.9	100	43070	2089.3257
Diesel oil	10^4 t	0.02	3.86	1.7	1.72	1.14		**8.44**	20.2	100	42652	266627.3198
Fuel oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	**14.37**	21.1	100	41816	464893.1434
LPG	10^4 t							**0**	17.2	100	50179	0
Refinery gas	10^4 t	3.52	2.27					**5.79**	15.7	100	46055	153506.3811
Natural gas	10^8 m^3						2.27	**2.27**	15.3	100	38931	495774.6057
Other petro products	10^4 t							**0**	20	100	38369	0
Other coking products	10^4 t							**0**	22	100	28435	0
Other energy	10^4 tsc		16.92		15.2	20.95		**53.07**	0	0	0	0
											Total	346035809.7

Data Source: *: China Energy Statistical Yearbook 2005

**: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol.2, page 1.23

Table A3-4 Power supply of fossil-fuel fired power plants in Central China Power Grid in 2002

Province	Power generated (MWh)	Auxiliary consumption rate (%)	Power supplied (MWh)
Jiangxi	18648000	7.67	17217698
Henan	84734000	8.03	77929860
Hubei	34301000	7.73	31649533
Hunan	20058000	7.73	18507517
Chongqing	14727000	10.21	13223373
Sichuan	27879000	9.59	25205404
Total			183733385

Data Source: China Electric Power Yearbook 2003

Table A3-5 Power supply of fossil-fuel fired power plants in Central China Power Grid in 2003

Province	Power generated (MWh)	Auxiliary consumption rate (%)	Power supplied (MWh)
Jiangxi	27165000	6.43	25418291
Henan	95518000	7.68	88182218
Hubei	39532000	3.81	38025831
Hunan	29501000	4.58	28149854
Chongqing	16341000	8.97	14875212
Sichuan	32782000	4.41	31336314
Total			225987719

Data Source: China Electric Power Yearbook 2004

Table A3-6 Power supply of fossil-fuel fired power plants in Central China Power Grid in 2004

Province	Power generated (MWh)	Auxiliary consumption rate (%)	Power supplied (MWh)
Jiangxi	30127000	7.04	28006059
Henan	109352000	8.19	100396071
Hubei	43034000	6.58	40202363
Hunan	37186000	7.47	34408206
Chongqing	16520000	11.06	14692888
Sichuan	34627000	9.41	31368599
Total			249074186

Data Source: China Electric Power Yearbook 2005

From the above tables, the OM emission factor of Central China Power Grid can be calculated as 1.2779 tCO_2/MWh.

The information used for the calculation of BM emission factor of Central China Power Grid is as follows.

Table A3-7 Percentage of emissions from Coal, Oil and Gas power plants in the total emission of Central China Power Grid in 2004

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	NCV		Carbon emission factor	Oxidation factor	Emission	%
		A*	B*	C*	D*	E*	F*	G=A+…+F	H*		I**	J**	K=G*H*I*J*44/12/100	
Raw coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	20908	kJ/kg	25.8	1	339,092,605	
Clean coal	10^4 t	0	2.34	0	0	0	0	2.34	26344	kJ/kg	25.8	1	58,316	
Other washed coal	10^4 t	48.93	104.22	0	0	89.72	0	242.87	8363	kJ/kg	25.8	1	1,921,441	
Coke	10^4 t	0	109.61	0	0	0	0	109.61	28435	kJ/kg	29.2	1	3,337,011	
Subtotal													344,409,374	99.53%
Crude oil	10^4 t	0	0.86	0.22	0	0	0	1.08	41816	kJ/kg	20	1	33,118	
Gasoline	10^4 t	0	0.06	0	0	0.01	0	0.07	43070	kJ/kg	18.9	1	2,089	
Kerosene	10^4 t	0	0	0	0	0	0	0	43070	kJ/kg	19.6	1	0	
Diesel oil	10^4 t	0.02	3.86	1.7	1.72	1.14	0	8.44	42652	kJ/kg	20.2	1	266,627	
Fuel oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	41816	kJ/kg	21.1	1	464,893	
Other petro product	10^4 t	0	0	0	0	0	0	0	38369	kJ/kg	20	1	0	
Subtotal													766,728	0.22%
Natural gas	$10^7 m^3$	0	0	0	0	0	22.7	22.7	38931	kJ/m3	15.3	1	495,775	
Coke oven gas	$10^7 m^3$	0	0	16.8	0	3.4	0	20.2	16726	kJ/m3	12.1	1	149,900	
Other gas	$10^7 m^3$	0	0	0	0	26.1	0	26.1	5227	kJ/m3	12.1	1	60,527	
LPG	10^4 t	0	0	0	0	0	0	0	50179	kJ/kg	17.2	1	0	
Refinery gas	10^4 t	3.52	2.27	0	0	0	0	5.79	46055	kJ/kg	15.7	1	153,506	
Subtotal													859,708	0.25%
TOTAL													346,035,810	

Data Source: *: China Energy Statistical Yearbook 2005
**: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol.2, page 1.23

According to the statistics of the newly built coal-fired power plants in the tenth five-year period done by the National Electricity Regulatory Commission, among the newly built coal-fired power plants during 2000-2005, units with capacity of 600 MW or more account for 21%, units with capacity of 300 MW account for 60% and the rest has capacity of less than 300 MW. The newly built coal-fired power plants in 2004 have a total capacity of 34 GW, which include 11 units of 600 MW generators, which account for almost 20% of the newly added capacity in the year. Therefore, the 600 MW sub-critical unit is used for the calculation of the best technology commercially available for the coal-fired power plant technology. The weighted-average of the unit coal consumption of the 11 units 600MW generators built in 2004 is used for the calculation, which is 336.66 gce/kWh, equivalent to a power generation efficiency of 36.53%.

200 MW combined cycle technology (equivalent to the GE 9E unit) is selected as the best technology commercially available for the oil and gas fired power plants. The best efficiency of the oil and gas power plants in 2004 is used for the calculation. The coal consumption is estimated as 268.13 gce/kWh, equivalent to a power generation efficiency of 45.87%.

Table A3-8 Calculation of the emission factors of the best technologies commercially available

	Parameter	Efficiency	Carbon emission factor (t C/TJ)	Oxidation factor	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal fired power plant	$EF_{Coal,Adv}$	36.53%	25.8	1	0.9323
Gas fired power plant	$EF_{Gas,Adv}$	45.87%	15.3	1	0.4403
Oil fired power plant	$EF_{Oil,Adv}$	45.87%	21.1	1	0.6072

Based on the above calculation, the emission factor of thermal power plants can be calculated as:

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9304 tCO_2/MWh

Table A3-9 Newly added capacity from 2000 to 2004

	Installed capacity in 2000	Installed capacity in 2001	Installed capacity in 2004	Newly added from 2000 to 2004	Percentage in the newly added capacity
	A	B	C	D=C-A	
Thermal (MW)	39864.6	42569.2	53744.7	13880.1	69.80%
Hydro (MW)	28637.8	30397	34642	6004.2	30.20%
Nuclear (MW)	0	0	0	0	0.00%
Wind farm (MW)	0	0	0	0	0.00%
Total (MW)	68502.4	72966.2	88386.7	19884.3	100.00%
Percentage of the 2004 capacity	77.5%	82.55 %	100%		

Data source: China Electric Power Yearbook, 2001, 2002, 2005

The BM emission factor of Central China Power Grid is then calculated as
EF_{BM}=0.9304*69.80%=0.6494 tCO_2/MWh

Annex 4

MONITORING INFORMATION

As per section B.7.