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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	2007/04/11	Initial version
02	2007/12/08	Revised according to the primary corrective activity requirement in the draft validation report of DOE
03	2008/02/18	Revised according to the further corrective activity requirement form DOE during developing the final report.
04	2008/03/13	Revised based on the approved consolidated methodology ACM0012 Ver 02, due to expiry of ACM0004.
05	2008/11/21	Revised based on the correction request in validation protocol.
05.1	2009/02/10	Revised based on the feedback correction request
05.2	2009/04/05	(current version) Revised based on the feedback correction request

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
Jiangxi Pinggang Group 20MW Waste Gas and Surplus Steam based Captive Power Plant
Version number of the document: 05.2
Date: 2009/04/05

A.2. Description of the project activity:

>>
The project activity is to install a 20MW Waste Gas and Surplus Steam based Captive Power Plant (hereafter referred to as the Project) in Pingxiang Iron and Steel Group Co., Ltd. (hereafter referred to as Pinggang Group) in Jiangxi Province of China. The objective of the project is to generate electricity by means of recovery of waste combustible gas and the surplus steam form the iron and steel making process in Pinggang Group and to displace part of the electricity purchased by Pinggang from the Central China Power Grid (CCPG), thus avoiding CO_2 emissions from the baseline scenario electricity generation of those fossil fuel-fired power plants connected into the Central China Power Grid. The main GHG source involved in emission reduction is for electricity generation of grid, and the GHG is solely focused on CO_2.

The proposed project is in Anyuan factory of Pinggang Group, of which capacity is 2 million tons steel products yearly. In the absence of the project activity, the blast furnace gas (BFG) and waste Converter Gas (LDG) are associated gases in iron and steel making process, of which the caloric value are respectively within the range of 3000~3500 kJ/Nm^3 and 6500~8300 kJ/Nm^3. Currently more than 76000 Nm^3/h of waste BFG and more than 6000 Nm^3/h of wasted LDG is released after flaring by ignition instrument which is in line with *Gas Security Regulation for Industry Enterprise* GB6222-2005, and 40 t/h surplus by-product steam from steel material production line is directly released to the atmosphere.

As the baseline scenario of the proposed project activity, the waste BFG and LDG would be kept flared, the surplus low-temperature steam would be kept released to the atmosphere without energy utilization and the equivalent power is obtained from the Central China Power Grid.

The project activity is to reclaim waste BFG, LDG and heat in surplus steam that have no current user via the installation of a gas-fuel power generator unit of 15MW and a low-pressure steam generator unit of 5MW. The GHG gas included in baseline and project activity are respectively sourced from the CO_2 emission of power generation from CCPG and supplemental fossil fuel consumption at the project plant.

The proposed project will support the development and commercialization of energy saving technologies in steel industry, especially for the small-and-medium scale steel enterprises in China. Other than supplying carbon-free electricity from waste energy of top gas pressure, the project is also can contribute to the sustainable development goal of the local community, the host country and the world by means of:

- Reduces GHG emissions compared to a business-as-usual scenario;
- Improve the energy consumption per unit of output in steel sector in China.
- Reduces emission of other pollutants (including SOx, NOx and floating particles), and thus improves the local environment.
- Increase 48 new employment opportunities for local people.

A.3. Project participants:

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Participants to the project activity are the following:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (Host)	Pingxiang Iron and Steel Group Co., Ltd. (Project owner)	No
Japan (Buyer's Country)	The Tokyo Electric Power Company, Incorporated (Buyer)	No

More detailed contact information on the Participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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

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

>>
Jiangxi Province

A.4.1.3. City/Town/Community etc:

>>
Pingxiang 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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Pingxiang City is located in the west of Jiangxi Province and close with the east of Hunan Province, with the geographical coordinates of east longitude of 113°54′22″ and north latitude of27°39′04″ (plant center). Figure 1 is a map showing the location of Pingxiang City in China.
The location of the Project is in the Baiyuan Street, Anyuan district, Pingxiang City, and the site is 5 kilometres far from the centre of Pingxaing City. Figure 2 is a map showing the location of the Project.

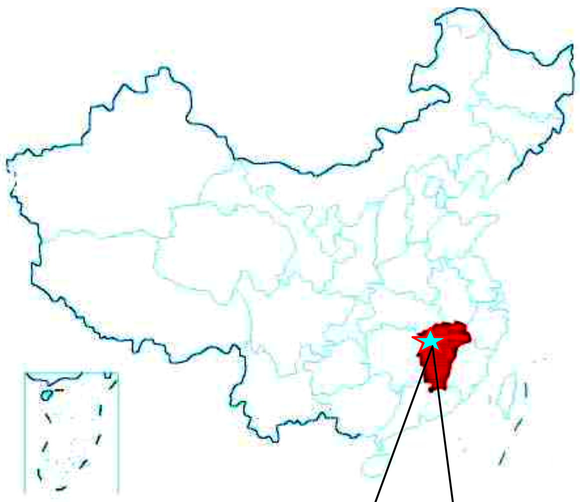

Figure 1. Map showing the location of Jiangxi Province in China

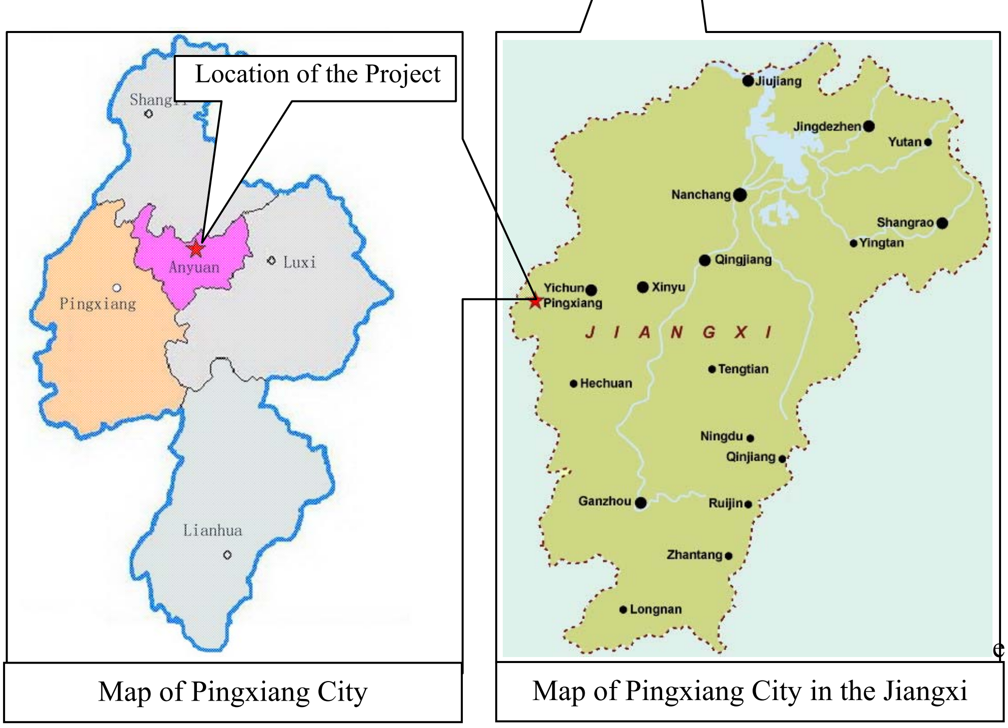

Figure 2. Map showing the location of the Project

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

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

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

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The Project comprised of two components: a gas-fuel power generator unit of 15MW and a low-pressure steam generator unit of 5MW. For the gas-fuel power generator unit, it includes the installation and operation of a set of gas boiler of 75t/h fueled with surplus BFG and LDG that otherwise was flared, together with a set of condensing steam turbine generator unit. For the low-pressure steam generator unit, it includes the installation and operation of a set of steam turbine generator unit to utilize the surplus steam

with pressure of only 0.6MPa which otherwise is released directly.

Based on the last history records of BFG balance of Pinggang before the implementation of the proposed project (detail referred to ANNEX 3), there is 76,365Nm^3/h of BFG is keep surplus. In according to the *Feasibility Study Report* of the proposed project, as the main fuel, the designed annual fuel consumptions of mixed gases include 70,000 Nm^3/h BFG and 6,000 Nm^3/h LDG. Moreover, bottled LPG will be used for igniting during startup of the gas boiler system and the estimated annual consumption is about 650 kg/13 bottles, therefore it would be monitored as source of project emission.

The maximum demand load of Anyuan factory is 93.4 MW and the annual power consumption is about 699.8 GWh, which is totally supplied by virtue of grid power in the absence of the project activity. The total power of the project activity is 20MW and the estimated net electricity generation provided to Pinggang Group could reach 108,000 MWh, displacing equal amount of grid power consumption.

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

Table 1 Key Characteristics of Major Technology Employed by project activity

Gas Boiler	Steam Turbine Generator Unit	Low-pressure Steam Turbine Generators Unit
Model: JG75-3.82/450-Q Rated output: 75 t/h Fuel design: 70%BFG+ 30%LDG Ignition : LPG Pressure out of superheater: 3.82 MPa Temperature out of superheater: 450 ℃ Designed boiler efficiency: ≥87%	Type: Condensing Steam Turbine Model: N15-3.43 Rated Power: 15MW Pressure of input: 3.43 MPa Temperature of input: 435 ℃ Rated Speed: 3000r/min	Type: Low-pressure Steam Turbine Model: S5-0.7 Rated Power: 5MW Pressure of input: 0.58 MPa Rated Speed: 3000r/min
	Generator Model: QFW-15-2 Rated Power: 15 MW Rated voltage: 10.5kV	Generator Mode: QFW-6-2 Maximum Power: 6 MW Rated voltage: 10.5kV
Note: ● The average life of major equipments is 15 years; ● The design standard is *criterion for small scale thermal power plant design.*		

The Key Characteristics of main facilities involved in the baseline scenario or project activity is in Table 2.

Table 2 Key Characteristics of main facilities involved before the project activity

Blast Furnace	Converter	Cooling system of converter and steel rolling
Scale: 450m^3 (volume) Number: 3 sets Starting year: 2004 Average life: no more than 15 years	Capacity: 50t Number: 2 sets Starting year: 2004 Average life: no more than 15 years	Technology: Water cooling system Starting year: 2004 Average life: same with converter

Table 3 Major Monitoring meters Employed by project activity

Parameters monitored	Instrument	location
BFG consumption (volume)	Gas flow meters	See ($Q_{WG,BFG,\ y}$)in Figure 3.
LDG consumption (volume)	Gas flow meters	See ($Q_{WG,LDG,\ y}$)in Figure 3.
Surplus steam input (mass flow)	Steam flow meters	See ($Q_{WH,\ y}$)in Figure 3.
Net Electricity output	Electricity meters	See ($EG_{P,i,\ y}$)in Figure 3.
LPG consumptions	Manual records	See ($FF_{LPG,y}$)in Figure 3.

The main facility involved in the baseline, the entire process of the project activity and major meters of monitoring are illustrated in the following diagram Figure 3.

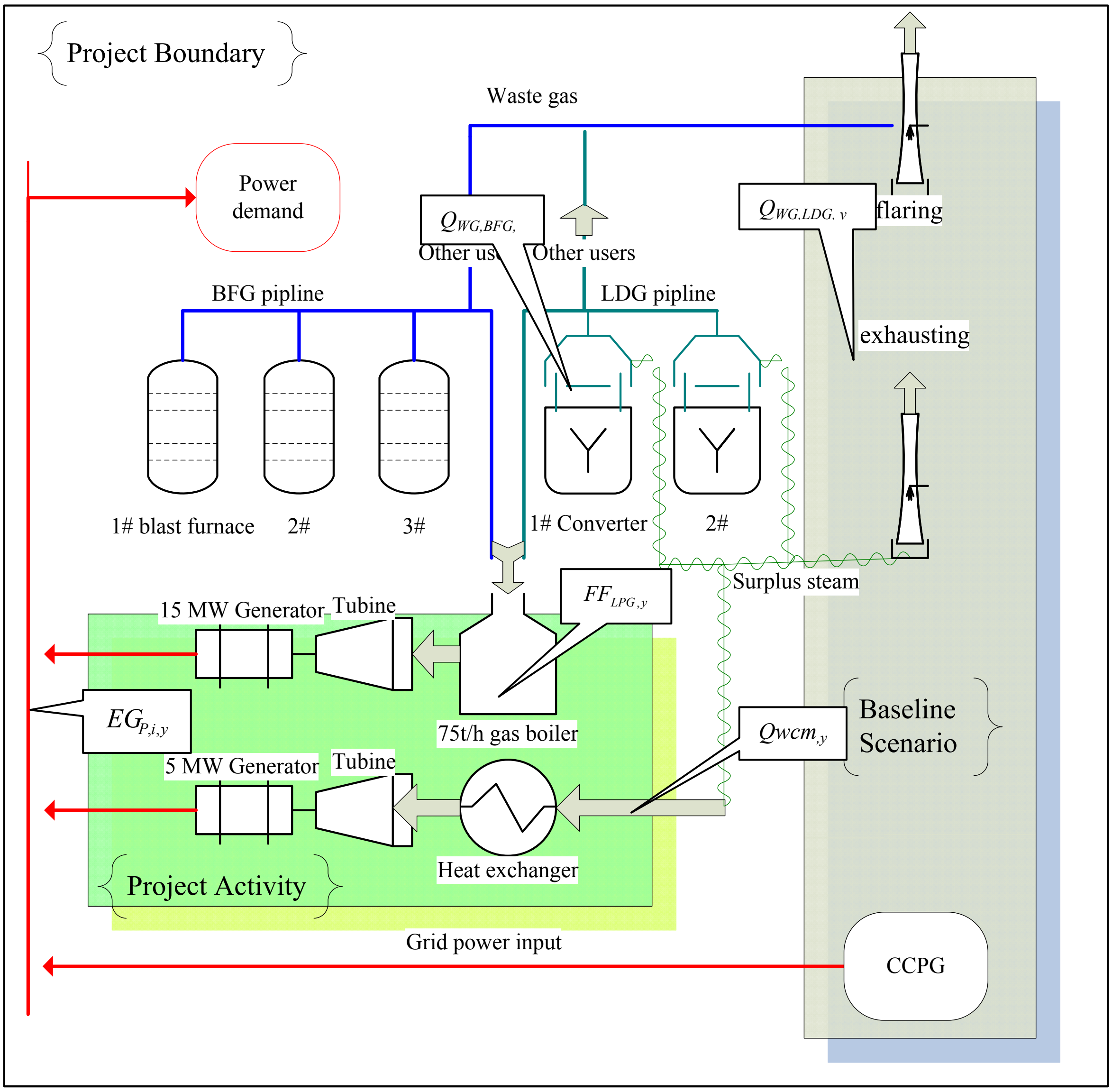

Figure 3. Overall diagram for the project activity, baseline scenario, project boundary and key monitoring metes involved in the proposed project

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

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It is expected that the project activities will generate emission reductions within the Central China Power Grid for about 103,368 tCO_2e per year over a 10-years fixed crediting period from 01/07/2009 to 30/06/2019.

Years	Annual estimation of emission reductions in tonnes of CO_2e
01/07/2009-30/06/2010	103,368
01/07/2010-30/06/2011	103,368
01/07/2011-30/06/2012	103,368
01/07/2012-30/06/2013	103,368
01/07/2013-30/06/2014	103,368
01/07/2014-30/06/2015	103,368
01/07/2015-30/06/2016	103,368
01/07/2016-30/06/2017	103,368
01/07/2017-30/06/2018	103,368
01/07/2018-30/06/2019	103,368
Total estimated reductions (tonnes of CO_2e)	1,033,680
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	103,368

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology:

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

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

Reference:

ACM0012 (version 03) [1]– "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"
(http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PCTTVEWT2HFO0BEYZ9042QPQC41VPH)

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

The *Tool for the Demonstration and Assessment of Additionality* (version 5).

1 The formulas on *fcap* calculation in ACM0012 ver03 are quoted to solve the flaw of the one in ACM0012 ver02.

(http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf)

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

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The consolidated methodology ACM0012 (version 2) is for project activities that utilize waste gas and/or waste heat (henceforth referred to as waste gas/heat) as an energy source for:

• Cogeneration; or
• Generation of electricity; or
• Direct use as process heat source; or
• For generation of heat in element process (e.g. steam, hot water, hot oil, hot air);

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

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

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

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

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

8	• The credits are claimed by the generator of energy using waste gas/heat/pressure. ● In case the energy is exported to other facilities an agreement is signed by the owner's of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source.	• The power plant using waste gas and heat, the generator, belongs to Pinggang. Simultaneously, the electricity generated by the project activity is delivered to meet the energy demand of Pinggang. Therefore, the credits are claimed by Pinggang, the generator.	**Applicable**
9	• For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: ● The remaining lifetime of equipments currently being used; and ● Credit period.	• in absence of the proposed project, the power is supplied by CCPG which will perennial exist obviously more than 10 years in future, so credits can be claimed for Credit period that is the lower one,the credit period.	**Applicable**
10	• Waste gas/ pressure that is released under abnormal operation (emergencies, shut down) of the plant shall not be accounted for.	• The project will not account for any waste gas that will be released under abnormal operation of the plant.	**Applicable**
11	• Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation.	• Cogeneration of energy is from combined heat and power. In this case, the proposed project activity generates electricity only.	**Applicable**
Conclusion: Clearly the project activity is in line with all the applicability criteria and the consolidated baseline methodology ACM0012 is applicable.			

It can be concluded that the consolidated baseline methodology ACM0012 is applicable for Jiangxi Pinggang Group 20MW Waste Gas and Surplus Steam based Captive Power Project, and the emission factor of baseline grid electricity displaced by net electricity supply of the Project is calculated as per the *Tool to calculate the emission factor for an electricity system* (version 1) , the additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* (version 4) approved by CDM EB.

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

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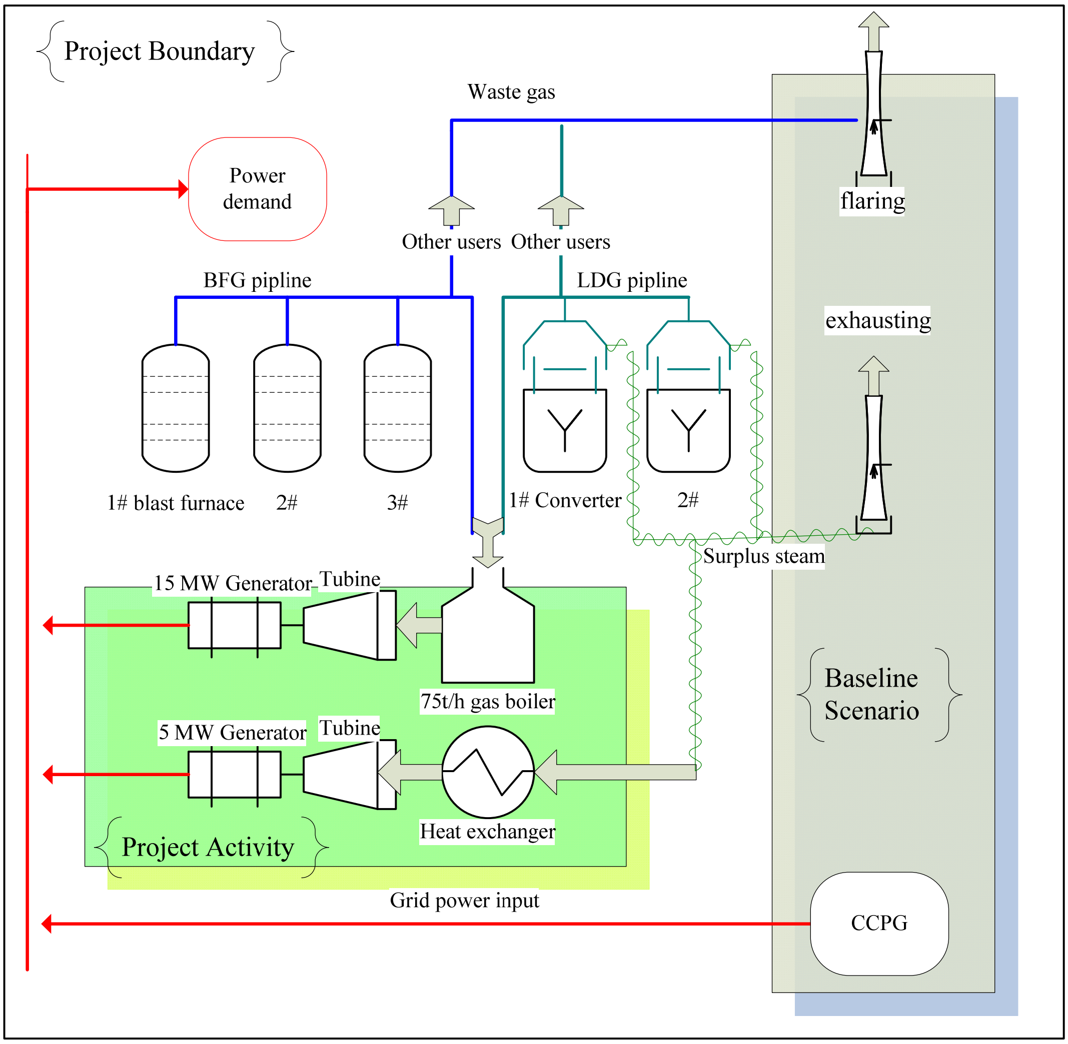
As per the methodology, the project boundary shall include:

1. The blast furnace and converter system which generate waste gases/heat, the process where release the waste gases/heat and the pipes transporting the waste gas /heat;
2. The power plant equipments where the energy content of the waste gases/heat will be utilized for generating electricity;
3. The iron and steel plant of Pinggang where the electricity converted from waste gas and heat will be consumed. Moreover, due to the power is supplied by grid in absence of proposed project, the spatial extent is extended to the power plants connected physically to Central China Power Grid, as defined in the *Tool to calculate the emission factor for an electricity system (version 1).*

The project boundary can be illustrated by below figure as well:



In accordance with the methodology, the following emission sources are considered for the purpose of

determination of baseline emission and project emission.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation, grid or captive source	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Fossil fuel consumption in boiler for thermal energy	CO_2	No	The project activity is utilizing waste gas and waste heat to generate electricity only.
		CH_4	No	
		N_2O	No	
	Fossil fuel consumption in cogeneration plant	CO_2	No	The project activity is utilizing waste gas and waste heat to generate electricity only.
		CH_4	No	
		N_2O	No	
	Baseline emission from generation of steam used in the flaring process, if any	CO_2	No	There is no steam requirement in the flaring process of the waste gas.
		CH_4	No	
		N_2O	No	
Project activity	Supplemental fossil fuel consumption at the project plant	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Supplemental electricity consumption	CO_2	No	Any electricity consumption by power plant equipment, despite which is supplied by grid or the Project itself owned or grid, will be deducted directly form the baseline electricity generation.
		CH_4	No	
		N_2O	No	
	Project emissions from cleaning of gas	CO_2	No	According to the Feasibility Study Report (FSR), no additional cleaning of waste gas will be required in the project scenario than that in the baseline scenario.

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

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

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

Sub-step1 Identification of all alternatives:

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

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

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

P1 Proposed project activity not undertaken as a CDM project activity;
P2 On-site or off-site existing/new fossil fuel fired cogeneration plant;
P3 On-site or off-site existing/new renewable energy based cogeneration plant;
P4 On-site or off-site existing/new fossil fuel based existing captive or identified plant;
P5 On-site or off-site existing/new renewable energy based existing captive or identified plant;

P6 Sourced Grid-connected power plants;
P7 Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity.);
P8 Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity).

Because the project activity is generation of electricity only, the alternatives of heat generation are excluded form consideration.

Sub-step2 Exclusion of non-realistic or non-credible baseline alternatives:
As per the ACM0012, to exclude baseline alternatives shall meet the following criteria:
·Do not comply with legal and regulatory requirements; or
·Depend on fuels (used for generation of heat and/or power), that are not available at the project site

W1 Waste gas is directly vented to atmosphere without incineration **is excluded upon following reason:**
Directly venting waste gas to atmosphere without incineration is conflict with relevant item in *Gas Security Regulation for Industry Enterprise GB6222-2005,* which requires the surplus gas was flared before being vented. Otherwise, for the waste heat form the converter cooling system, this alternative is not applicable.

W3 Waste gas/heat is sold as an energy source **is not feasible due to:**
According to the gas balance of Pinggang Group (detail referred to ANNEX 3), most of the combustible gas generated from the iron and steel making facilities are being used within the production process as fuel or energy sources. In addition, two third-party companies purchased a part of BFG as fuel for **c**alces making process. In absence of the proposed project, for the high toxicity, easy explosion and low caloric value of the waste gas, there is no appropriate user nearby.
According to the steam balance of Pinggang Group, except for the part of used by the iron and steel making facilities, about 40t/h of steam is remaining surplus, which can be utilized in proposed project to power generation. In absence of the proposed project, due to the low pressure, high humidity and discontinuity, there no appropriate user nearby.

P2 On-site or off-site existing/new fossil fuel fired cogeneration plant **is not be considered as the following reason:**
Due to no appropriate heat demand, installation of a new cogeneration plant will not be considered by the project participant. Moreover, no cogeneration plants exist in the project site currently. So Pinggang Group can not get electricity from on-site or off-site existing/new cogeneration plant. Besides, that is simultaneously the main reason to exclude below alternatives with cogenerations.

P3 On-site or off-site existing/new renewable energy based cogeneration plant **is excluded by the following considerations:**
As for renewable sources project, the electricity generated by hydro and wind resources is unstable, and the biomass is not abundant in a reasonable area e.g. Pingxiang City. After considering these reasons, the project participant will not build any renewable sources power plant. On the other hand, for the same reason in excluding ***P2,*** renewable energy based cogeneration plant is not a sensible alternative for the proposed project activity.

P4 On-site or off-site existing/new fossil fuel based existing captive or identified plant is not feasible for the baseline scenario for the below reasons:
There is no existing captive power plant on-site currently, therefore this alternative is discussed mainly focus on new captive power plant scenarios that use other energy sources than waste gases and waste heat afterwards.
For new coal fired power generation project: Considering the same annual electricity generation, the alternative scenario for the proposed project should be a fuel-fired power plant with installed capacity of 20 MW or lower. However, according to China's regulations, construction of coal-fired power plants with

capacity of less than 135 MW are prohibited in the areas which can be covered by large grids such as provincial grids[2], and the coal-fired power units with capacity of less than 100 MW is strictly limited for installation[3]. For these reasons, the possible alternative baseline scenario of building a 20 MW coal-fired power plant conflicts with China's current regulations.
For diesel or natural gas based power generation project: Prices of petroleum and natural gas are very high in China at present and it is expected to be increased in the foreseeable future. Due to the increasing oil price, most oil fired power plants in China are losing money at present. Advice is given by professional institute that necessary cautions should be taken when construct diesel or natural gas based power plant.[4] Under this context, there is no incentive for the project owner to build diesel or natural gas based power project at the project site.

P5 On-site or off-site existing/new renewable energy based existing captive or identified plant **are not feasible** and the analysis has been included in the exclusion of ***P3.***

P7 Captive Electricity generation from waste gas (if project activity is captive generation with waste gas, this scenario represents captive generation with lower efficiency than the project activity.) **is not a creditable alternative in the view point of the owner, just as follow:**
The objectives of the project are to recovery the waste resource to generating lower-emission electricity that displaces the purchased grid power. So the owner shall choose the appropriate technology with best performance unless the owner can not afford it.
On the other hand, according to the FSR there is no applicable technology with significantly lower efficiency for the use of waste gases and heat to power generation currently.

P8 Cogeneration from waste gas (if project activity is cogeneration with waste gas, this scenario represents cogeneration with lower efficiency than the project activity) **is not feasible** and the analysis has been included in the exclusion of ***P2.***

As the outcome of sub-step2, alternatives W2, W4, P1 and P6 are remained as baseline options. A scenario matrix can be developed based on various combinations of baseline options.

Table4 the scenario matrix of the proposed project

Power generation / Waste gas	P1	P6
W2	W2/P1 dose not match. Due to in P1 the energy content of the waste gases and heat is used for power generation, it conflict with W2 where the waste gases is vented after flaring and waste heat released in to atmosphere directly.	W2/P6 dose match. It is considered as a plausible baseline scenario combination. This scenario is "continuation of current practice"
W4	W4/P1 dose match. It is the proposed project activity not undertaken as a CDM project	W4/P6 dose not match. Due to in W4 the energy content of waste gases/heat is used for power

2 *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.
3 *Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators* (issued in Aug., 1997).
4 Http://www.sp.com.cn/dlyw/gndlyw/200602200017.htm.

	activity	generation that displaces equal electricity purchase from grid, it conflict with P6 where this amount of power is purchased from local grid.

The outcome of the Step1: The plausible baseline scenarios may include, inter alia:
W2/P6 The waste gases generated from the three blast furnaces and two converters would have been flared and the surplus steam would have been wasted. Power, equivalent to that generated in the project activity, would have been generated at power plants connected to the Central China Power Grid

W4/P1 The project proponent could have utilized the waste gases/heat for generation of power displacing equivalent purchased grid power. In other words, the project activity will be implemented without CDM.

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

The energy source in the plausible baseline scenario combination identified in step 1 is sourced Grid-connected power plants. Therefore the fuel for the baseline of energy source shall be determined by the real condition of the Central China Power Grid, of which detail is illuminated in B.6.1. Furthermore, the inputs grid power to meet energy demand is definitely eligible all the applicable national/sectoral policies.

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

In the absence of CDM, the alternative combination W4/P1 would be encountered with barriers, particularly investment barriers i.e. the financial uncertainty of the project is too high to be afforded by the restricted equity while commercial loan being rejected and it is not feasible. Therefore it shall be excluded from further consideration (please refer to Section B.5 for 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.

Based on the analysis in Section B.4, all options are excluded other than the combination W2/P6, which shall be identified as the baseline scenario.

Table5 Combinations of baseline options and scenarios applicable to the proposed project activity

Baseline options		Description of situation
Waste gas	**Power**	
W2	**P6**	The waste gases/heat is kept flaring/releasing to atmosphere without energy utilization and the equivalent power is obtained from the 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):

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The chronological events up to now of the proposed project are show step by step in below table: (All relevant documents as evidence could be validated by DOE is necessary)

Stage	Time (year-month)	Events	Remarks
Primary feasibility study and consideration of CDM for the projects	2005-01	Initially propose to consider the project, including benefit and risk of the projects.	*It is to make primary financial analysis and deliberate proposing of the project and how to conquer the potential barriers.*
	2005-11	Brought into contact with CDM experience for steel industry when visit other steel enterprise in Hunan. And started to considered to implement the proposed projects undertaken CDM.	*It is the time to aware of concept and benefit of CDM to the proposing project.*
	2005-12	The decision-maker of Pinggang decide to carry out the projects undertaken CDM.	*It is the earliest formal decision to perform the project based on CDM.*
Attempt to apply loan for projects first time.	2006-03	The application of loan, without content of CDM, for the projects was rejected by local bank	*Encounter with financing barrier by the proposal of the project itself without CDM.*
Start applying for registration as CDM projects	2006-06	Signed CDM consulting service agreement with consultant entity	*Searching for professionals to help them apply and take advantage of CDM to overcome the barriers.*
Negotiation with bank with CDM consideration second time.	2006-06	Reply to the supplement application materials for loan, with consideration of CDM revenue.	*By support of consultancy, successful got a intention of loan with condition of CDM.*
Decided to carry out the proposed project by virtue of equity at first	2006-07	Internal approval letter to this proposal, based on the letter of intent for loan.	*Based on the LoI with bank, decided to implement project firstly to help attract better CER contract provision*
finalization of feasibility study report	2006-08	Started to develop feasibility study report of 20 MW gases and steam based power plant.	*It is the time that has a detailed plan and a clear financial situation of the project, with and without CDM revenue.*
Obtained the governmental approval	2006-11	Obtained approval letter of 20 MW gases and steam based power plant form local government	*N/A*
Obtained EIA from local environment bureau.	2006-12	Obtained EIA of 20 MW gases and steam based power plant from local environment bureau.	*N/A*
Start construction	2006-12-25 **(Start date)**	Civil work construction was formally begun, and it can be demonstrated by the supervision report.	*It is the earliest" real action" to start the project formally, thereby is deemed as the start date.*

Sign general contract.(including equipment purchasing and installation)	2006-12-28	General contract was sign with contractor and put into effect then.	*N/A*
Start GSP of validation	2007-05	CDM Validation process was formally started	*N/A*
Form a intention with buyer for CERs	2007-06	Sign the LoI with buyer.	*Primarily build up a contract relation with buyer.*
Sign ERPA with the buyer	2007-10	Sign the ERPA with buyer.	*N/A*
Obtained LoA of CDM from DNA of China	2007-10	The CDM process was approved by DNA of China.	*N/A*
Start commercial operation	2007-11	The project start commercial operation of power generation	*N/A*
Revision and re-GSP	2008-03	Re-Kick of GSP due to Methodology switch.	*Switch to ACM0012.*

The additionality of the Project is demonstrated by using the *Tool for the Demonstration and Assessment of Additionality (version 04)* approved by CDM EB.

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

The outcome of Step1: Both of the alternative combinations W4/P1 and W2/P6 as showed below are consistent with current mandatory laws and regulations. Therefore, both them are remained for further steps.

W2/P6 The waste gases generated from the three blast furnaces and two converters would have been flared and the surplus steam would have been wasted. Power, equivalent to that generated in the project activity, would have been generated at power plants connected to the Central China Power Grid

W4/P1 The project proponent could have utilized the waste gases/heat for generation of power displacing equivalent purchased grid power. In other words, the project activity will be implemented without CDM.

Step 2. Investment Analysis

This step is bypassed in the PDD.

Step 3. Barrier analysis

This step is used to determine whether the proposed project activity faces real barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Step 3 is carried out in the following sub-steps:

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

<u>Investment Barrier</u>

The proposed project is clean energy technologic project i.e. waste energy utilization project carried out by a non-public steel company. The identity brought an inherent dilemma or investment barrier to the project. In the first place, domestic commercial bank refused to afford loan to the project considering that the risk can hardly compensated by the current interest rate level, particularly to such project implemented by a non-public steel firm. In the second place, there is not enough incentive for the owner, Pinggang Group, to allocate limited equity to the project that is financially non-attractive either a non-core-business project. Since it is with the highest priority to reinforce their Competitive forces by invest on expansion and product upgrade, otherwise, the firm may encounter a threat on survival. Based on that situation, the investment barrier is substantiated from following two aspects:

- ☐ Barriers of investment on a non-core business project with high financial uncertainty by equity.

As a non-public steel company, Pinggang Group has to confront with the reality that the stiff competitions and sectoral policy enforced them to continuously allocate their equity to enhance their core business or expand their steel production scale.

In accordance to the investigation by Mckinsey[5] , China will keep a strong and fast rising demand for flat steel before 2010 and China is a pure importing country for flat steel now. Moreover, the domestic steel plants recently are prevailingly enhancing their competitive ability through expanding production scale or invest to increase the production with high added-value.

In addition, currently the iron and steel industry in China is undergoing a structure adjustment period. According to the *development policy of steel industry of China* published by NDRC of China in 20th Jul 2005[6], a batch of enterprise with small scale and low technology level will fall into disuse in the coming years; simultaneously expanding scale via enterprise merging is encouraged by the policy. Under this context, the iron and steel enterprises in Jiangxi Province are in face of capacity integration[7]. Furthermore, the groups of non-public firms are the most vulnerable to the stringent policy and facing competition threat of the state-owned groups. In order to implement their expanding and development plan, Pinggang also allocated to conduct a merging business and to develop flat steel product line[8.]

The project activity, by contrast, is obviously not a strategic or core-business project, furthermore, no evidence could substantiate that the project is financially attractive without CER revenues, no matter based on the financial analysis in FSR or other plausible data recourse. At least, it could be observed that the financial uncertainty is too high for the owner to judge whether it is a profitable investment. Thus it would be carried out only on the grounds of owning plenty of free equity capital or financing support to offset the risks in investment.

Based on above situation, so as to alleviate the pressure of survival, Pinggang Group has to collect their equity to increase the competitive forces in core-business and make sure using that in the highest efficient way. Therefore, if without any financing support or guarantee, it is not reasonable and acceptable for the owner to invest in a non-core business project with high uncertainty in financial attractiveness.

- ☐ Lack of loan from commercial bank.

5 http://www.mckinseyquarterly.com/The_China_factor_in_global_steel
6 http://zys.ndrc.gov.cn/xwfb/t20050720_37565.htm
7 http://jxgdw.net/jxgd/news/jxsz/userobject1ai502187.html
8 http://business.sohu.com/20060929/n245604233.shtml

Financing restriction is a major barrier not only to the development of non-public steel firms, but also to the spread of clean energy technology in China. Firstly, the fact has been extensively reported that numerous non-public steel firms had suffering prevalent severe stress on their cash flows, for the reason of restriction policy on banking for the steel sector since 2004 in China[9]. Under this situation, the non-public steel firms cannot help to raising fund by self-accumulation, as a result, the investment activity or expansion of these enterprises are fundamentally limited. Moreover, the domestic banks in China generally have little awareness on the clean energy technology project e.g. the waste energy recovery and power generation project, worse, a cap of interest rate of commercial loan make the banks risk-averse towards the unfamiliar sector with evident uncertainty.[10]

Since 2004, working conference on economic issues held by the central government and the No.47 standing conference of State Council have required that macro regulations be imposed on loans to industries such as steel industry[11]. China Banking Regulatory Commission organized inspections in 2004 and 2005 on loans made by banks to steel industry[12]. In addition, banks implement strict control on loans made to steel industry, and ICBC even withdrew loans previously made[13].

Similarly, the proposed project has ever suffered from the rejections of loan applications form local banks[14]. This financial barrier has lasted to Jun 2006, till when the bank started to change their negative attitude with a consideration of CER revenue as a security[15]. Since Pinggang Group was willing to take the potential CERs revenue as a security and use to return the loan in top-priority, the bank showed there conditional intent on loan, and they promised to provide loan to the project activity as long as it being registered as a CDM project. Moreover, then the CER revenue would remarkablely offset the financial risks in operating the project.

In summary, the factor of CDM turned into the catalyst which attracted bank by compensating their risk of loan and make the proposed project financial feasible in term of equity investment requirement as well. Eventually, by virtue of the conditional promise form bank, Pinggang Group decided to start the construction with equity at first, so as to obtain the CER revenue as soon as possible to realize the loan support.[16] Therefore, in absence of considering the CDM revenue, the Project faced investment barrier constituted by above two aspects.

Based on the analysis above, due to the financing difficulties and the investment dilemma, the proposed project undertaken without registered as a CDM project would be prevented by the investment barrier.

Technological barriers

Difficulties for utilization result from the low quality of resources.

BFG is the by-product of blast furnace iron-making process. Due to the low caloric value and unstable status of combustion of BFG, effective utilization of BFG has always been a difficult problem for China's iron and steel producers. The first choice for them at present is to flare BFG in case of gas surplus.

LDG is the by-product of the converter steel-making process, which is characterized by high temperature, high dust content and discontinuousness. Thus it is difficult to treat or be used in other way except for fueled among the steel making process system, therefore the prevailing practice for surplus LDG is flare currently. To utilize the LDG as a fuel for power generation, accessorial facilities including a 30,000m^3 gas holder is necessary, moreover, the requirement for the dedust system would be higher. Therefore the

9 *Report on the Actual Situation of Non-Public Iron and Steel Enterprises in China, 2004.*

10 Report: *Financing Energy Efficiency in China.*

11 Www.hnii.gov.cn/itlt1.asp?theid=2641.

12 Http://www.mysteel.com/servlet/News.Detail?id=531227 and http://news.yonghua.net.cn/htmldata/2005_03/2/11/ article_126308_1.html.

13 Http://finance.sina.com.cn/money/bank/bank_hydt/20060404/20372473902.shtml.

14 Loan replay letter of the project from ICBC

15 Loan reply letter form ICBC,with a conditional intent.

16 Internal approval letter.

project owner has to provide additional investment for the operation and maintaince the waste gas power generation unit.

In the sub-project of 5 MW steam based power plant, the afterheat Steam is a by-product of the cooling system within the steel-making process. Distinguishing the high-pressure steam, Low-pressure afterheat steam is difficult to utilize except for some simple Enthalpy reclaim measures especially when the pressure is below 0.6MPa. Thus the prevailing treatment for the surplus low pressure afterheat steam is release on-site directly[17]. The low pressure steam in proposed project is yield from the converter and furnace cooling system, and the pressure of which is stabilized into 0.6 MPa by the steam heat accumulator. Such a pressure is too low to generate electricity through the condensing turbine unit, i.e. the energy efficiency will be as low as about 12%. Therefore there are few similar cases made use of such a 0.6 MPa surplus steam in Jiangxi Province[18]. The 5MW low pressure steam turbine unit will be the 'first-of-a-kind' in steel sector of Jiangxi Province and lack the successful practice experience, thus uncertain technical risk exist in the operation of the project activity.

Lack of experience of operation and maintenance

As to the project owner, they have no experience in respects of operation and maintenance of the Project. Therefore, construction and operation of the Project need strong technical support from equipment suppliers. In the meantime, the project owner is required to make additional investment in human resources and capitals to study and master the technologies related to the operation and maintenance of the Project. On the other hand, it is necessary to prepare more reserve fund to handle the potential technical risks that discussed above.

Pinggang Group started to consider the feasibility of proposed project since Jan 2005, however their initial attitude towards the project was once negative due to the encountered barriers. Until Nov 2005, they were acknowledged of CDM form experience of other steel enterprise in Hunan Province, they acquired a new incentive to perform the project, and they began trying to persuade bank borrow them money on that in middle 2006, by virtue of advisory of relevant consultant entity. While they got a conditional promise of loan from bank on the base of CERs, the decision-maker of Pinggang decided to conduct the proposed project undertaken as CDM project. During the period, the CDM related preparation works was undergoing in parallel with the project. Till Dec 2006, the project had been approved by government, Pinggang decided to commence construction of the proposed project. Hence it is able to testify that the CDM is an indispensable condition in financing channel and a necessary motivation of Pinggang to start the proposed project as well.

To summarize, the combined alternative W4/P1 is not feasible as it faces investment barrier, technological barrier and the first-of-its-kind barrier. Alternative W4/P1 is not baseline scenario.

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):

For combined alternative W2/P6, there does not exist above identified barriers.

Step 4 Common practice analysis

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

According to the criterion to define similar activities to the proposed project, following two factors are considered during the discussion:

Define the region for analysis—Provincial area.

17 Xian liqing, Discussion on Utilization of Low- pressure Afterheat Steam[J] ,Metallurgical Power .2005, 5(111) :86~87

18 Discussion on plan of waste heat steam utilization in steelmaking process[J] , Energy for Metallurgical Industry.2005, 5(24) :54~56

Till 2006, the total crude steel production of Jiangxi Province has gone beyond 10 million tonnes , which means the scale of steel industry in Jiangxi Province is closed to some of other greatest steel production country e.g. United Kingdom (13.9 million tonnes, 2006), Belgium (11.6 million tonnes, 2006), Poland (10.0 million tonnes, 2006), Iran (9.8 million tonnes, 2006)[19]. Therefore, the Provincial area, Jiangxi, is a representative sample to have the analysis on steel sector in term of scale.

In addition, in China there are many distinctions among provinces upon series significant factors for steel sector or individual enterprises, including the differences in aspects of market constitution, raw material supply, the industry development strategy and the financing policy.

As to the material factor e.g. power price, ironstone, are sensitive with provincial differences. Ironstone for steel sector in China depends on import more than half[20], therefore the distance to main harbours along coastline impacts the cost significantly, which is mainly decided by the geographic location. Besides, the power cost is with obvious distinctions among provinces of central China.[21] About the steel industry strategies, provincial differences also greatly affect the enterprises development plan and local financing policy in each province.[22] With reference to the statistic data of Jiangxi Association of Industry economy in 2006, the profit level of unit steel product remarkablely lower than the other province, as the data show in Table 3. [23]

Table 7 the comparison of Steel profit between the corporation in Jiangxi and other province

Corporation	**Province**	**Profit unit steel (RMB/ton)**
Xinyu steel	Jiangxi Province	**270**
Nanchang steel	Jiangxi Province	**183**
Pingxiang steel	Jiangxi Province	**220**
Hangzhou Steel	Zhejiang Province	597
Liuzhou steel	Guangxi Province	479
Shaoguan Steel	Guangdong Province	333
Sanming Steel	Fujian Province	406
Lianyuan Steel	Hunan Province	402
Nanjing Steel	Jiangsu Province	422
Jinan Steel	Shandong Province	427

Hence, as one of the steel enterprises in Jiangxi Province, product Pinggang Group is affected significantly by provincial market demand, their raw material cost is restricted by the nature resource, geographic and transportation conditions, their development strategy can be independent against the provincial industry plan, and they can hardly obtain financing support beyond the local bank entities.

In summary, the provincial region could reflect a comparable environment with respect to regulatory framework, investment climate, which is in line with the requirement of the *Additionality Tool (Ver05)*, particularly in the point of the financing barrier of the proposed project, as described above.

Define the similar activities

19Statistic data of International Iron and Steel Institute (IISI), 2007

20 http://business.sohu.com/20070416/n249455721.shtml

21 Statistic data of grid power price in provinces of CCPG,2006.

22 Structural adjustment and development planning in Jiangxi steel industry "11th Five-Year Plan" structural adjustment and development planning

23 http://www.jxjmw.com/user/jxgjl/index.php?langtype=cn&pageid=cn_13&add=view&id=225

Within the area of Jiangxi Province, the operational projects that are similar to the proposed project i.e. the waste gas/steam based power generation projects are presented in Table 8.

Table 8. the comparable activities in Jiangxi Province

No	*Projects*	*owner*	*Identity of the owner*	*Technical features*
1	*Waste BFG power generation*	*Xinyu Iron and Steel Group Co.*[24]	*State owned listed company*	*Out put volume of boiler: 130t/h*[25] *Fuel: solely BFG*
2	*Waste BFG power generation*	*Nanchang Changli Iron and Steel Croup Co.*[26]	*State owned listed company*	*Output volume of boiler: 90t/h* [27] *Fuel: solely BFG*

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

A common ground of above projects is that, obviously, the projects are performed by state owned listed steel companies. The stock codes of each firm are respectively SHA: 600507 (*Nanchang Changli Iron and Steel Croup Co.*) and SHA: 600782 (*Xinyu Iron and Steel Group Co.*). Generally, equity financing method, like seeking financing by listing on the stock market is a relatively lower cost way to raise fund, due to the avoidance of cost of interest compared with commercial loan. Moreover, the state owned enterprises have overwhelming advantage against the non-public firms in China. Therefore, the investment environment being confronted with is significantly distinctive against the owner of Pinggang Group.

As analysed in step 3, the barriers to implement the proposed project are focused on the characters of financially unattractiveness to the equity, as well as the reality of lack of loan support. What should be accounted is that both that two aspects can be attributed to the identity of private steel firm of the project owner to a large degree.

As analysed in paragraph of investment barrier, the difficulties to a large extent stem from the being a non-public steel firm. Unlike the state-owned enterprises, non-public firms have disadvantages in receiving bank loans and getting approval form authorities. It has been well recognized the lack of a “level playing field” for non-public enterprises. For instance, firstly, government procurement and bidding is generally only open to government departments State-owned-enterprises. Private enterprises are excluded. Moreover, in terms of financial and industrial services, private enterprises are not given equal treatment. It is well known that financial support is an important factor for private enterprise development. At present, private enterprises face many financial difficulties. Based on some statistic data on the classification of the resources for private investment in 2001, self-financing accounted for 82% out of the total. It means that the financing channels of private enterprises are relatively narrow and that financial support from the banking sector is far from sufficient.[28]

Obviously in term of the investment climate or financing access, there are series distinctions for non-public and public enterprises in China. Therefore, the investment barriers that the proposed project subjects to are hardly deemed to prevent similar waste energy utilization activities that occurred in other state owned listed companies. Thus the two projects listed in **Table 8** are not contradicted with the barriers or financial unattractiveness of the proposed project, and they could be excluded from the common practice analysis.

In fact until 2009, Pinggang Group was the largest one among the 90 non-public steel firms in Jiangxi Province. The proposed project would be the first waste energy based power plant project conducted in

24 http://www.xinsteel.com.cn/qyjs/qyjs.htm

25 http://www.cqvip.com/qk/92432x/2005008/18115323.html

26 http://www.changli-steels.com/

27 *Xu Donghua.the application of energy saving technology in No.1BF system of Nangang.[J].Vol.26.No.5.Energy For Metallurgical Industry.*

28 *WORKING PAPER No.27 .Private Sector Development in the People's Republic of China*

Jiangxi province, by a non-public steel firm. There is no other operational activity similar to the proposed project activity.[29]

That no similar project exists supports the conclusion of step 2 and step 3 and further demonstrates the additionality of the Project.

To sum up, the proposed project is of additionality.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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

·calculate the baseline GHG emissions;

·calculate the emission factor of grid;

·calculate the project GHG emissions;

·calculate the project leakage;

·calculate the emission reductions.

Calculate the baseline GHG emission

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

$$BE_y = BE_{En,y} + BE_{flst,y} \tag{1}$$

BE_y	are total baseline emissions during the year y in tons of CO_2
$BE_{En,y}$	are baseline emissions from energy generated by project activity during the year y in tons of CO_2
$BE_{flst,y}$	Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year). This part of emission does not exist in the baseline scenario of the proposed project, thus it is not involved in baseline calculation any more. $BE_{flst,y} = 0$

The calculation of baseline emissions （$BE_{En,y}$）depends on the identified baseline scenario.

The baseline scenario represents the situation where the electricity is obtained from the grid:

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \tag{1-1}$$

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

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

29 A Certificate: *Illustration of WHR technology penetration situation for non-public steel firms in Jiangxi Province.*

$$BE_{Elec,y} = \sum_{i=1,2} f_{cap,i} * f_{wg,i} * (EG_{P,i,y} * EF_{Elec,gr,y}) \quad \textbf{(1-2)}$$

Where:

$EG_{P,i,y}$	is the quantity of electricity supplied to the recipient by the project activity, which in Net quantity of electricity supplied to the recipient by the unit i which in the absence of the project activity would have been sourced from the Central China Power Grid during the year y in MWh.
$EF_{Elec,gr,y}$	is the CO_2 emission factor for the Central China Power Grid, displaced due to the project activity, during the year y in tons CO_2/MWh
$f_{wg,i}$	Fraction of total electricity generated by the project activity using waste gas and waste heat. Under normal conditions, the electricity generation is purely from use of waste gas and waste heat in the project activity, that is $f_{wg} = 1$.
$f_{cap,i}$	Energy that would have been produced in proposed project year y using waste gas and surplus heat generated in base year expressed as a fraction of total energy produced using waste gas in year y. The ratio is 1 if the waste gas/heat/pressure generated in project year y is same or less then that generated in base year. The value is estimated using equation (1-3) and (1-4).
i	When i=1 means waste BFG and LDG based unit, 2 for surplus heat based unit.

Capping of baseline emissions

As per ACM0012 (ver02), the quantity of waste gas and heat in the 3 years previous to the project activity is available, however, due to the unit of waste heat in project is not consistent with ACM0012(ver02) ones, the $f_{cap,i=2}$., capping value for surplus steam utilization, has to resort to the corresponding equation in ACM0012(ver03) .

Hereby the combined use of formulas is adopted, in which **method-1** in ACM0012 (ver02) is selected to calculate the $f_{cap,i=1,}$ capping value for was gases utilization, and **method-2** in ACM0012 (ver03) is selected to calculate the $f_{cap,i=2,}$ capping value for surplus steam utilization.

Method-1 in ACM0012 (ver02) for $f_{cap,i-1}$:

The baseline emissions are capped at the maximum quality of waste gas flared/combusted released into the atmosphere under normal operation conditions in the 3 years previous to the project activity.

$$f_{cap,i=1} = \frac{Q_{WG,BFG,BL} * NCV_{BFG,BL} + Q_{WG,LDG,BL} * NCV_{LDG,BL}}{Q_{WG,BFG,y} * NCV_{BFG,y} + Q_{WG,LDG,y} * NCV_{LDG,y}} \quad \textbf{(1-3)}$$

Where:

$\mathbf{Q_{WG,BFG,BL}}$	Quantity of waste BFG generated prior to the start of the project activity. (Nm^3/yr)
$\mathbf{Q_{WG,BFG,y}}$	Quantity of waste BFG used for energy generation during year y (Nm^3/yr)
$\mathbf{NCV_{BFG,BL}}$	Net caloric value of per volume unit BFG generated prior to the start of the project activity (MJ /Nm^3)
$\mathbf{NCV_{BFG,y}}$	Net caloric value of per volume unit BFG used for energy generation during year y (MJ /Nm^3)
$\mathbf{Q_{WG,LDG,BL}}$	Quantity of waste LDG generated prior to the start of the project activity. (Nm^3/yr)
$\mathbf{Q_{WG,LDG,y}}$	Quantity of waste LDG used for energy generation during year y (Nm^3/yr)
$\mathbf{NCV_{LDG,BL}}$	Net caloric value of per volume unit LDG generated prior to the start of the project activity (MJ/Nm^3)

$NCV_{LDG,y}$ Net caloric value of per volume unit LDG generated in year y

Method-2 in ACM0012 (ver03) for $f_{cap,i-2}$:
The manufacturer's data for the industrial facility shall be used to estimate the amount of waste energy the industrial facility generates per unit of product generated by the process that generates waste energy. In case any modification is carried out by project proponent or in case the manufacturer's data is not available for an assessment should be carried out by independent qualified/certified external process experts such as a chartered engineer on a conservative quantity of waste energy generated by plant per unit of product manufactured by the process generating waste energy. The value arrived based on above sources of data, shall be used to estimate the baseline cap. The documentation of such assessment shall be verified by the validating DOE.
The basis for using the capped value (including manufacturer's design document/letter and the expert's analysis) should be provided to DoE during validation.
Under this method, following equations should be used to estimate fcap.

$$f_{cap,i=2} = \frac{Q_{WCM,BL}}{Q_{WCM,y}} \quad \textbf{(1-4)}$$

Where **(1-4-1)**

$$Q_{WCM,BL} = Q_{BL,product} * q_{wcm,product}$$

Where:

$Q_{WCM,BL}$ Quantity of waste energy generated prior to the start of the project activity estimated using equation (1-4-1). (tonnes steam) .In the project activity, the surplus steam is generated form two source: the converter system and the steel rolling system. Hereby, the aggregated quantity of both part is adopted in the PDD.

$Q_{BL,product}$ Production associated with the relevant waste energy generation as it occurs in the baseline scenario. In the project activity, raw steel produced by converter system and rolled steel is adopted respectively (tonnes).
The minimum of the following two figures should be used: (1) average annual historical production data from start-up, if plant operational history is less than three years, of the plant or (2) the most relevant manufacture's data for normal operating conditions.

$q_{wcm,product}$ Amount of waste steam per unit steel in the steel material production line (tonnes steam/tonnes steel).

Calculate the emission factor of Central China Power Grid

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

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

Step 1. Identify the relevant electric power system

According to the"Tool to calculate the emission factor for an electricity system", the data published by the DNA of China is refered. Therefore, in accordance to the latest delineation published by DNA of China on Dec of 2006, Central China Power Grid (CCPG) is identified as the electric power system, from which would provide electricity in baseline scenario. The spatial extent of the CCPG comprises all the power plants connected physically to the Central China Grid, which covers Henan Province, Hubei Province, Hunan Province, Jiangxi Province, Sichuan Province and Chongqing City.

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

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

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

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Among the total electricity generations of the Central China Power Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 38.00% in 2000, 36.76% in 2001, 35.95% in 2002, 32.86% in 2003 and 32.36% in 2004, the average is 35.19%. Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{OM,y}$) for the Project.

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

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

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

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

According to the "Tool", Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. However, due to the necessary data, including the fuel consumption and net electricity generation of each power plant, being not available in China, neither Option A nor Option B can be used. So Option C is adopted and accordingly only nuclear and renewable power generation are considered as low-cost/must-run power sources and data of the quantity of electricity supplied to the grid by these sources should be available.

As per Option C, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

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

where:

$EF_{grid,OM,simple,y}$ is Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$FC_{i,y}$	is the amount of fuel i (in a mass or volume unit) consumed by project electricity system in year(s) y,
$NCV_{i,y}$	is Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	is Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	is All fossil fuel types combusted in power sources in the project electricity system in year y
y	is Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option), following the guidance on data vintage in step 2

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

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

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

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

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

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

Due to the information of the five power plants built most recently in each regional gird of China being not available. Therefore, the sample group of power units *m* used to calculate the build margin is chosen (b).

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

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

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

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

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

Where:

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

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

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

m Power units included in the build margin

The sample group of power units m used to calculate the build margin is chosen (b) in step 4. According to the EB's guidance on DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China", the EB accepted the following deviation[30]:

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

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

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

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

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

Where:

$\Sigma CAP_{fossil,y-s}$ Total capacity additions of fossil fuel fired power of CCPG from year s to year y,

ΣCAP_{y-s} Total capacity additions of CCPG from year s to year y,

$EF_{EL,fossil,y}$ The emission factor for fossil fuel fired power of CCPG with the efficiency level of the best technology commercially available,

y Mostly recent year that the relevant data can be obtained publicly,

s Determined by:

Starting from year *y*, the differences of total installed capacity of the grid between year *y* and year *y*-1, year *y* and year *y*-2, …year *y* and year *y-s*, year *y* and year *y-s*-1, …are calculated respectively, and then divided by the installed capacity of *y* year. The year that can make the left-hand side of the following formula greater than 20% will be regarded as *s*. The formula is as follows: $\Sigma CAP_{y-s}/\Sigma CAP_y$ (see Annex 3 for detailed information)

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

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

Where:

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

It is calculated as follows:

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

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

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

Where:

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

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

Coal, Oil and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

.

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ in formula(2-4) represent the related Emission Factor of the commercially available most advanced coal, oil and gas fired power technology, which shall be determined using Option B2, as follows:,

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

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

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

Where:

η_{Adv} net energy conversion efficiency of the best thermal power technology commercially.

Coal, Oil and *Gas* is the feet for solid fuels, liquid fuels and gas fuels.

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

Step 6. Calculate the combined margin emissions factor

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

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

Where:

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

$EF_{grid,OM,y}$ Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} Weighting of operating margin emissions factor (%)

w_{BM} Weighting of build margin emissions factor (%)

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

Calculate the project GHG emission

Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of heat/energy/electricity.

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

PE_y Project emissions due to project activity.

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

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

In the project activity, bottled LPG (Liquefied Petroleum Gas) will be used for igniting during the start-up generation or in emergencies and other fossil fuels rather than LPG can not be used. Please refer to Feasibility Study Report (page 12-13) for more details.

Where:

$$PE_{AF,y} = FF_{LPG,y} * NCV_{LPG} * EF_{CO2,LPG} \qquad \textbf{(3-1)}$$

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

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

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

$PE_{EL,y}$ Project activity emissions from on-site consumption of electricity for gas cleaning equipment.
Because the electricity was consumed in gas cleaning equipment in baseline as well, project emission due to electricity consumption for gas clean will be ignored.
So, $PE_{EL,y} = 0$

Calculate the project leakage

According to the consolidated baseline methodology ACM0012, no leakage is considered,
$L_y = 0$ *tCO_2e.* ***(4)***

Calculate the emission reductions

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

$$ER_y = BE_y - PE_y \qquad \textbf{(5)}$$

Where:

ER_y is the emissions reductions of the project activity during the year y (tCO_2e),

BE_y is the baseline emissions due to displacement of electricity during the year y (tCO_2e),

PE_y is the project emissions during the year y (tCO_2e).

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

Data / Parameter:	EG_y

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

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

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

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

Data / Parameter:	$OXID_i$

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

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	The capability of power plant with technology *j* in CCPG in year *y*
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the China Electric Power Yearbook is reliable.
Any comment:	

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

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

Data / Parameter:	$Q_{WG,BFG,BL}$
Data unit:	Nm^3 /y
Description:	Quantity of waste BFG generated prior to the start of the project activity, which will be used by generator in proposed project activity. (Nm^3)
Source of data used:	Waste BFG quantity historical records , please refer to data in ANNEX 03
Value applied:	319,381,853
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average of three years historic BFG quantity records is selected. The method 1) is selected thus the adopting historical records is reasonable.
Any comment:	In case of modification of plant the method-2 can be used as stated above.

Data / Parameter:	$Q_{WG, LDG,BL}$
Data unit:	Nm^3 /y
Description:	Quantity of waste LDG generated prior to the start of the project activity, which will be used by generator in proposed project activity. (Nm^3)
Source of data used:	Waste LDG quantity historical records, please refer to data in ANNEX 03
Value applied:	48,626,687
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average of three years historic BFG quantity records is selected. The method 1) is selected thus the adopting historical records is reasonable.
Any comment:	In case of modification of plant the method-2 can be used as stated above.

Data / Parameter:	$NCV_{BFG,BL}$
Data unit:	MJ/m^3
Description:	Net caloric value of per volume unit BFG generated prior to the start of the project activity
Source of data used:	the upper value in FSR.
Value applied:	3.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the priority for the regional specific value, national specific value was selected.
Any comment:	-

Data / Parameter:	$NCV_{LDG,BL}$
Data unit:	MJ/m^3
Description:	Net caloric value of per volume unit LDG generated prior to the start of the project activity
Source of data used:	the upper value in FSR.
Value applied:	8.37
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the priority for the regional specific value, national specific value was selected.
Any comment:	-

Data / Parameter:	$Q_{BL,product}$
Data unit:	tonnes steel/y
Description:	Production associated with the relevant waste energy generation as it occurs in the baseline scenario. Here it is the steel produced by steel material production line.
Source of data used:	Average historical records of Annual steel production (respectively 814,991 in latter half of 2004, 1,810,337 in 2005 and 1,964,645 in 2006), please refer to data in ANNEX 03
Value applied:	1,835,989
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to methodology, production associated with the relevant waste energy generation as it occurs in the baseline scenario. In the project activity, crude steel produced by converter system and rolled steel is adopted respectively (tonnes). The minimum of the following two figures should be used: (1) average annual historical production data from start-up, if plant operational history is less than three years, of the plant or (2) the most relevant manufacture's data for normal operating conditions. On account that the later value in the project is 2,000,000 tonnes[31] which is higher than the historical records. Therefore, the adoption of 1,835,989 is conservative.
Any comment:	-

Data / Parameter:	$q_{wcm,product}$
Data unit:	tonnes steam/tonnes steel
Description:	Amount of waste steam per unit steel in the steel material production line.
Source of data used:	The manufactures design data.
Value applied:	0.16
Justification of the choice of data or description of measurement methods and procedures actually applied :	The manufactures data is adopted, which is allowed by the methodology.
Any comment:	-

Data / Parameter:	NCV_{LPG}
Data unit:	MJ/t
Description:	the net calorific value per mass or volume unit of LPG
Source of data used:	China Energy Statistical Yearbook 2006, pg 365
Value applied:	50,179
Justification of the choice of data or description of measurement methods and procedures actually applied :	As the priority for the regional specific value, national specific value was selected.
Any comment:	-

Data / Parameter:	$EF_{CO2,LPG}$
Data unit:	tC/TJ(which can be converted to tCO_2e/TJ)
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	IPCC Guidelines for National Greenhouse Gas Inventories

Value applied:	17.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Because the regional specific value is not available, the IPCC default value was selected.
Any comment:	-

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

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I. Calculate the emission factor of grid

Based on the data and calculating method provide by DNA of China, $EF_{Elec,gr,y}$ the CO_2 emission factor for the Central China Power Grid, is 0.95713 tCO_2/MWh (see Annex 3 for details).

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

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

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

where

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

$BE_{Ther,y}$ = 0 tCO_2e, due to there is no thermal output involved in the project activity.

$BE_{Elec,y}$ = 105,257 tCO_2e, which is estimated using equation (1-2)

$$BE_{Elec,y} = \sum_{i=1,2} f_{cap,i} * f_{wg,i} * (EG_{P,i,y} * EF_{Elec,gr,y}) \quad \textbf{(1-2)}$$

$EG_{P,y}$	108,000 MWh, which is based on the data in *Feasibility Study Report.*
$EF_{Elec,gr,y}$	0.95713 tCO_2/MWh
f_{wg}	1, due to the electricity generation is purely from use of waste pressure.
$f_{cap,i}$	1, estimated ex-ante and the amount of waste gas in *y* year is deemed to less than in baseline year.
$BE_{flst,y}$	0 tCO_2e, due to there is no fossil fuel or steam consumed that would have been used for flaring the waste gas in absence of the project activity.
BE_y	103,370 tCO_2e , calculated in accordance to formula **(1-1) and (1-2)..**

III. Estimated project activity emissions:

$$PE_y = PE_{AF,y} + PE_{EL,y} = 2\ tCO_2e \quad \textbf{(3)}$$

Where:

$$PE_{AF,y} = FF_{LPG,y} * NCV_{LPG} * EF_{CO2,LPG} = 2\ tCO_2e \quad \textbf{(3-1)}$$

$FF_{LPG,y}$	= 650 kg/y, LPG will be use for boiler ignition and the amount LPG is about 650kg every year according to the Feasibility Study Report.
NCV_{LPG}	= 50179 MJ/t, Please refer to China Energy Statistical Yearbook 2006 (pg 365) for details.
$EF_{CO2,LPG}$	= 17.2 tC/TJ = 63.07 tCO_2/TJ, the IPCC default value
$PE_{EL,y}$	Because the electricity was consumed in gas cleaning equipment in baseline as well, project emission due to electricity consumption for gas clean will be ignored.

So, $PE_{EL,y} = 0$

I. Estimated project leakage:

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

II. Estimated emission reductions

$$ER_y = BE_y - PE_y \quad \textbf{(5)}$$

ER_y = 103,368 tCO_2e

BE_y = 103,370 tCO_2e

PE_y = 2 tCO_2e

As per formula provided in Section B.6.1, the annual expected emission reductions of the Project are 103,368 tCO_2e.

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

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It is expected that the project activities will generate emission reductions within the Central China Power Grid for about 103,368 tCO_2e per year over a 10-year fixed crediting period 01/07/2009 to 30/06/2019.

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
01/07/2009-30/06/2010	2	103,370	0	103,368
01/07/2010-30/06/2011	2	103,370	0	103,368
01/07/2011-30/06/2012	2	103,370	0	103,368
01/07/2012-30/06/2013	2	103,370	0	103,368
01/07/2013-30/06/2014	2	103,370	0	103,368
01/07/2014-30/06/2015	2	103,370	0	103,368
01/07/2015-30/06/2016	2	103,370	0	103,368
01/07/2016-30/06/2017	2	103,370	0	103,368
01/07/2017-30/06/2018	2	103,370	0	103,368
01/07/2018-30/06/2019	2	103,370	0	103,368
Total (tCO_2e))	**20**	**1,033,700**	**0**	**1,033,680**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	$EG_{P,i,y}$
Data unit:	MWh/y
Description:	Net quantity of electricity supplied to the manufacturing facility by the

	unit *i* during the year y
Source of data to be used:	Calculated based on data provided from *Feasibility study report* of project
Value of data applied for the purpose of calculating expected emission reductions in section B.6	108,000MWh (estimated by $EG_{GEN,\ y}$,- $EG_{AUX,\ y}$,=120000 MWh- 12000 MWh)
Description of measurement methods and procedures to be applied:	The net power output could be obtained by the difference between the output and input records data that is monitored by the supply meter to grid. Besides, another backup data source is based on difference between the records of the gross power generation from the project activity ($EG_{GEN,\ y}$,) and the self-consumption of the project activity. ($EG_{AUX,\ y}$,) All the Meters at the project site measure electricity continuously and the data will be archived electronically; furthermore, each main meter has a backup one.
QA/QC procedures to be applied:	Operator in charge would be responsible for regular calibration of the meter at least once per half year in accordance with the national standard. Backup data recourse is designated in case of the data of predominant meter exceeding receivable range. The calibration and error information will be recorded and filed with a regular and transparent management.
Any comment:	-

Data / Parameter:	$FF_{LPG,y}$
Data unit:	kg/y
Description:	The quantity of auxiliary fossil fuel (LPG) consumed in project startup by project activity itself in year y
Source of data to be used:	The quantity record of auxiliary fuel consumption by power plant/the related receipt in financial sector
Value of data applied for the purpose of calculating expected emission reductions in section B.6	650kg/y
Description of measurement methods and procedures to be applied:	Artificial records about the amount of bottles used and the LPG weight per bottle shall be made regularly, and $FF_{LPG,y}$can be calculated then. Specially, when the amount of LPG used less than one bottle, for the conservative consideration, to record it as a whole bottle for calculated.
QA/QC procedures to be applied:	Data of LPG consumption should be consistent with the ignition record of the boiler system. In addition, relevant records in financial department are designated as backup data in case of error takes place in the record. The error information will be recorded and filed with a regular and transparent management.
Any comment:	-

Data / Parameter:	$Q_{WG,BFG,\ y}$
Data unit:	Nm^3/y
Description:	The quantity of waste BFG consumed by project activity in year y
Source of data to be used:	Log data of gas flow meter
Value of data applied for the purpose of calculating	Due to the data is used to ex post calculation of ER, it is not applied in B.6.

expected emission reductions in section B.6	
Description of measurement methods and procedures to be applied:	The quantity of waste gas fed to boiler is measured by flow meters continuously and the data will be archived electronically.
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	-

Data / Parameter:	$Q_{WG,LDG,y}$
Data unit:	Nm^3/y
Description:	The quantity of waste LDG consumed by project activity in year y
Source of data to be used:	Log data of gas flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.6	Due to the data is used to ex post calculation of ER, it is not applied in B.6.
Description of measurement methods and procedures to be applied:	The quantity of waste gas fed to boiler is measured by flow meters continuously and the data will be archived electronically.
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	

Data / Parameter:	$Q_{wcm,y}$
Data unit:	t/y
Description:	The quantity of waste steam consumed by project activity in year y
Source of data to be used:	Log data of team flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.6	Due to the data is used to ex post calculation of Emission Reduction, it is not applied in B.6.
Description of measurement methods and procedures to be applied:	The quantity of waste heat fed to turbine is measured by flow meters continuously and the data will be archived electronically.
QA/QC procedures to be applied:	Measuring equipment should be calibrated on regular. During the time of calibration and maintenance, alternative equipment should be used for monitoring.
Any comment:	

B.7.2. Description of the monitoring plan:

>>
Emission factor of the Project is determined ex ante (please refer to annex 3 for more details). Therefore the net electricity supply, waste gases/heat consumption and NCV of the Project is defined as the key data to be monitored, which the monitoring plan is drafted to focus on.

1. Methods for monitoring of net electricity supply and quantity of waste gases/steam consumed by the project

1.1 Methods for monitoring of net electricity supply

The below diagram shows the location of meters, in addition the detail information of meters and monitoring methods for parameters to calculate the net electricity supply is described following.

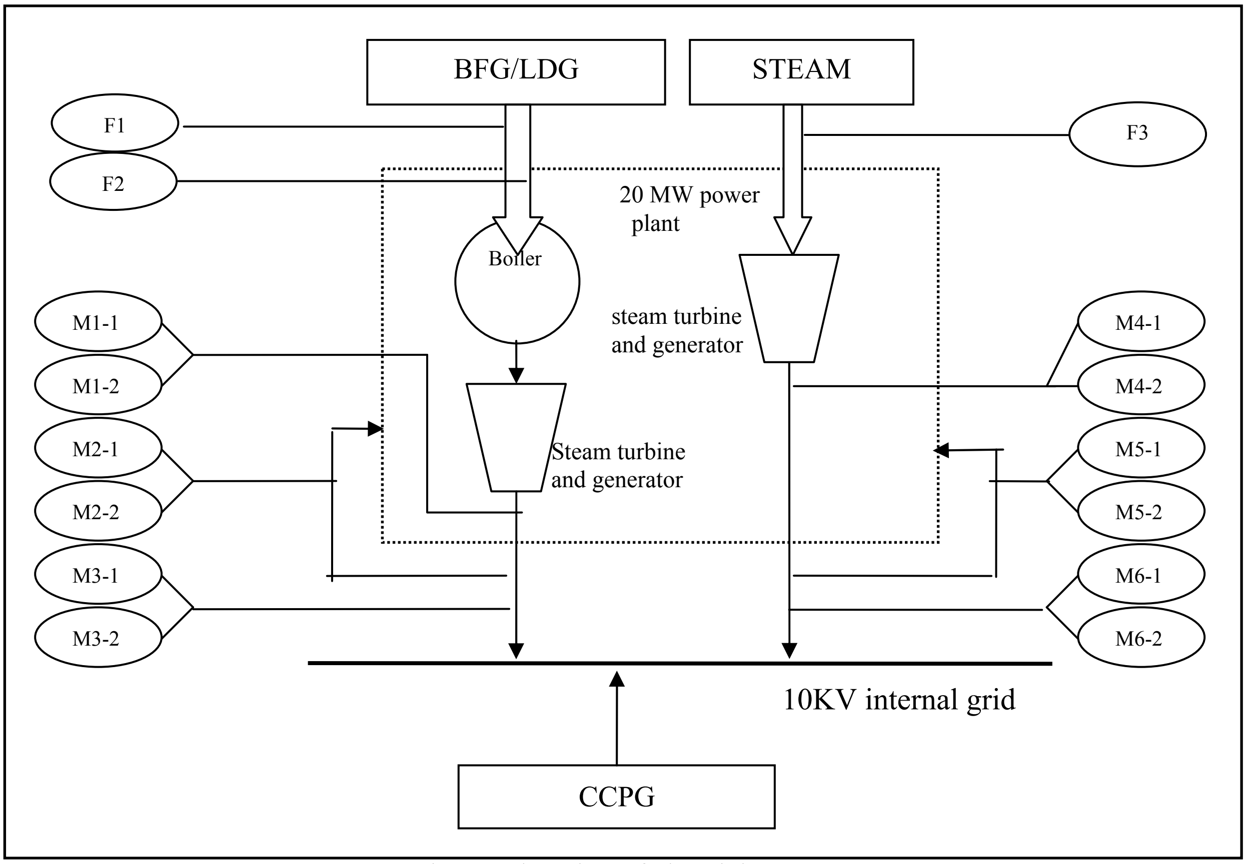

Figure.5 location of electricity meters

Table 8 detail information of electricity meters

Code of meter	Monitoring parameters of metes	Precision	Remark
M1-1	Main meter for EG_{GEN} of 15MW power system	0.5	-
M1-2	backup meter for EG_{GEN} of 15MW power system	0.5	-
M2-1	Main meter for EG_{AUX} of 15MW power system	0.5	-
M2-2	backup meter for EG_{AUX} of 15MW power system	0.5	-
M3-1	Main meter for EG_y of 15MW power system	0.5	bidirectional
M3-2	backup meter for EG_y of 15MW power system	0.5	bidirectional
M4-1	Main meter for EG_{GEN} of 5MW power system	0.5	-
M4-2	backup meter for EG_{GEN} of 5MW power system	0.5	-
M5-1	Main meter for EG_{AUX} of 5MW power system	0.5	-
M5-2	backup meter for EG_{AUX} of 5MW power system	0.5	-
M6-1	Main meter for EG_y of 5MW power system	0.5	bidirectional
M6-2	backup meter for EG_y of 5MW power system	0.5	bidirectional
F1	Flow meter for $Q_{WG,BFG,y}$ consumed by 15MW power system	-	-
F2	Flow meter for $Q_{WG,LDG,y}$ consumed by 15MW power system	-	-

F3	Flow meter for $Q_{WG,steam,y}$ consumed by 5 MW power system	-	-

As a preferred method, the net quantity of electricity supplied to the manufacturing facility by the project during the year y ($EG_{P,i,,y}$) will be monitored by the difference between the output and input amount of each bidirectional meters at side of substation (M3-1 and M6-1). Also the ($EG_{P,i,,y}$) has its own backup metering equipment (M3-2 and M6-2) to avoid the data absence while the equipment maintenance being conducted.

Alternatively, the net electricity supply of the Project ($EG_{P,i,,y}$) will be calculated based on the metered value of the amount of electricity generated from the component *i* ($EG_{GEN,i,y}$, i.e. M1-1 and M4-1) minus the metered amount of electricity consumed for component *i* itself ($EG_{AUX,i,y}$, i.e. M2-1 and M5-1), of which the calculation formula is as following:

$$EG_{P,i=1,y} = EG_{GEN,i=1,y} - EG_{AUX,i=1,y} = (M1\text{-}1) - (M2\text{-}1)\text{ , and}$$
$$EG_{P,i=2,y} = EG_{GEN,i=2,y} - EG_{AUX,i=2,y} = (M4\text{-}1) - (M5\text{-}1) \qquad (13)$$

Simultaneously, the $EG_{GEN,i,y}$ and $EG_{AUX,i,y}$ both have their own backup metering equipment (M1-2 and M4-2 , M2-2 and M5-2) to avoid the data absence while the equipment maintenance being conducted.

1.2 Methods for monitoring the amount of waste gases combusted in the boiler ($Q_{WG,y}$), surplus and low-pressure steam fed into the turbine ($Q_{H,y}$) and LPG as auxiliary fuel ($FF_{LPG,y}$)

$Q_{WG,BFG,,y}$ and $Q_{WG,LDG,,y}$ will be monitored through the flow meters installed in each the gases pipe where waste gases i.e. BFG and LDG will be delivered into the boiler. $Q_{wcm,y}$ will be monitored through flow meters installed in the steam pipe where surplus steam with low-pressure will be fed into the turbine.

$FF_{LPG,y}$ is a calculated value. The amount of bottles of LPG used for ignition and stabilizing the combustion will be recorded monthly and the weight of every bottle is also available. In addition, relevant records in financial department are designated as backup data in case of error takes place in the record. The error information will be recorded and filed with a regular and transparent management.

2. Calibration of Meters & Metering

All the KWh meters and flow meters shall be in line of national standard GB/T17883 and DT/L488-2000. Calibration of Meters & Metering should be implemented according to relevant national and local standards and rules. And all the records should be documented and maintained by the project owner for DOE’s verification.

3. Quality Assurance and Quality Control

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

4. Data Management System

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

5. Verification

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

6. Management structure

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

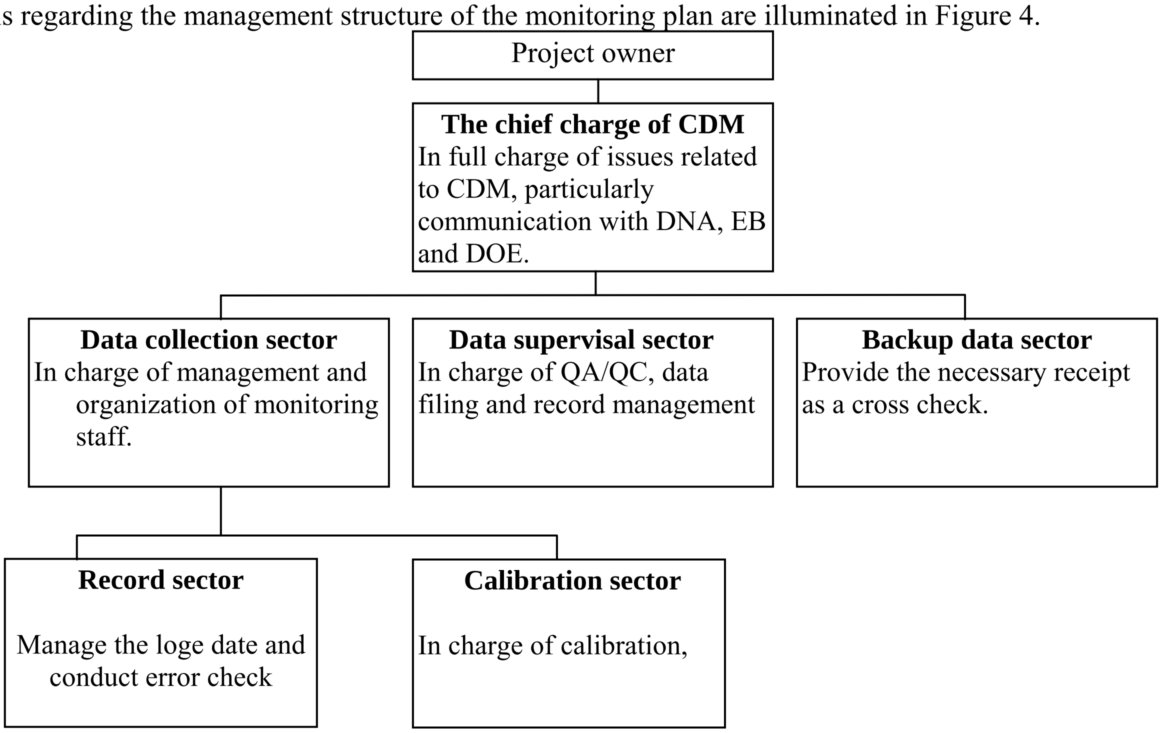

Figure 6. Management Structure of Monitoring Plan

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

>>

The application of the baseline study and monitoring methodology of the Project was completed by KOE Environmental Consulting, Inc. (Japan) (http://www.cncdm.cn).

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

KOE Environmental Consulting, Inc. (Japan)
Daniel Cao Email: cy@cncdm.cn ; Website: http://www.cncdm.cn Tel: +86 010 62219066; Fax: +86 010 62219066

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:

>>
25/12/2006 (the date of start of civil work construction which is the earliest 'real action')

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:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>
01/07/2009 or the date of registration which ever is later

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

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

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

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

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

3、The water discharged by the project is mainly the cooling water of the equipment, such as the fans and generator. The water discharge and the making up water is $112m^3/h$ and $253m^3/h$ separately. The flow capacity of the local Baiyuan River is relatively low, especially in the dry Season. So are its environmental capacity and self-purification capacity. Thus this assessment proposes the project owner to treat the waste water effectively which can meet the recycling requirements. And the reuse water can be used to generate electricity and other processes.

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

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

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

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

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

SECTION E. Stakeholders' comments

>>

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

>>

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

E.2. Summary of the comments received:

>>

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

Table 3. Statistics on the basic conditions of people surveyed

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

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

41 people surveyed (accounting for 85%) have a clear understanding of the basic information of the Project,·48 people surveyed (accounting for100%) hold a supportive attitude towards the project, which was considered to reduce environmental pollution (79%), increase income (15%), decrease electricity purchase price (46%) and provide employment opportunity (15%).
As the suggestion towards the project, People surveyed supposed it is necessary to control noise appropriately during the construction and operation process of the project (0.04%) and the related environmental protection measure should be fulfilled (0.02%), furthermore, hoped the project could put into operation on time (0.125%).

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

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

>>

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Pingxiang Iron and Steel Group Co., Ltd.
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URL:	http://www.pxsteel.com/
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Title:	secretary
Salutation:	madam
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Middle Name:	----
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URL:	http://www.tepco.co.jp/en/index-e.html
Represented by:	
Title:	Group manager, International Environmental Business Group
Salutation:	Mr.
Last Name:	Kageyama
Middle Name:	
First Name:	Yoshihiro
Department:	Environment Department
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

The baseline information for calculation of OM, BM and CM emission factor of Central China Power Grid is shown in the Report on Determination of Baseline Grid Emission Factor by the Office of the National Coordination Committee on Climate Change of China at http://cdm.ccchina.gov.cn. The concrete process is shown in the following tables.

Table A1 Fuel consumption and emission of Central China Power Grid in 2002

Energy	**unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total fuel**	**Emission factor**	**Oxidation rate**	**NCV**	**Emission**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H tc/TJ**	**I (%)**	**J (MJ/t or 1000m3)**	**(tCO_2e) K=G*H*I*J*44/12 /10000 K=G*H*I*J*44/12 /1000 (for gases)**
Coal	10^4t	1062.63	4679.02	1710	1113.78	398.57	1964.32	10928.32	25.8	100	20,908	216,150,892
Cleaned coal	10^4t	2.72						2.72	25.8	100	26,344	67,786
Other washed coal	10^4t	3.66	26.49			249.99		280.14	25.8	100	8,363	2,216,299
Coke	10^4t		1.15					1.15	29.2	100	28,435	35,011
Coke oven gas	10^8m^3			1.11				1.11	12.1	100	16,726	82,371
Other gas	10^8m^3		2.16					2.16	12.1	100	5,227	50,091
Crude oil	10^4t		0.67	1.17			0.81	2.65	20	100	41,816	81,262
Gasoline	10^4t	1	1.34	1.08	2.19	0.51	0.51	6.63	18.9	100	43,070	197,889
Diesel	10^4t								20.2	100	42,652	0
Fuel oil	10^4t	0.33	0.16	0.34	0.69		1.51	3.03	21.1	100	41,816	98,025
LPG	10^4t		0.02					0.02	17.2	100	50,179	633
Refinery gas	10^8m^3	0.49			1.9			2.39	15.7	100	46,055	63,364
Natural gas	10^8m^3						1.75	1.75	15.3	100	38,931	382,205
Other petroleum products	10^4t							0	20	100		
Other coking products	10^4t							0	25.8	100		
Other energy	10^4tCe		3.38					3.38	0	100	38,369	0
Total emission of the Central China Power Grid (tCO_2e)												**219,425,829**

Data sources: China Energy Statistical Yearbook 2003

Table A2 The fuel fired electricity generation and calculation of emission factor of Central China Power Grid in 2002

Province	The fuel fired electricity generation （MWh）	The rate of electricity self-consumption （%）	The fuel fired electricity connected to the grid（MWh）
Jiangxi	18,648,000	7.67	17,217,698
Henan	84,734,000	8.03	77,929,860
Hubei	34,301,000	7.73	31,649,533
Hunan	20,058,000	7.73	18,507,517
Chongqing	14,727,000	10.21	13,223,373
Sichuan	27,879,000	9.59	25,205,404
The Total			**183,733,385**
Total Emission (tCO_2)			**219,425,829**
$EF_{OM,y}$ for 2002			**1.19426216**

Data source: *China Electric Power Yearbook 2003*

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

Energy	unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total fuel	Emission factor	Oxidation rate	NCV	Emission
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H** tc/TJ	**I** (%)	**J** (MJ/t or 1000m3)	**(tCO_2e)** K=G*H*I*J*44/12/10000 K=G*H*I*J*44/12/1000 (for gases)
Coal	10^4t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	**13851.66**	25.8	100	20,908	273,971,540
Cleaned coal	10^4t							**0**	25.8	100	26,344	0
Other washed coal	10^4t	2.03	39.63			106.12		**147.78**	25.8	100	8,363	1,169,146
Coke	10^4t				1.22			**1.22**	29.2	100	28,435	37,142
Coke oven gas	10^8m^3			0.93				**0.93**	12.1	100	16,726	69,013
Other gas	10^8m^3							**0**	12.1	100	5,227	0
Crude oil	10^4t		0.5	0.24			1.2	**1.94**	20	100	41,816	59,490
Gasoline	10^4t								18.9	100	43,070	0
Diesel	10^4t	0.52	2.54	0.69	1.21	0.77		**5.73**	20.2	100	42,652	181,016
Fuel oil	10^4t	0.42	0.25	2.17	0.54	0.28	1.2	**4.86**	21.1	100	41,816	157,229
LPG	10^4t							**0**	17.2	100	50,179	0
Refinery gas	10^8m^3	1.76	6.53		0.66			**8.95**	15.7	100	46,055	237,285
Natural gas	10^8m^3					0.04	2.2	**2.24**	15.3	100	38,931	489,223
Other petroleum products	10^4t							**0**	20	100		
Other coking products	10^4t							**0**	25.8	100		
Other energy	10^4tCe		11.04			16.2		**27.24**	0	100	38,369	0
Total emission of the Central China Power Grid (tCO_2e)												**276,371,085**

Data sources: China Energy Statistical Yearbook 2004

Table A4 The fuel fired electricity generation and calculation of emission factor of Central China Power Grid in 2003

Province	The fuel fired electricity generation（MWh）	The rate of electricity self-consumption（%）	The fuel fired electricity connected to the grid（MWh）
Jiangxi	27,165,000	6.43	25,418,291
Henan	95,518,000	7.68	88,182,218
Hubei	39,532,000	3.81	38,025,831
Hunan	29,501,000	4.58	28,149,854
Chongqing	16,341,000	8.97	14,875,212
Sichuan	32,782,000	4.41	31,336,314
The Total			**225,987,720**
Total Emission (tCO_2)			**276,371,085**
$EF_{OM,y}$ **for 2003**			**1.222947356**

Data source: *China Electric Power Yearbook 2004*

Table A5 Fuel consumption and emission of Central China Power Grid in 2004

Energy	unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total fuel	Emission factor	Oxidation rate	NCV	Emission
		A	B	C	D	E	F	G=A+B+C+D+E+F	H tc/TJ	I (%)	J (MJ/t or 1000m3)	(tCO_2e) K=G*H*I*J*44/12/10000 K=G*H*I*J*44/12/1000 (for gases)
Coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20,908	339,092,605
Cleaned coal	10^4t		2.34					2.34	25.8	100	26,344	58,316
Other washed coal	10^4t	48.93	104.22			89.72		242.87	25.8	100	8,363	1,921,441
Coke	10^4t		109.61					109.61	29.2	100	28,435	3,337,011
Coke oven gas	10^8m^3			1.68		0.34		2.02	12.1	100	16,726	149,900
Other gas	10^8m^3					2.61		2.61	12.1	100	5,227	60,527
Crude oil	10^4t		0.86	0.22				1.08	20	100	41,816	33,118
Gasoline	10^4t		0.06			0.01		0.07	18.9	100	43,070	2,089
Diesel	10^4t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42,652	266,627
Fuel oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41,816	464,893
LPG	10^4t							0	17.2	100	50,179	0
Refinery gas	10^8m^3	3.52	2.27					5.79	15.7	100	46,055	153,506
Natural gas	10^8m^3						2.27	2.27	15.3	100	38,931	495,775
Other petroleum products	10^4t							0	20	100	38,369	0
Other coking products	10^4t							0	25.8	100	28,435	0
Other energy	10^4tCe							0	0	100	0	0
Total emission of the Central China Power Grid (tCO_2e)												**346,035,810**

Data sources: China Energy Statistical Yearbook 2005

Table A6 The fuel fired electricity generation and calculation of emission factor of Central China Power Grid in 2004

Province	The fuel fired electricity generation（MWh）	The rate of electricity self-consumption（%）	The fuel fired electricity connected to the grid（MWh）
Jiangxi	30,127,000	7.04	28,006,059
Henan	109,352,000	8.19	100,396,071
Hubei	43,034,000	6.58	40,202,363
Hunan	37,186,000	7.47	34,408,206
Chongqing	16,520,000	11.06	14,692,888
Sichuan	34,627,000	9.41	31,368,599
The Total			**249,074,186**
Total Emission (tCO_2)			**346,035,810**
$EF_{OM,y}$ **for 2004**			**1.38929**

Data source: *China Electric Power Yearbook 2005*

TableA7 The three years generation weighted average emission factor of Central China Power Grid

Years	**2002**	**2003**	**2004**	three years average emission factor （tCO_2e/MWh）
Total CO_2 emission（tCO_2e）	219,425,829	276,371,085	346,035,810	1.27784
The total fuel fired electricity connected to the grid（MWh）	183,733,385	225,987,720	249,074,186	

Table A8 Calculation the weight of CO_2 emissions from solid fuels, liquid fuels and gas fuels among the total emissions in Central China Power Grid

Energy	unit	Jiangxi	Henan	Hubei	Hunan	Chong qing	Sichuan	Total fuel	Emission factor	Oxidation rate	NCV	Emission
		A	B	C	D	E	F	G=A+B+ C+D+E+ F	H tc/TJ	I (%)	J (MJ/t or 1000m3)	(tCO_2e) K=G*H*I*J*44/12/10000 K=G*H*I*J*44/12/1000 (for gases)
Coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	100	20,908	339,092,605
Cleaned coal	10^4t		2.34					2.34	25.8	100	26,344	58,316
Other washed coal	10^4t	48.93	104.22			89.72		242.87	25.8	100	8,363	1,921,441
Coke	10^4t		109.61					109.61	29.2	100	28,435	3,337,011
Total of solid fuels												**344,409,374**
Crude oil	10^4t		0.86	0.22				1.08	20	100	41,816	33,118
Gasoline	10^4t		0.06			0.01		0.07	18.9	100	43,070	2,089
Diesel	10^4t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100	42,652	266,627
Fuel oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41,816	464,893
Other petroleum products	10^4t							0	20	100	38,369	0
Other coking products	10^4t							0	25.8	100	28,435	0
Total of liquid fuels												**766,728**
Coke oven gas	10^8m^3			1.68		0.34		2.02	12.1	100	16,726	149,900
Other gas	10^8m^3					2.61		2.61	12.1	100	5,227	60,527
LPG	10^4t							0	17.2	100	50,179	0
Refinery gas	10^8m^3	3.52	2.27					5.79	15.7	100	46,055	153,506
Natural gas	10^8m^3						2.27	2.27	15.3	100	38,931	495,775
Total of gas fuels												**859,708**
Total of all fuels												346,035,810

Data sources: China Energy Statistical Yearbook 2005

Table A9 The emission factor of the most efficient commercial coal-fueled, oil-fueled and gas-fueled power plant

	Variable	**Electricity supply efficiency**	**Emission factor of fuel (tC/TJ)**	**Oxidation rate**	**Emission factor (tCO_2/MWh)**
		A	B	C	D=3.6/A/1000*B*C44/12
Coal-based power plants	$EF_{Coal,Adv}$	36.53%	25.8	1	0.9136
Gas-based power plants	$EF_{Gas,Adv}$	45.87%	15.3	1	0.4381
Oil-based power plants	$EF_{Oil,Adv}$	45.87%	21.1	1	0.6011

TableA10 the weight of CO2 emission from solid, liquid and gas fuels among the total emissions and the thermal emission factor of CCPG

$\lambda_{Coal,y}$	$\lambda_{Oil,y}$	$\lambda_{Gas,y}$	**$EF_{EL,fossil,Adv,y}$（tCO_2e/MWh）** ($\lambda_{Coal,y}$* $EF_{Coal,Adv}$+$\lambda_{Oil,y}$* $EF_{Oil,Adv}$+$\lambda_{Gas,y}$* $EF_{Gas,Adv}$)
99.53%	0.22%	0.25%	0.91177

Table A11 Calculation of BM emission factor of Central China Power Grid

	Installed capacity in 2000	**installed capacity in 2001**	**installed capacity in 2004**	**New installed capacity during 2000-2004**	**Share in the new installed capacity**
	A	B	C	D=C-A	
Fossil fueled(MW)	39864.6	42569.2	53744.7	13880.1	69.80%
Hydro power(MW)	28637.8	30397	34642	6004.2	30.20%
Nuclear power(MW)	0	0	0	0	0.00%
Wind power(MW)	0	0	0	0	0.00%
Total(MW)	68502.4	72966.2	88386.7	19884.3	100.00%
Share in 2004 installed capacity	77.50%	82.55%	100%		

Data source: *China Electric Power Yearbook 2001*-2005

BM=0.91177 ****0.698***=0.63642 (tCO_2e/MWh)

Table A12 Calculation of CM emission factor of Central China Power Grid and emission reductions of the proposed project

OM (tCO2e/MWh)	BM (tCO2e/MWh)	CM (tCO2e/MWh)
1.27784	0.63642	0.95713

Table A13-1 Balance of the Blast Furnace Gas (BFG) involved in the project activity （2004-2006）

	No.	Dept	Gas generator/users	Gas volume (unit m^3/y)		
				Year 2004	Year 2005	Year 2006
gas generation	1	iron factory	3 sets of Blast Furnace	1308941802	2921849974	3137930255
	Sum of generation			1308941802	2921849974	3137930255
gas consumption	1	iron factory	3 sets of hot air stove	810670195	1718570817	2013911635
	2	sintering	sintering	77274274	127149157	130848459
	3	Steel rolling	Wire production	113799242	243080217	242639535
			Club production	95381970	225800262	218236310
	4	output	other company in the factory boundary	129378716	287867668	265203870
	Sum of consumption			1226504397	2602468121	2870839809
Waste amount (m^3/y) = Sum of generation - Sum of consumption				82437405	319381853	267090446
Maximum value of waste gas amount form 2004 to 2006 (m^3/y)				**319381853**		
Average Caloric Value of BFG monitored (MJ/m^3)				3.5		

Table A13-2 Balance of the Converter (LDG) involved in the project activity （2004-2006）

	No.	Dept	Gas generator/users	Gas volume (unit m^3/y)		
				Year 2004	Year 2005	Year 2006
gas generation	1	iron factory	2 sets of Converter	40749550①	90516850①	98232250①
	Sum of generation			40749550①	90516850①	98232250①
gas consumption	1	Steel rolling	Steel rolling	25980500	52811200	49569563
	Sum of consumption			25980500	52811200	49569563
Waste amount (m^3/y) = Sum of generation - Sum of consumption				14769050	37705650	48662687
Maximum value of waste gas amount form 2004 to 2006 (m^3/y)				48662687		
Average Caloric Value of BFG monitored (MJ/m^3)				8.37		

Table A13-3 Balance of the surplus steam involved in the project activity （2004-2006）

	No.	Dept	Steam users	Steam Quantity (unit t/y)		
				Year 2004	Year 2005	Year 2006
Steam generation	1	iron factory	2 sets of Converter	77000	147230	151350
	Sum of generation			77000	147230	151350
Steam consumption	1	N/A	N/A	0	0	0
	Sum of consumption			0	0	0
Waste amount (t/y) = Sum of generation - Sum of consumption				77000	147230	151350

Table A13-4 Production records of annual steel production by the converter system invloved （2004-2006）

	Year 2004 (tonnes)	Year 2005 (tonnes)	Year 2006 (tonnes)	Average value (tonnes)
Steel production of the converter system	814991 (6 monthes)	1810337	1964645	1,835,989

Annex 4

MONITORING INFORMATION

No additional information here, the detailed information of monitoring is included in the monitoring menu for project owner and it is able to be delivered to DOE.