CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

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SECTION A. General description of project activity

A.1 Title of the project activity:

China Nanjing Iron & Steel United Co., Ltd (NISCO) Converter Gas Recovery and Power Generation Project

Version：8

Date：April 10, 2006

A.2. Description of the project activity:

This project will build a set of converter gas recovery and power generation system which uses the 4th generation converter gas recovery system (OG system), recovering the converter gas (LDG) produced by the two converters of NISCO in steel production process and utilizing the gas for electricity generation. The generated electricity will be used to partially meet the company's power need in its daily production, therefore some grid electricity will be replaced. Due to the instability, low quality and quantity of LDG, there is currently no relevant regulation obliging the iron and steel works to recover the LDG in China yet, so if there is not such a project, the LDG produced in steel-making process will be fired and released.
This project will yearly generate 156.666GWh, which will replace the equivalent quantity of electricity of the east China grid, then reduce the GHG emissions generated from the east China grid which is coal-dominated. The expected emission reduction of the project is 123,720 tCO_2e.
This project generates electricity by using the residual energy of waste gas, which will bring out many environmental and economical benefits. It will contribute to the sustainable development in the region as followings.

- The project will promote the integrated resource utilization and thus reduce the waste of the energy sources
- Due to this project, NISCO will reduce the demand of the gird electricity and thus the electricity shortage in the region will be partially alleviated.
- The electricity generated by this project will displace some electricity generated by the coal-fired power plants, which will reduce the environmental pollution.
- The project will avoid the heat pollution caused by direct LDG combustion.
- The project will create some employment opportunities.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Nanjing Iron & Steel United Co., Ltd (project owner)	No
Republic of Italy	World bank (buyer)	Yes

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Jiangsu Province

A.4.1.3. City/Town/Community etc:

Nanjing City

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

This project is located in the iron production area of NISCO. NISCO is located in the Yanjiang Industry Development Zone in the north of Nanjing City, closed to the Nanjing Yangtze Bridge on west, No.2 Yangtze Bridge on the east, the Ning-lian highways on the north, and the Yangtze golden channel on the south.

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

This category would fall within sectoral scope 1: energy industries

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

This project will apply the fourth generation OG system in recovering the converter gas (LDG) produced by the two 120-ton converters of NISCO in steel-making process, cleaning the LDG, and then sending into the gas boiler for electricity generation.
The project components include:

- Converter gas cleaning system;
- Fan room for converter gas with a blower capacity of 3,350m^3/min;
- Storage station for converter gas: One gas tank with volume of 80,000 m^3.
- Two 220t/h high temperature and high pressure gas boilers;
- Two 50MW steam turbine generators.

The two 50MW steam turbine generators not only use the recovered LDG, but also the blast furnace gas and coke-oven gas collected from the other production installation. Calculating the total caloric power, the collected LDG gas will meet the generation of electric energy capacity of 23MW.
The technology used in this project is the patent of Capital Engineering & Research Incorporation Limited (CERI), and this project will promote the dissemination of this technology in China. This project does not involve international technology transfer.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

Due to the low heat value and unstable quantity of LDG, it's not an attractive fuel source for electrical power generation. There is still no related regulation obliging the iron and steel works to recover or utilize the waste gas in China, so the LDG produced in steel-making process will be fired and then released in most of the steel-making enterprises of China.

If there is no such a project, 156.666GWh electricity which can be generated by the project will have to be provided by the east China grid every year. There is coal-dominated power generation in the east China grid, so the quantity of electricity generated by this project will replace the equivalent quantity of electricity generated by some fossil fuel-fired power plants of the east China grid, and then reduce the GHG emissions.

The project activity installed the 4th generation OG system for recovering LDG in order to utilize it for electricity generation, which is used in the steel production. The generated electricity displaces an equivalent amount of electricity which would otherwise be supplied by the grid where most of the electricity is generated by coal-fired power plants.

Since the installation of this project requires significant investment, the enterprise will face some difficulties. Furthermore, this project is the first application of the 4th generation OG system in China's steel enterprises, of which the technical performance has never been tested, so the owner will face a rather large technical risk when putting this advanced technology into use. If there is no revenue gave by sell the CER, the owner will not construct this project, but still fire the LDG and release it.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

The project activity is expected to generate an estimated annual emission reduction of 123,720 tCO_2e and 1,237,200tCO_2e during the 10 years' crediting period of the project.

Years	Annual estimation of emission reductions in tonnes of CO2e
2006	123,720
2007	123,720
2008	123,720
2009	123,720
2010	123,720
2011	123,720
2012	123,720
2013	123,720
2014	123,720
2015	123,720
Total estimated reductions (tonnes of CO_2e)	1,237,200
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	123,720

A.4.5. Public funding of the project activity:

The public funding from the developed country used in this project activity is solely set up for purchasing CER and will not result in a diversion of official development assistance.

SECTION B. Application of a baseline methodology

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

Approved consolidated baseline methodology ACM0004 (Consolidated baseline methodology for waste gas and/or heat for power generation)/Version02 and ACM0002 (Consolidated baseline methodology for grid-connected electricity generation from renewable sources)/Version05 are applied for this project activity.
For more information about ACM0002 and ACM0004 please refer to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

Approved consolidated baseline methodology ACM0004 applies to the project as followings:

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

This project fulfils all of the above qualifications:

- this project utilize the waste gas (LDG) in steel-making process;
- that displace electricity generation with fossil fuels in the east China electricity grid, which heat engine installed capacity account for more than 80%;
- This project will not lead fuel switch.

Accordingly, it's appropriate to use ACM0004 in this project.
According to ACM0004, if the replaced electricity is grid electricity, the emission factor should be calculated by ACM0002. This project complies with this demand.

B.2. Description of how the methodology is applied in the context of the project activity:

According to the ACM0004, project emissions are given as:

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \quad (1)$$

where:

PE_y	Project emissions in year y (tCO_2)
Q_i	Mass or volume unit of fuel i consumed (t)
NCV_i	Net calorific value per mass or volume unit of fuel i (TJ/t)
EF_i	Carbon emissions factor per unit of energy of the fuel i (tC/TJ)
$OXID_i$	Oxidation factor of the fuel i (%)

The project consumes some electricity during its operation, and doesn't consume any others fossil fuel except LDG, blast furnace gas or coke-oven gas. Because use the net delivery to calculate the baseline emission, the consumed electricity has been recouped, the project emission is zero.

Baseline emissions are given as:

$$BE_{electricity,y} = EG_y \cdot EF_{electricity,y} \quad (2)$$

where:

EG_y Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and

EF_y CO_2 baseline emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2/MWh).

In this project the electrical generator use the collected LDG of this project, blast furnace gas and coke-oven gas. According to the ACM0004, the net quantity of electricity supplied to the manufacturing facility by the project can be calculated by formula (3) and (4):

$$EG_y = \frac{\sum_{h=1}^{8760} Q_{WG,h} \times NCV_{WG}}{H_r} \quad (3)$$

Where:

$Q_{WG,h}$ the quantity of collected LDG in the project (Nm^3)

NCV_{WG} the net heat value of the LDG (TJ/ Nm^3)

H_r the average efficiency of the electric power plant(TJ/MW)

The average efficiency of the electric power plant can be calculated by formula (4):

$$H_r = \frac{\sum_{h=1}^{8760} \sum_{i=1}^{I} Q_{i,h} \times NCV_i}{EG_{total,y}} \quad (4)$$

Where:

H_r the average efficiency of the electric power plant (TJ/MW)

The electricity generated in this project will replace the equivalent grid electricity. The baseline CO_2 emission factor of the grid can be calculated based ACM002. The project locates in east China, so it is appropriate to select the east China grid as project system boundary. In this project, use the advance calculation method to calculate the emission factor of the baseline, which will keep unchangeable over the chosen crediting period.

Firstly, calculate the operating margin emission factor(s) ($EF_{OM,y}$) and build margin emission factor ($EF_{BM,y}$), and then calculate the baseline emission factor ($EF_{electricity,y}$)

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

According the ACM0002, if the grid dispatch data can be attained, then the dispatch data analysis (c) should be the first methodological choice. However, these data are secret at present in China, and can't be obtained in public, the method C can't be used to calculate the operating margin emission factor(s) ($EF_{OM,y}$) in this project.

From 1999 to 2003, hydro and other low-cost/must run resources generation takes the total amount of power generation in the grid with the share of 11.4% in 1999, 10.0% in 2000, 1.49% in 2001, 11.86% in

2002, and 10.95% in 2003[1]. Therefore, it is reasonable to select the simple OM method (a) to calculate the OM emission factor ($EF_{OM,y}$).

According the simple OM method, the formulae calculate the $EF_{OM,y}$ list as followings:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (5)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*, while *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;

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

And $GEN_{j,y}$,is the electricity (MWh) delivered to the grid by the source *j*. While the electricity is heat-engine, $GEN_{j,y}$ can be calculated as followings:

$$GEN_{j,y} = G_{j,y} \times \frac{PGCC_{j,y}}{PSCC_{j,y}} \quad (6)$$

Where:

$G_{j,y}$ is the amount of electricity (MWh) generated by the source j in the year y;

$PGCC_{j,y}$ is coal consumed coefficient of generation of electric energy of source j in the year y (mass or volume unit/MWh), while $PSCC_{j,y}$ is coal consumed coefficient of electricity supply of source j in the year y (mass or volume unit/MWh).

The CO_2 emission coefficient $COEF_i$ of fuel i is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (7)$$

Where:

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

$OXID_i$ is the oxidation factor of the fuel,

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

In respect that the $OXID_i$ of each generating stations of the east China grid can't be attained, use 98% is default values of IPCC[2]. In this PDD, NCV_i of different fuels are obtained from *China Energy Statistical yearbook 2004*[3]. $EF_{CO2,i}$ uses default value of IPCC.

$EF_{OM,y}$ is calculated through the data of east China grid in recent three years (2001-2003) in this project. East China grid connect with the Huazhong gird, and will import electricity less than 4% of the total electricity amount of east China grid every year. Hence, the emission factor of Huazhong gird is consider as zero when calculate the $EF_{OM,y}$. The average emission factor between 2001 and 2003 of East China Gird is calculated as $0.9450tCO_2/MWh$.

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

$EF_{BM,y}$ is determined by the formula 8 as following, which parameters, calculating process and result refers to annex 3.

[1] China Power Yearbook 2005

[2] the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. Page 129.

[3] China Energy Statistical Yearbook 2004,P301

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \quad (8)$$

Where:
$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources m in year(s) *y*;
$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel) when consider the oxidation factor of the fuel i of the power sources m in year y;
$GEN_{m,y}$,is the electricity (MWh) delivered to the grid by the source m in the year y.

Because the average operation hours of heat-engine plants are far more than the other electricity generation stations, $EF_{BM,y}$ can be conservatively describe as the share of heat-engine in increased capacity multiply the amount of fuel consumed by the increased advanced technology heat-engine plants multiply the emission factor of coal.
In the following table, the installed capacity of east China grid in the year 1999,2000 and 2003 are listed. It's obvious that the total increased installed capacity from 2000 to 2003 less than %50 of the installed capacity in 2003, so in this project use the data of east China grid in 1999 and 2003 calculate the $EF_{BM,y}$. From 1999 to 2003, heat-engine account for 71.23% of the increased installed capacity.

Installed capacity	1999	2000	2003	Increased installed capacity(1999-2003)
	A	B	C	D=C-A
Heat power (MW)	51198.9		65036.5	13837.6
Hydro power (MW)			13602.5	3467.5
Others (MW)	336.7		2457.7	2121
Total (MW)	61670.6	67099.9	81096.7	19426.1
Percentage of the installed capacity in 2003	76.05%	82.74%	100%	23.95%
Share of heat power of the increased installed capacity				71.23%
Data source： Installed capacity in 1999: China power yearbook 2000. Installed capacity in 2000: China power yearbook 2001. Installed capacity in 2003: China power yearbook 2004.				

Presently, the dominating type of the electric generating set of the increased heat-engine plants in east China gird is 600MW subcritical set, which coal consumed coefficient of generation of electric energy is 328.2gce/kWh [4] , and emission factor is $0.8906tCO_2$/MWh. Hence, $EF_{BM,y}$of the east China is $0.6344tCO_2$/MWh (calculating process and data table refers to annex 3).

Step3. Calculate the baseline emission factor EF_y
The baseline emission factor EF_y should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor($EF_{BM,y}$):

$$EF_{elecctricity} = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

Where the weights w_{OM} and $w_{BM,}$ are 50%(i.e. w_{OM} =w_{BM}= 0.5) by default, and ($EF_{OM,y}$) and ($EF_{BM,y}$) are calculated as described in Step 1 and 2.

$F_{electricity,y}$=$EF_{OM,y}$/2+ $EF_{BM,y}$/2= $0.7897tCO_2$/MWh

[4] Mi jianhua. Analysis on Energy Saving Condition in China Power Industry[J]. Electrical equipement. 2005. Vol.6.No.6. P1-4

The expected net output of the project is: EG_y=156.666GWh.
The annual baseline emission is: $BE_y=EG_y \times EF_{electricity}$, y=123,720 tCO_2.
The amount of GHG emission in this project is zero, namely: PE_y=0.
There is no leakage in this project, namely: $L_y=0$.
Then annual estimation of emission reductions in tonnes of CO_2 in this project is:
$ER_y=BE_y-PE_y-L_y$=123,720tCO_2

B.3. 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:

According to the ACM0004, the project uses the *Tool for the Demonstration and Assessment of Additionality (version 2)*, to demonstrate its additionality. The tool includes the following steps:

Step 0. Preliminary screening based on the starting date of the project activity

The proposed project started in May 2002, lying between 1 January 2000 and 18 November 2004. In the decision process, CDM has played an important role. As early in 2001, the project owner had taken business negotiation with Holland government for purchasing CERs generated by this project, however, it's a pity that both sides didn't come to an agreement. Moreover, the application files submitted to the World Bank Carbon Fund by the project owner also clearly prove that before determining the construction of this project, NISCO has consider the CDM factor seriously.

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

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

To the project owner, in order to acquire the necessary electric power, the **alternative scenarios include:**

1) Still construct this project, but don't undertake as a CDM project.
2) Use the 3rd generation OG LDG dedusting and combustion system, dedust the LDG to the national emission standard, fire and then release to the atmosphere. The necessary 23MW power will purchase from the grid.
3) Install LT system, use dry electrostatic precipitator technology, dedust the LDG to the national emission standard fire and then release to the atmosphere. The necessary 23MW power will purchase from the grid.
4) Build new self-supply power plant, use coal, diesel fuel, natural gas, hydro, and wind and so on instead of LDG as fuel.
5) Scenario 1 or scenario 2 combines with scenario 4.
6) By other means make use of LDG.

The price of LT system is high, for example, if install the self-contained LT system for two 120 ton converters, it will costs about 2,000,000 EURO, which far expensive than the OG system. OG system use electrostatic precipitator combined with venturi, which could attach the same clean effect as the LT system. Furthermore, compared with the OG system, the LT system can't bring any additional income, so the scenario 3 leaves out of account.
The project owner doesn't have any demand for utilizing the LDG presently, so the scenario 3 is unfeasible.

Sub-step 1b. Enforcement of applicable laws and regulation

It prohibit construct the heat-engine plant which installed capacity is 50MW or below at present in China. Because there isn't hydro, wind or any other renewable energy source can be used in the region where the project constructed, the scenario 4 is unfeasible.
Obviously, the scenario 5 is unfeasible.
There isn't relevant regulation obliges the iron and steel works recover the LDG in China, so the scenario1 and 2 all comply with the existing regulation.

Step 3. Barrier analysis
The 4th generation OG system use wet dedusting technology, moreover can recover amount of LDG and utilize it as energy. However, compared with the 3rd generation OG system, there are obviously technical barriers.
1. Increased technical difficulty
One of the pivotal technology of the 4th generation OG system is insure there is minute differential pressure between the moving petticoat pipe and converter hole, control the oxygen content below 2%, which insure recovery and utilization of LDG in security. In the process of using LDG, must operate as the gas operation regulations strictly, avoid accidents of gas poisoning and gas explosion.
2. Strict demand for precision and reliability of the in-line detection instrument.
In order to insure the process of recovery and utilization of LDG in security, system has very strict demand for precision and reliability of the in-line detection instrument. Explosion may be happened in case the instrument became breaking-down.
3. Increased malfunction of the equipment
Due to the technical features of the 4th generation OG system, compared with the 3rd generation OG system, increase the malfunction odds, therefore, increase the system operation cost.
4. The staff operating the system must be trained strictly
The operation level of the staff has very direct impact on the amount of recovered LDG. In order to increase the amount of the recovered LDG, the staff operating the system must be trained strictly, which will increase the expenditure in early stage and operation cost.
Moreover, it's the first application of the 4th generation OG system in Chinese steel enterprises, and its' practical performance of this technology has not been tested. Therefore, the owner of the project will have to face the more technical risk once this technology is decided to be used.

Step 4. Common practice analysis
There are 1499 steel enterprises in China at present. This project is the first application of the 4th generation OG system in steel enterprises of China, of which the technical performance has never been tested in actual production. Therefore, the owner of the project will have to face the more technical risk once this technology is decided to be used.

Step 5. Impact of CDM registration
In the decision process, the owner considers the additional revenues seriously, which CDM factor plays a key role. As a CDM project register successfully will bring intending economic benefit to the owner, which will redound the owner's invest. Meanwhile, this project registered as a CDM project successfully has a very positive effect on build up social image of recognition of environmental protection and concerning social benefit.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The border of this project includes itself and all generation stations connected with the east China grid. East China grid has partly exchanged with Huazhong grid, when calculate the emission factor (s), the

emission factor of Huazhong grid is consider as zero.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The baseline was determined by Mitsubishi Research Institute, Inc in April 10th, which isn't a Project participant.

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:

01/01/2006

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

15 years

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

C.2.1. Renewable crediting period

Not applicable

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

C.2.1.2.Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1.Starting date:

01/01/2006

C.2.2.2.Length:

10years

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

This project use approved consolidated monitoring methodology ACM0004 "Consolidated monitoring methodology for waste gas and/or heat for power generation" (version02) and approved consolidated baseline methodology ACM0002"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version05)

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

This methodology ACM0004 applies to project activities as followings:

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

This project fulfils all of the above qualifications:

- this project utilize the waste gas (LDG) in steel-making process;
- that displace electricity generation with fossil fuels in the east China electricity grid, which heat engine installed capacity account for more than 80%;
- This project will not lead fuel switch.

Accordingly, it's appropriate use the approved consolidated baseline methodology ACM0004 in this project.

According to ACM0004, if the replaced electricity is grid electricity, the emission factor should be calculated by ACM0002. This project complies with this demand.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

The project emission is zero, so it is not necessary to monitor relevant data.

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The project emission is zero, so it isn't applicable.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.EG_{GEN}	Total Electricity Generated	project owner	MWh/yr	m	Continuously	100%	Electronic	Monitor by electric metre, special worker is responsible for the correction of the meters
2.EG_{Aux}	Auxiliary comsumed Electricity	project owner	MWh/yr	m	Continuously	100%	Electronic	Monitor by electric metre, special worker is responsible for the correction of the meters

3.EG_y	Net Electricity supplied to facility	Calculated	MWh/yr	C	Continuously	100%	Electronic	Use the above data to calculate
4.Q_{CVG}	The amount of LDG used for electric power generation	project owner	Nm^3	m	Continuously	100%	Electronic	
5. Q_{BFG}	The amount of blast furnace gas for electric power generation	project owner	Nm^3	m	Continuously, record hourly	100%	Electronic	
6. Q_{COG}	The amount of coke oven gas for electric power generation	project owner	Nm^3	m	Continuously, record hourly	100%	Electronic	
7.NCV_{CVG}	The net heat value of LDG for electric power generation	project owner	TJ/ Nm^3	m	Continuously, record hourly	100%	Electronic	

8.NCV_{BFG}	The net heat value of blast furnace gas for electric power generation	project owner	TJ/ Nm^3	m	Continuously	100%	Electronic	
9.NCV_{COG}	The net heat value of coke oven gas for electric power generation	project owner	TJ/ Nm^3	m	Continuously	100%	Electronic	
10. H_r	The average efficiency of electric power generation	Calculated	TJ/MWh	c	yearly	-	Electronic	

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

（2）Baseline emissions are given as the following formulae:

$$BE_{electricity,y} = EG_y \cdot EF_{electricity,y} \quad (2)$$

where:
EG_y is the net quantity of electricity supplied to the manufacturing facility by the project during the year y (MWh), and
EF_y is the CO_2 baseline emission factor for the electricity displaced due to the project activity during the year y (tCO_2/MWh).

EG_y is calculated as the formula 3 and 4.

$$EG_y = \frac{\sum_{h=1}^{8760} Q_{WG,h} \times NCV_{WG}}{H_r} \quad (3)$$

where:
$Q_{WG,h}$ is the amount of LDG recovered from converter (Nm^3/h), and
NCV_{WG} is the net Calorific Value of LDG (TJ/Nm^3), and
H_r is the average Power Plants Efficiency (TJ/MW)

H_r is calculated as the formula 4.

$$H_r = \frac{\sum_{h=1}^{8760} \sum_{i=1}^{I} Q_{i,h} \times NCV_i}{EG_{total,y}} \quad (4)$$

where:
H_r is the average Power Plants Efficiency (TJ/MWh), and
$Q_{i,h}$ is the amount of individual waste gas I consumed at the power plants during the hour h (Nm^3/h), and
NCV_i is the net Calorific Value annual average for each individual consumed fuel and the waste gas (TJ/Nm^3), and
$EG_{total,y}$ is the total energy produced at the power plants during the year y. (MWh/year)

The Emission factor (EF_y) is calculated using the combined margin approach $(EF_{CM,y})$ outlined in the approved ACM0002 methodology. East China Grid is chose as the project boundary. The emission factor of electricity on baseline is calculated beforehand with the method, and hold the line during crediting period.

At first, the operating margin emission factor and the Build Margin emission factor are calculated, and then the baseline emission factor.

Step 1. Calculate the operating margin emission factor $(EF_{OM,y})$

The operating margin emission factor is calculated with the simple OM method. The emission factor is calculated using the following formula:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (5)$$

where:

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

j is the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports[1] to the grid,

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

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

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

$$GEN_{j,y} = G_{j,y} \times \frac{PGCC_{j,y}}{PSCC_{j,y}} \quad (6)$$

Where

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

$G_{j,y}$ is the electricity(MWh) generated by the power sources j, and

$PGCC_{j,y}$ is the amount of coal consumed by the power sources j to generate electricity in the year y(tce/MWh), and

$PSCC_{j,y}$ is the amount of coal consumed by the power sources j to deliver electricity in the year y(tce/MWh)

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (7)$$

where:

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

$OXID_i$ is the oxidation factor of the fuel, and

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

[1] As described above, an import from a connected electricity system should be considered as one power source j.

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

The Build Margin emission factor (EFBM,y) has been calculated as the generation-weighted average emission factor (tCO2/MWh) of a sample of power plants m, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \quad (8)$$

Where

$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants *m*.

Step 3. Calculate the baseline emission factor EF_y

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

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (9)$$

where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Baseline Emission Calculations

The baseline emission is calculated as,

$$BE_y = EG_y \times EF_{electricity,y} \quad (10)$$

where,

BEy = Baseline Emissions due to displacement of electricity during the year y (in tons of CO2)
EGy = Net units of electricity due to WHR substituted in the grid during the year y (in MWh)
EFy = Emission Factor of the grid (in tCO2/ MWh) and

y is any year within the crediting period of the project activity

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

Not applicable.

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

No leakage is considered.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

No leakage is considered.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The emission reductions (ER_y) for the project activity during a given year *y* is the difference between the baseline emissions (BE_y) and project emissions (PE_y), are calculated according to the following formula below:

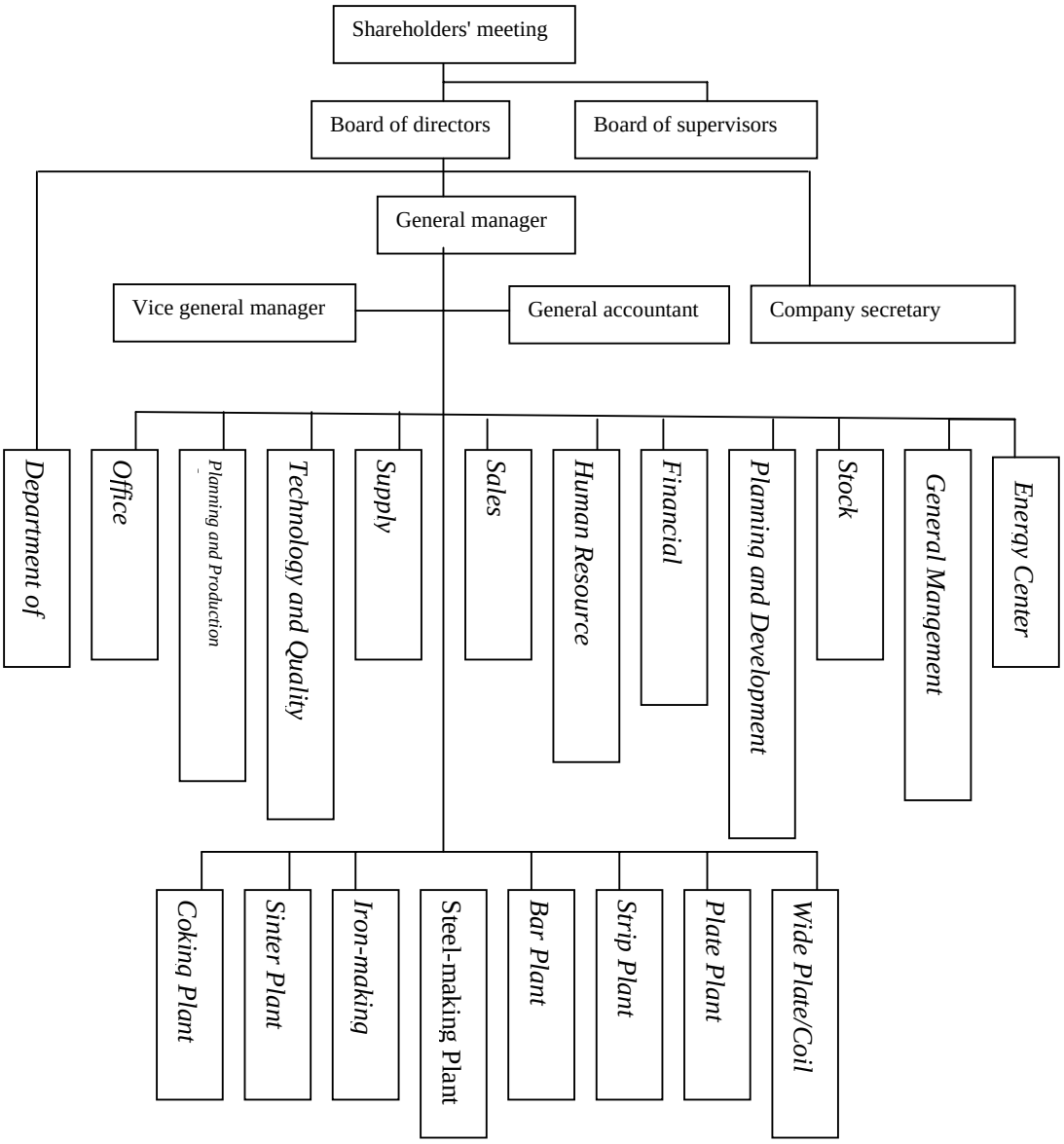
$$ER_y = BE_y - PE_y$$

where:
ER_y are the emissions reductions for the project activity during the year *y* in tons of CO_2,
$BE_{,y}$ are the baseline emissions due to displacement of electricity during the year *y* in tons of CO_2,
PE_y are the project emissions during the year *y* in tons of CO_2,

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1-2	Low	Monitoring instrument will be subject to a regular maintenance and testing regime to ensure accuracy termly
3	Low	This data is calculated, so does not need QA procedures
4.,-9	Low	Monitoring instrument will be subject to a regular maintenance and testing regime to ensure accuracy termly
10	Low	This data is calculated, so does not need QA procedures

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The monitoring will be conducted by the Energy Centre of the company, and the quantity control is the responsibility of the assigned manager.



Structure of the Company

D.5 Name of person/entity determining the monitoring methodology:

The monitoring methodology was determined by the Mitsubishi Research Institute, Inc. on Apr.10, 2006. Mitsubishi Research Institute, Inc. is not a project participant in the project activity.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

The project emissions (PE_y) is zero.

E.2. Estimated leakage:

$L_y=0$

E.3. The sum of E.1 and E.2 representing the project activity emissions:

E3 = E1 + E2 = $PE_y + L_y$

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

The electricity baseline emission factor (EF_y) in the project activity is 0.7897 tCO_2 / kWh.
The net quantity of electricity supplied to the manufacturing facility by the project during the year y (EG_y) is 156.666 GWh.
Baseline emissions are given as:

$$BE_y = EG_y \cdot EF_y$$

Therefore, the baseline emission is 123,7205t CO_2.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

$ER_y = BE_y - PE_y - Ly$=123,720 t CO_2.

E.6. Table providing values obtained when applying formulae above:

Year	Estimation of Project activity Emission reductions (tonnes of CO_2e)	Estimation of baseline emission reductions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2e)	Estimation of Emission reductions (tonnes of CO_2 e)
2006	0	123,720	0	123,720
2007	0	123,720	0	123,720
2008	0	123,720	0	123,720
2009	0	123,720	0	123,720
2010	0	123,720	0	123,720
2011	0	123,720	0	123,720
2012	0	123,720	0	123,720
2013	0	123,720	0	123,720
2014	0	123,720	0	123,720
2015	0	123,720	0	123,720
Total (t CO_2e)	0	1,237,200	0	1,237,200

SECTION F. Environmental impacts

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

The construction of the project stared in May 2002 and finished in June 2004.

As for the installation of the OG system, NISCO submitted the Supplemental Impact Assessment (SEIA). The SEIA described that the proposed project will produce significant benefits to the air environment. The concentrations of dust emission with or without the OG system do not differ significantly, because both conditions must comply with the emission standard. However, the total amount of dust emission is reduced by 80 percent with OG system.

The OG system is a semi-closed, and the recovered gas will be treated in a closed system. The environment impact are (1) gas emission at the beginning and the ending of batch operations of the converter (secondary exhaust gas), (2) wastewater and sludge from wet de-dusting facilities, and (3) solid wastes from a dry bag filter for secondary exhaust gas. The secondary exhaust gas will be treated by dry bag filters and released into the atmosphere. In the NISCO establishment, this type of exhaust gas in the existing plants is deal with and can comply with environment standards. The wastewater and sludge will be collected in a pipe or ditch and sent to the central treatment facility, and the residues after sedimentation will be dried and sent to the blast furnace as a carbon source. The solid wastes will be put into the blast furnace as the raw material

Therefore, the OG system will have no significant environmental impacts and will comply with relevant environment standards. Monitoring of the secondary exhaust gas will be conducted four times per year. The wastewater and sludge will be monitored at the central treatment facility.

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

The project can improve the environment and have no significant environmental impacts. The potential environmental risks relate to air pollutants, waste water, and solid waste, all of these can be controlled.

The other 80 percent will be recovered in a closed system, and the 20 percent of the exhaust gas with dust content below the national standard of 100mg/Nm^3 from the converter, will be released into the atmosphere.

The wastewater and slurry generated from the wet de-dusting device of the OG system, will be collected with other wastewater together and treated at a pollution facility.

Solid wastes generated from the converter itself as steel slag and from bag filters as dust, will be reused in the blast furnace as raw material.

SECTION G. Stakeholders' comments

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

During the environment impact assessment, the 35 opinion tables were distributed to the inhabitant nearby for their advice, and the 30 recycled, which return-ratio 86%. All of these were responsible for the EIA organization to compile.

G.2. Summary of the comments received:

According to the participant opinions, the project does not affect the city planning and accelerates the local economy development, and the necessary pollution control measure is feasible. During the project The strict implementation of environmental protection " at the same time Three" must be complied with, and the environment management and monitoring.

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

Considering the opinions, the Wuhan metropolis environmental protection limited company was entrusted to carry on the construction, and according to ISO14001 environment management system, the environment management during the constructing period was implemented. Nanjing Iron & Steel United Co., Ltd has the right environment management system and pass the authentication of ISO14001 environment management system. During the on-line monitoring by Jangshu Province environment monitoring centre, the environment quality and pollution emission concentration was answered for the relevant standards.

In addition, the World Bank consulted with NISCO, the local government, and the local communities, to design a social development component to enhance the project's social benefits for its sustainability. NISCO agreed to take part in this initiative as a responsible member of the local community.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Nanjing Iron & Steel United Co., LTD.
Street/P.O.Box:	Dachang District
Building:	
City:	Nanjing
State/Region:	
Postfix/ZIP:	210035
Country:	P.R. China
Telephone:	+86 25 84812333
FAX:	+86 25 84816649
E-Mail:	wxf@nansteel.com
URL:	
Represented by:	Liu Yuejian
Title:	Department Manager
Salutation:	Mr.
Last Name:	Liu
Middle Name:	
First Name:	Yuejian
Department:	Development & Planning Department
Mobile:	
Direct FAX:	+86 25 57793497
Direct tel:	+86 25 57074718
Personal E-Mail:	

Organization:	World Bank Carbon Finance Unit
Street/P.O.Box:	1818 H Street, NW
Building:	MSN MC4-766
City:	Washington
State/Region:	D.C
Postfix/ZIP:	20433
Country:	United States of America
Telephone:	+1-202-473-2928
FAX:	+1-202-522-7432
E-Mail:	ibrd-carbonfinance@worldbank.org
URL:	www.carbonfinance.org
Represented by:	
Title:	Senior Environmental Specialist
Salutation:	Mr.
Last Name:	Ringius
Middle Name:	
First Name:	Lasse
Department:	Carbon Finance Unit
Mobile:	
Direct FAX:	+1-202-522-7432
Direct tel:	+1-202-473-6381
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The public funds from the developed countries are special for the purchase of emission reductions, which will not lead to the transfer of public assistance.

Annex 3

BASELINE INFORMATION

Table A3-1:Installed capacities and electricity quantities of East China Grid in 2001

	Installed capacities（MW）			
	Total	**Hydro**	**Coal**	**Other**
Shanghai	**11232.7**	0	11232.7	0
Jiangsu	**19701.5**	33.7	19667.8	0
Zhejiang	**18818.9**	5732.5	12736.2	350.2
Anhui	**9569.1**	608.8	8960.3	0
Fujian	**12523.2**	6086.3	6424	12.9
Total	**71845.4**	12461.3	59021	363.1
Proportion	**100%**	17.34%	82.15%	0.15%
	Electricity quantities（TWh）			
	Total	**Hydro**	**Coal**	**Other**
Shanghai	**57.697**	0	57.697	0
Jiangsu	**104.119**	0.057	104.062	0
Zhejiang	**78.817**	10.573	65.691	2.553
Anhui	**41.742**	0.926	40.816	0
Fujian	**44.639**	23.443	21.17	0.026
Total	**327.014**	34.999	289.436	2.579
Proportion	**100%**	10.7%	88.51%	0.79%

Data source：China electric power Statistical Yearbook in 2002, P616 - 617,P625。

Table A3-2:Installed capacities and electricity quantities of East China Grid in 2002

	Installed capacities（MW）			
	Total	**Hydro**	**Coal**	**Other**
Shanghai	**11382.6**	0	11382.6	
Jiangsu	**20736.2**	137.2	20599	
Zhejiang	**20677.4**	5866.8	13082.4	1728.2
Anhui	**9705.4**	649.1	9056.3	
Fujian	**13523.9**	6512	6999.9	12
Total	**76025.5**	13165.1	61120.2	1740.2
Proportion	**100%**	17.32%	80.39%	2.29%
	Electricity quantities（TWh）			
	Total	**Hydro**	**Coal**	**Other**
Shanghai	**61.648**		61.648	
Jiangsu	**116.876**	0.16	116.716	
Zhejiang	**88.921**	13.883	69.287	5.751
Anhui	**47.06**	1.357	45.703	
Fujian	**53.309**	22.435	30.85	0.024
Total	**367.814**	37.835	324.204	5.775
Proportion	**100%**	10.29%	88.14%	1.57%

Data source：China electric power Statistical Yearbook in 2003，P584 - 585，P593。

Table A3-3:Installed capacities and electricity quantities of East China Grid in 2003

	Installed capacities（MW）				Electricity quantities（TWh）			
	Total	**Hydro**	**Coal**	**Other**	**Total**	**Hydro**	**Coal**	**Other**
Shanghai	**11092.6**		11092.6		**69.444**		69.444	
Jiangsu	**22382.8**	137.8	22245		**133.677**	0.4	133.277	
Zhejiang	**23821.4**	6054.5	15321.2	2445.7	**109.221**	11.123	83.089	15.009
Anhui	**9934**	649.1	9284.9		**55.716**	1.56	54.156	
Fujian	**13865.9**	6761.1	7092.8	12	**61.069**	18.899	42.146	0.024
Total	**81096.7**	13602.5	65036.5	2457.7	**429.127**	31.982	382.112	15.033
Proportion	**100%**	16.77%	80.20%	3.03%	**100%**	7.45%	89.04%	3.50%

Data source：China electric power Statistical Yearbook in 2004，P709。

Table A3-4:Economical index of generating electricity in East China Grid (2001- 2003)

	2001（gce/kWh）		2002（gce/kWh）		2003（gce/kWh）	
	coal (generate electricity)	**coal (supply electricity)**	**coal (generate electricity)**	**coal (supply electricity)**	**coal (generate electricity)**	**coal (supply electricity)**
Shanghai	331	350	331	351	331	349
Jiangsu	353	378	349	372	348	370
Zhejiang	343	365	344	366	325	345
Anhui	346	371	342	365	362	340
Fujian	342	365	339	364	332	354

Data source：China electric power Statistical Yearbook in 2004，P670，China electric power Statistical Yearbook in 2003，P591，China electric power Statistical Yearbook in 2002，P623。

Table A3-5: Calculation of thermal power in East China Grid (2001- 2003)

	2001（TWh）		2002（TWh）		2003（TWh）	
	Generation	**Network**	**Generation**	**Network**	**Generation**	**Network**
Shanghai	57.697	**54.56**	61.648	**58.14**	69.444	**65.86**
Jiangsu	104.062	**97.18**	116.716	**109.50**	133.277	**125.35**
Zhejiang	65.691	**61.73**	69.287	**65.12**	83.089	**78.27**
Anhui	40.816	**38.07**	45.703	**42.82**	54.156	**50.86**
Fujian	21.17	**19.84**	30.85	**28.73**	42.146	**39.53**
Total (Thermal power)	**289.436**	**271.38**	**324.204**	**304.31**	**382.112**	**359.88**

Table A3-6 Calculation of simple OM emission factor of East China Grid in 2001

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Net inports	Total	Emission Factor（tc/TJ）	Oxidatio C rate（%）	Average low Caloric value（MJ/t,m3,tce）	CO_2emission（tCO_2e）
		A	B	C	D	E	F	G = A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/100
Raw coal	Mt	22.2194	51.3235	28.788	18.4751	9.9104		130.7164	25.8	98	20908	**253372678.3**
Coke coal	Mt	0	0	0	0.0088	0		0.0088	29.5	98	28435	**26525.00209**
Coke coal gas	$10^{10}m^3$	0.0146	0	0	0	0		0.0146	20.2	99	16726	**17906.17987**
Other coal gas	$10^{10}m^3$	0.6629	0	0	0	0		0.6629	20.2	99	5227	**254072.9988**
Diesel oil	Mt	0.0149	0.0509	0.3043	0.0108	0.0189		0.3998	20.2	98	42652	**1237744.673**
Fuel oil	Mt	0.4208	0.0163	0.9711	0	0.1602		1.5684	21.1	98	41816	**4972551.413**
Refinery gas	Mt	0.0267	0	0	0	0		0.0267	20	99	46055	**89273.9331**
Other oil produce	Mt	0.0078	0.0182	0	0	0		0.026	20.2	98	41816	**78915.93577**
Other energy	Mtce	0	0.0032	0	0	0		0.0032	0		29271.2	**0**
											Total	**260049668.4**

Calculation of key variable:

a：Total emissions in East China Grid（tCO_2e） **260049668.4**

b：Generations of Thermal power in East China Grid（TWh） **271.38**

c：OM emission factor of East China Grid（tCO_2/MWh）（$c = a/b \times 10^{-6}$） **0.9582**

Date source：

Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. P1.13.

National Climate Change Research，P57 - 58，

Wu zong-xin，Chen wen-ying. Diversified energy strategy on the base of clean coal, P145 - 146,

China Energy Statistical Yearbook (2000 - 2002)，P220 - P249，P535。

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Table A3-7 Calculation of simple OM emission factor of East China Grid in 2002

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Net imports	Total	Emission Factor (tc/TJ)	Oxidatio C rate (%)	Average low Caloric value (MJ/t,m3,tce)	CO_2emission (tCO_2e)
		A	B	C	D	E	F	G = A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/100
Raw coal	Mtons	23.86	56.7469	29.2366	20.2505	13.3649		143.4589	25.8	98	20908	**278071961.3**
Coke coal	Mtons	0.0223	0.0002					0.0225	29.5	99	16726	**40299.83348**
Coke coal gas	$10^{10}m^3$	0.6682						0.6682	20.2	99	5227	**256104.3563**
Other coal gas	$10^{10}m^3$		0.0007					0.0007	18.9	98	43070	**2047.539186**
Diesel oil	Mtons	0.0121	0.1345	0.3				0.4466	20.2	98	42652	**1382633.244**
Fuel oil	Mtons	0.532	0.0119	0.9138	0.0109	0.126		1.5946	21.1	98	41816	**5055617.498**
Refinery gas	Mtons	0.0084						0.0084	20	99	46055	**28086.1812**
Other oil produce	Mtons	0.1	0.0347					0.1347	20.2	98	41816	**408845.2518**
Other energy	Mtons-tce	0.03		0.104				0.134	0		29271.2	**0**
											Total	**285245595.2**

Calculation of key variable:

a：Total emissions in East China Grid（tCO_2e）	**285245595.2**
b：Generations of Thermal power in East China Grid（TWh）	**304.31**
c：OM emission factor of East China Grid（tCO2/MWh）（c = a/b×10-6）	**0.9374**

Date source：

Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. P1.13.

National Climate Change Research，P57 - 58，

Wu zong-xin，Chen wen-ying. Diversified energy strategy on the base of clean coal, P145 - 146,

China Energy Statistical Yearbook (2000 - 2002)，P220 - P249，P535。

Table A3-8 Calculation of simple OM emission factor of East China Grid in 2003

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Net import	Total	Emission Factor (tc/TJ)	Oxidatio C rate (%)	Average low Caloric value (MJ/t,m3,tce)	CO_2emission (tCO_2e)
		A	B	C	D	E	F	G = A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/100
Raw coal	Mtons	26.18	64.1774	34.424	26.6967	17.54		169.0181	25.8	98	20908	**327614351.9**
Coke coal gas	$10^{10}m^3$	0.0199	0.0006					0.0205	29.5	99	16726	**36717.62606**
Other coal gas	$10^{10}m^3$	0.6634						0.6634	20.2	99	5227	**254264.6363**
Diesel oil	Mtons	0.0126	0.1471	0.1399				0.2996	20.2	98	42652	**927534.5273**
Fuel oil	Mtons	0.9549	0.0076	1.7448		0.1889		2.8962	21.1	98	41816	**9182289.851**
Refinery gas	Mtons	0.0049	0.0096					0.0145	20	99	46055	**48482.0985**
Other energy	Mtons-tce	0.0568		0.0783				0.1351	0		29271.2	**0**
											Total	**338063640.7**

Calculation of key variable:

a：Total emissions in East China Grid（tCO_2e） **338063640.7**

b：Generations of Thermal power in East China Grid（TWh） **359.88**

c：OM emission factor of East China Grid（tCO_2/MWh）（$c = a/b \times 10^{-6}$） **0.9394**

Date source：

Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual. P1.13

National Climate Change Research，P57 - 58，

Wu zong-xin，Chen wen-ying. Diversified energy strategy on the base of clean coal, P145 - 146,

China Energy Statistical Yearbook in 2004，P166 - P177，P301。

Table A3-9 Calculation of new installed capacities in East China Grid

	installed capacities in 1999	installed capacities in 2000	installed capacities in 2003	installed capacities(1999 - 2003)
	A	B	C	D=C-A
Coal (MW)	51198.9		65036.5	13837.6
Hydro (MW)			13602.5	3467.5
Other (MW)	336.7		2457.7	2121
Total (MW)	61670.6	67099.9	81096.7	19426.1
Percentage of installed capacities in 2003	76.05%	82.74%	100%	23.95%
The share of heat-engine in total installed capacities in 2003				71.23%

Date source：

Installed in 1999：China electric power Statistical Yearbook in 2000。

Installed in 2000：China electric power Statistical Yearbook in 2001。

Installed in 2003：China electric power Statistical Yearbook in 2004。

Table A3-10 Calculation of CO2 emission factor thermal power project in East China Grid

Coal of power supply	net calorific values	emission factor	Oxidatio rate	CO_2emission factor
（kgce/MWh）	（MJ/tce）	（tc/TJ）		（tCO_2/MWh）
A	B	C	D	$E=A*B*C*D*44/12/10^9$
328.2	29271.2	25.8	0.98	0.9178

Date source：Mi jian-hua，Analysis of the energy-saving situation in China power industry, Power equipment, June 2005,Vol 6 (6).

Annex 4

MONITORING PLAN

The Energy Centre of the company answer for the date of monitoring, as follows

1. Total quantity of generating power
2. Comsuming quantity of assistant equipment
3. The amount of LDG recovered from converter to generate power
4. The amount of blast furnace gas to generate power
5. The amount of coke coal gas to generate power
6. The net Calorific Value of LDG recovered from converter
7. The net Calorific Value of blast furnace gas to generate power
8. The net Calorific Value of coke coal gas to generate power

The person was assigned by the Energy Centre of the company specially for monitoring quality. Monitoring instrument will be subject to a regular maintenance and testing regime to ensure accuracy termly.