CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03.1 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1. Title of the project activity:

>>
25.3MW WHR Project of Zhejiang Leomax Group
PDD Version: 04
11/07/2011

This version contains modifications as follows:
(i) The parameters of major facilities selected in the project activity
(ii) The monitoring parameters in Section B7.1 and 7.2.

A.2. Description of the project activity:

>>
The project activity involves the installation of waste heat recovery (WHR) systems to generate electricity for the four clinker production lines of Zhejiang Leomax Group (hereafter referred to the 'project entity'). The clinker production lines in the project activity include two 2,500 t/d clinker production lines in Tonglu County, Zhejiang Province, and two 5,000 t/d clinker production lines (one in Jiande City, Zhejiang Province and the other in Guangde County, Anhui Province). All these lines have been equipped with pre-calcining kilns, and the annual total power demand of the aforesaid production lines amounts to 354GWh, which is bought from East China Power Grid in the absence of the project activity.
To effectively utilize the waste heat energy carried by the exit gases from the pre-heater (Suspension Preheater) and the cooler (Air Quenching Chamber), the project entity has made a decision to build three WHR captive power stations. The total installed capacity reaches 25.3 MW. The general information of the WHR captive power station is showed in table A 2-1 (below).
Table A 2-1 The general information of the project activity

site	Tonglu County	Jiande City	Guangde County	Total
Power generation (MWh)/a	67,310	64,800	62,140	194,250
Power displaced by the project activity (MWh)/a	61,930`	59,880	57,540	179,350
The expected annual emission reductions (tCO_2e)	56,009	54,155	52,039	162,203

The electricity generated by the aforesaid stations will be used to meet part of power demand of the project entity which originally supplied by the thermal power plants in East China Power Grid, thereby significantly reducing the emission of GHG gases. The total expected annual emission reductions will be **162,203 tCO_2e**.

It is firmly believed by the project participant that the project activity will promote sustainable economic and industrial development in the long run, help conserving natural resources, and consequently contribute to the coming of a cleaner and healthier environment. The project activity will bring:
Social benefits: the project activity will provide some job opportunities for the professionals, workers and residents in the region. In addition to the benefit that the project entity will become less dependent on

power supply from East China Power Grid, the project activity will promote the sustainable development in the region and even the country as a whole.
Environmental benefits: The major share of East China Power Grid is thermal power plants. By substituting part of the electricity supply from these plants, the project activity will save fossil fuel sources and reduce GHGs emissions, thereby mitigating the negative impact incurred by the excessive exploitation of natural resources.

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)	*Zhejiang Leomax Group Co. Ltd.*	*No*
the Netherlands	*Essent Energy Trading BV*	*No*

>>
For more detailed contact information on participants in the project activities, please refer to Annex 1.

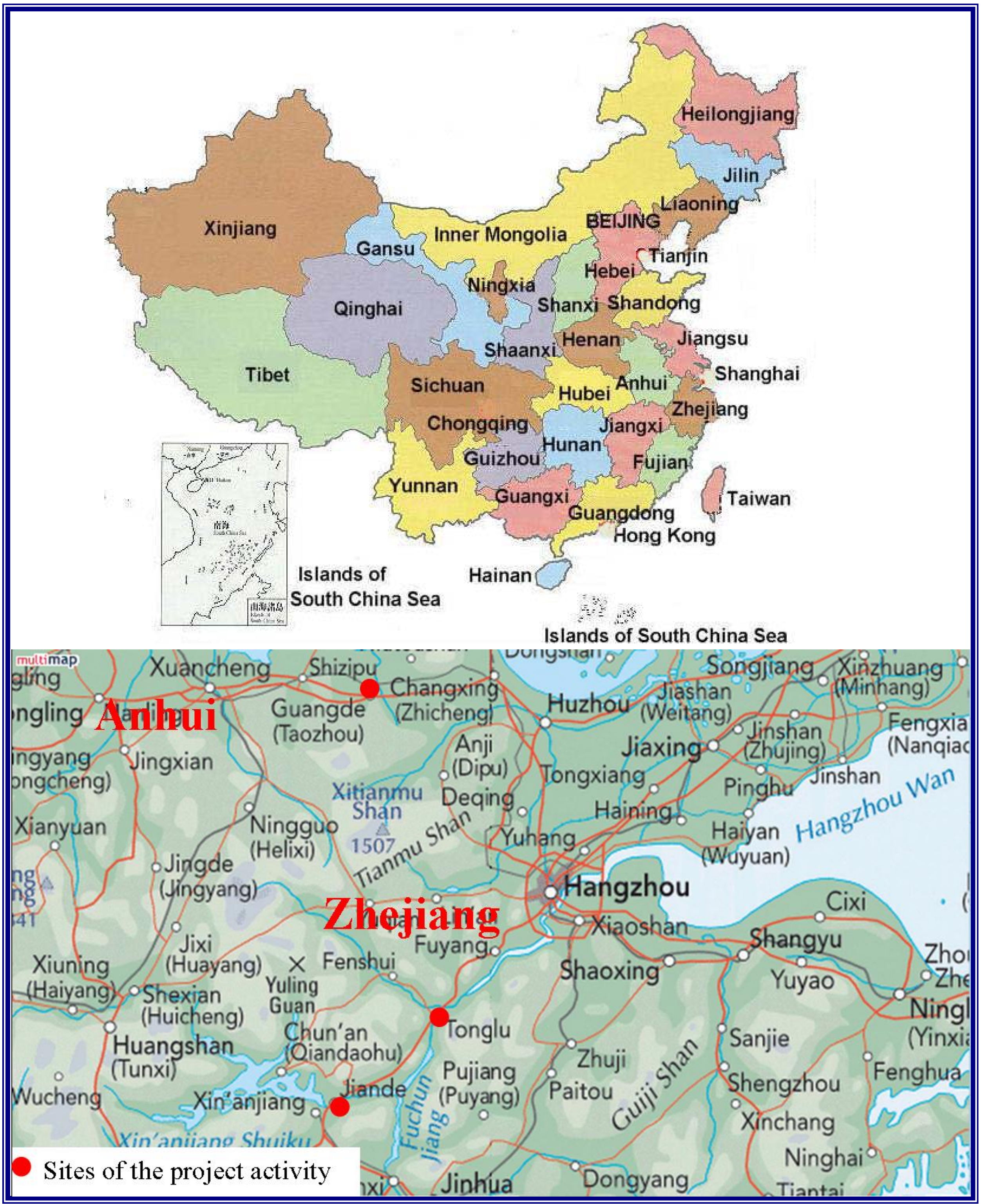
A.4. Technical description of the project activity:

A.4.1: Location of the project activity:
>>
A.4.1.1: Host Party(ies):
>>
People's Republic of China

A.4.1.2: Region/State/Province etc.:
>>
Zhejiang Province and Anhui Province

A.4.1.3: City/Town/Community etc:
>>
Tonglu WHR captive power station is located at Yinfangwu, Tonglu County, and Hangzhou City.
Jiande WHR captive power station is located at Huang'ao Village, Jiande City.
Guangde WHR captive power station is located at Liudong Town, Guangde County.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):
>>
Tonglu WHR captive power station lies in Yinfangwu, Tonglu County, Hangzhou City, Zhejiang Province, and the coordinates of the project location are 119°30′ east longitude, 29°50′ north latitude.
Jiande WHR captive power station lies in Huang'ao Village, Jiande City, Zhejiang Province, and the coordinates of the project location are 119°27′ east longitude, 29°43′ north latitude.
Guangde WHR captive power station lies in Liudong Town, Guangde County, Anhui Province. It is near the 215 Provincial Road and 318 National Road. The coordinates of the project location are 119°53′ east longitude, 31°03′ north latitude.
The geographical coordinates of the three project sites are shown in the **Fig. A.4-1** below:


Xinjiang
Gansu
Inner Mongolia
BEIJING
Heilongjiang
Jilin
Liaoning
Tianjin
Hebei
Ningxia
Qinghai
Shanxi
Shandong
Shaanxi
Henan
Jiangsu
Tibet
Sichuan
Hubei
Anhui
Shanghai
Zhejiang
Chongqing
Jiangxi
Hunan
Guizhou
Fujian
Yunnan
Guangxi
Taiwan
Guangdong
Hong Kong
Islands of
South China Sea
Hainan
Islands of South China Sea
multimap
Anhui
Zhejiang
Xuancheng
Shizipu
Changxing
(Zhicheng)
Guangde
(Taozhou)
Huzhou
Jiashan
(Weitang)
Songjiang
Xinzhuang
(Minhang)
Jinshan
(Zhujing)
Jiaxing
Fengxia
Jingxian
Anji
(Dipu)
Tongxiang
Pinghu
Jinshan
Hangzhou Wan
Xitianmu
Shan
1507
Deqing
Haining
Haiyan
(Wuyuan)
Xianyuan
Ningguo
(Helixi)
Tianmu Shan
Yuhang
Hangzhou
Jingde
(Jingyang)
Xiaoshan
Cixi
Fuyang
Shangyu
Jixi
(Huayang)
Fenshui
Shaoxing
Yuyao
Xiuning
(Haiyang)
Shexian
(Huicheng)
Yuling
Guan
Tonglu
Huangshan
(Tunxi)
Chun'an
(Qiandaohu)
Pujiang
(Puyang)
Zhuji
Sanjie
Paitou
Guiji Shan
Shengzhou
Fenghua
Wucheng
Xin'anjiang
Jiande
Fuchun Jiang
Xinchang
Xin'anjiang Shuiku
Ninghai
Jinhua
Dongyang
Sites of the project activity

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

>>
As per the scope of the project activity defined in the 'list of sectoral scopes and approved baseline and monitoring methodologies', the project activity falls under Scope Number 4-Manufacturing industries, especially the cement sector. The project activity is also relevant to sectoral scope 1-Energy industries (Renewable-/non-renewable sources).

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

>>
The production of cement mostly has to go through the following processes:
Raw material procurement and processing→raw meal grinding→calcination process→clinker storage and grinding→ cement silos and dispatch.
Large amount of energy consumption for the production of cement occurs in the calcination process which involves passing raw materials through a preheater stack containing cyclone heaters to a long rotating kiln to create clinker and then cooling clinker in the clinker cooler. In clinker production process, a great amount of heat is vented to the atmosphere without utilization. This process wastes natural resources and caused serious heat pollution in the workplace. If the waste heat is captured and used for power generation, as proposed in the project activity, it can significantly raise energy efficiency and reduce the amount of power imported from the Grid, thereby reducing GHGs emissions.

Home-made facilities have been selected to effectively utilize the waste heat of the exit gases from Suspension Preheater (SP) and Air Quenching Chamber (AQC). The project entity will employ waste heat recovery (WHR) system for power generation in the project activity. The WHR system consists of SP boiler, AQC boiler, steam turbine generator, DCS system, water-circulation system and dust-removal system etc. A schematic of the key equipment fitted as part of the project activity is demonstrated in Fig. A 4-2 (below). The waste heat from SP and AQC will be lead to WHR boilers (SP boiler and AQC boiler) to generate steam for power generation.

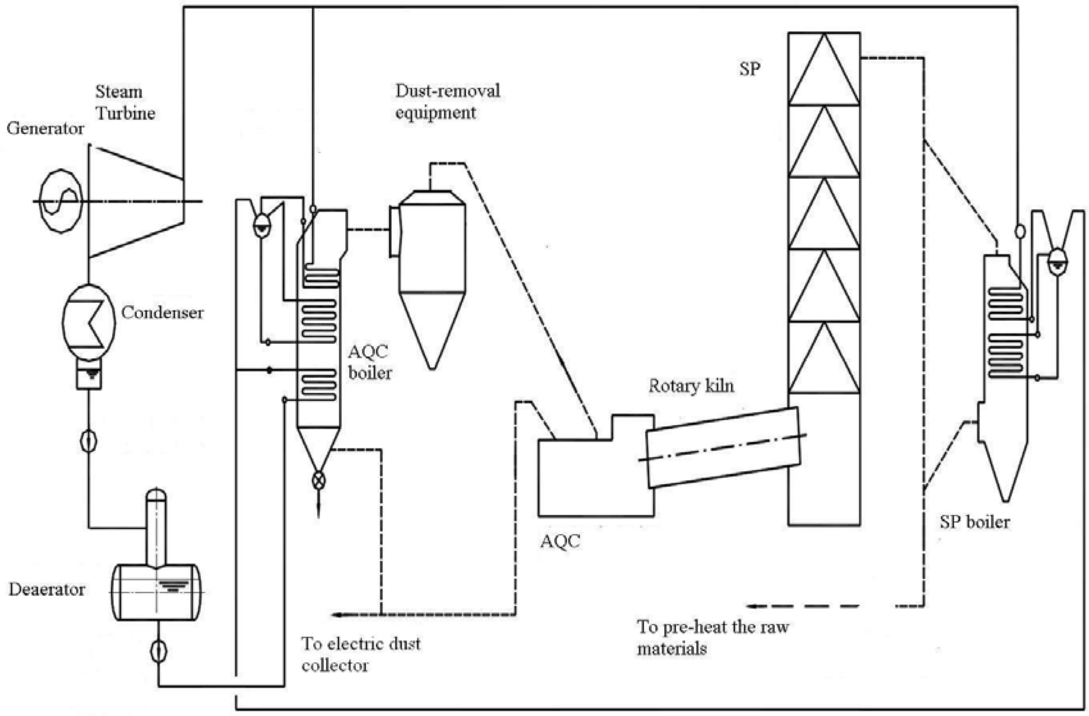


Fig. A 4-2 Schematic of key technology employed by the project activity

The major facilities which will be employed in the project activity refer to table A 4-1.

Table A 4-1 general information of major facilities selected in the project activity (From the feasibility study report)

Device Name	Number	Technical parameter	
Tonglu cement clinker line			
9MW Generator	1	Model: Rated power: Rated rotate speed:	QF2-J9-29MW 3000r/min
9MW Steam turbine	1	Model: Rated power: Rated rotate speed: Main steam pressure: Main steam temperature: Exhaust steam pressure:	N9-1.25 9MW 3000r/min 1.25 MPa 320℃ 0.0075 MPa
SP boiler	2	Steam parameter:	6.5t/h-1.35Mpa-340℃ (1#) 6.8t/h-1.35Mpa-340℃ (2#)
AQC Boiler	2	Steam parameter:	14.3t/h-1.35Mpa-340℃(1#) 12.8t/h-1.35Mpa-320℃(2#)
Jiande cement clinker line			
7.5MW Generator	1	Model: Rated power: Rated rotate speed: Output voltage:	N7.5-2 7.5MW 3000r/min 10500V
7.5MW Steam turbine	1	Model: Rated power: Rated rotate speed: Main steam pressure:	N7.5-0.98 7.5MW 3000r/min 0.98 MPa

Device Name	Number	Technical parameter	
		Main steam temperature: Exhaust steam pressure:	325℃ 0.008 MPa
SP boiler	1	Steam parameter:	23t/h-1.1Mpa-320℃
AQC Boiler	1	Steam parameter:	23.5t/h-1.1Mpa-340℃
Guangde cement clinker line			
9.0MW Generator	1	Model: Rated power: Rated rotate speed: Output voltage:	QFj9-2 9MW 3000r/min 10500V
8.8MW Steam turbine	1	Model: Rated power: Rated rotate speed: Main steam pressure: Main steam temperature: Output Pressure: Rated steam rate:	N9-0.88 9MW 3000r/min 0.88 MPa 310℃ 0.008 Mpa ≤5.92kg/KWh
SP Boiler	1	Steam parameter:	340000Nm^3/h-350℃ 190℃ 27.6t/h-1.0Mpa-320℃(overheat)
AQC Boiler	1	Steam parameter	23.5t/h－1.0Mpa—320℃

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

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The total expected emission reductions of the project activity in the 10 years crediting period are **1,622,030**tCO_2e. And the expected emission reductions in the fixed crediting period are demonstrated in the table below.

year	**Annual estimation of emission reductions in tonnes of CO_2e**			
	Tonglu County	Jiande City	Guangde County	Total
09/2008-12/2008	18,670	18,052	17,346	54,068
2009	56,009	54,155	52,039	162,203
2010	56,009	54,155	52,039	162,203
2011	56,009	54,155	52,039	162,203
2012	56,009	54,155	52,039	162,203
2013	56,009	54,155	52,039	162,203
2014	56,009	54,155	52,039	162,203
2015	56,009	54,155	52,039	162,203
2016	56,009	54,155	52,039	162,203
2017	56,009	54,155	52,039	162,203
01/2018-08/2018	37,339	36,103	34,693	108,135
Total estimated reductions (tonnes of CO2e)	**560,090**	**541,550**	**520,390**	**1,622,030**
Total number of crediting years	10 years	10 years	10 years	10 years
Annual average over the crediting period	56,009	54,155	52,039	162,203

of estimated reductions (tonnes of CO2e)				

A.4.5: Public funding of the project activity:

>>

No public funding from any Annex I parties are involved in the project activity.

SECTION B: Application of a baseline and monitoring methodology:

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

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The methodology applied:

Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants - AM0024 (version 01)

The methodology referred:

Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources – ACM0002 (version 06) and

Tool for the Demonstration and Assessment of Additionality - version 03

More information about the above methodology can be found on the website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

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

>>

Methodology	*The proposed project activity*
The electricity produced is used within the cement works where the proposed project activity is located and excess electricity is supplied to the grid; it is assumed that there is no electricity export to the grid in the baseline scenario (in case of existing captive power plant).	*At present, all the electricity consumption at the Tonglu Plant, Jiande Plant and Guangde Plant is imported from the ECPG. The electricity generated by the project activity will be totally supplied to the cement production line and on the stage can not meet the power demand of the cement production, so at this stage there is no electricity export that will be supplied to the grid.*

Electricity generated under the project activity displaces either grid electricity or from an identified specific generation source. Identified specific generation source could be either an existing captive power generation source or new generation source.	*Electricity generated under the project activity will directly displace electricity imported from the ECPG.*
The grid or identified specific generation source option is clearly identifiable.	*The power grid boundaries in China are clearly identified and are managed as six regional power grids of which ECPG is one of them. The information of ECPG is reported annually in the China Electric Power Yearbook.*
Waste heat is only to be used in the project activity	*All the recovered waste heat is only to be used in the project activity to generate electricity that will be used in cement production.*
In the baseline scenario, the recycling of waste heat is possible only within the boundary of the clinker making process (e.g. clinker production lines in baseline scenario could include some heat recovery systems to capture a portion of the waste heat from the cooler end of the clinker kiln and use this to heat up the incoming raw materials and fuel - so called Type 1 Waste Heat Utilization as described in explanatory note below).	*In the clinker making process, most waste heat is vented to atmosphere and a portion is used to heat up the incoming raw materials and fuel – so called Type 1 Waste Heat Utilization which could be included in baseline scenario.*
Non applicability Criteria	
Where the current use of waste heat or the identified alternative business as usual use of waste heat is located outside of the clinker making process (so called Type 2 Waste heat utilization as described in explanatory note below)	*The current use of waste heat is used to heat up the incoming raw materials and fuel which is located in the clinker making process.*
That affects process emissions from cement plants.	*The clinker making process is a chemical process with pre-determined materials input. Therefore the project activity will not affect emissions and the entire volume of waste heat is a by-product of the process.*

The project activity satisfies the applicability conditions as specified in the methodology AM0024 (version 01). Therefore the methodology is applicable for the project activity.

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

>>

As per the methodology, the project boundary includes the sources related to project emissions and baseline emissions. The grid that the project joins up with is the East China Power Grid. Therefore the

Project Boundary is defined as the waste heat source (rotating kiln generating the waste heat of the project), heat recovery boilers (SP boiler and AQC boiler), waste heat generator units and its auxiliary facilities and all power plants which join up with the East China Power Grid.
Table B.3-1 illustrates which emission sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.
Table B.3-1: Overview on emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity generation /identified specific generation source	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	On-site fossil fuel consumption due to the project activity	CO2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

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

>>
The methodology is applied to the project activity through the following steps:
Step 1: Determination of technically feasible alternatives to the project activity:

1. **A. Identify and list, within the local context, the current business, as usual utilization of, and options technically feasible for, waste heat utilization. Include an assessment of potential use of waste heat in the cement work.**

The current situation at Tonglu Plant, Jiande Plant and Guangde Plant is that most of the waste heat from kilns is vented to atmosphere and only a portion is used to heat up the incoming raw materials and fuel. This is also the normal use of the waste heat from kilns in local context.

There are no other potential demands for additional waste heat. The project locations are in rural area. The decentralized farmers have no central heating demand, besides, because of the long distance and large investment in pipe network, it is not financially attractive to transmit waste heat to urban residential. Moreover, the main industrial facilities around the project location are cement plants[1] which do not need waste heat since these cement plants also generate waste heat by themselves.

The waste heat used is within the boundary of the clinker making process as it is used to heat the incoming raw materials and fuel that are used to make the clinker (see Fig. B 4-1). As outlined in the methodology, before and after measurements of the specific fuel consumption per unit clinker output of the clinker lines connected to the project activity would capture any change in emissions resulting from this change in Type 1 waste heat flows.
Fig. B 4-1 outlines the key components of this for ease of understanding.

[1] http://gdgyj.2.yongnet.cn/guimogongye/xxjc/index.html

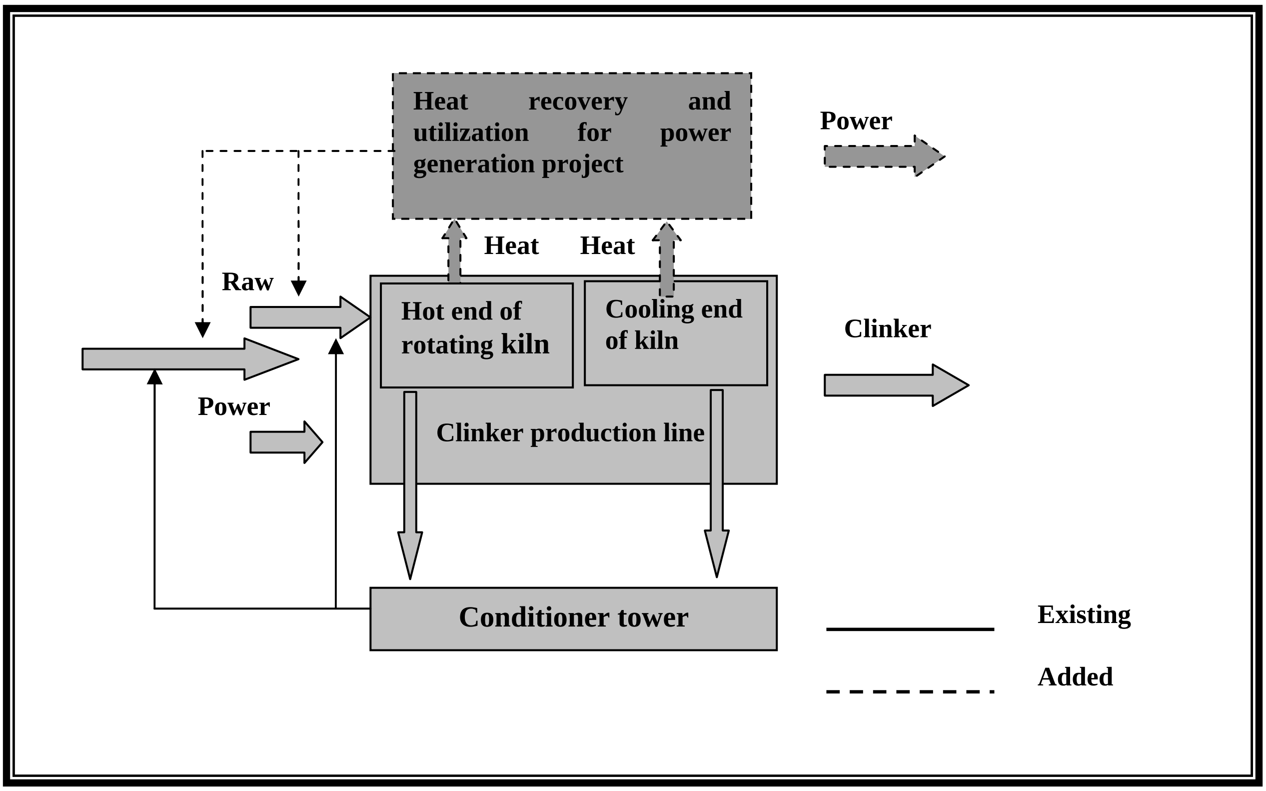

Fig. B. 4-1 Thermodynamic system of the project activity

1. B. Identify and list the source of electric energy supply for the cement plants, in the local context. The current and future situation of the electricity demand and supply to the cement plant, where the project activity is located, should be included in the CDM-PDD in order to determine what electricity supply is likely to be displaced by the project activity.

There are no other local loads and existing captive power plants in Tonglu plant, Jiande plant and Guagde plant. The table B4-1 shows the historical and projected electrical supply and demand at Tonglu plant, Jiande plant and Guagde plant over the Crediting period.

Table B4-1 Historical and Planed Electrical Supply and Demand at the Tonglu Cement Works, Jiande Cement Works and Guangde Cement Works over the Crediting period(including the project activity).

Item	*FSR*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010-17*
Tonglu Cement Plant								
Annual Demand(GWh), E_{CEMENT}	*146*[2]	*107*	*135*	*136*	*120*	*130*	*130*	*160*
Annual Power purchase from ECPG (GWh)	*/*	*107*	*135*	*136*	*120*	*115*[3]	*80*	*110*[4]
Jiande Cement Plant								
Annual Demand (GWh), E_{CEMENT}	*108*[5]	*19*[6]	*76*	*104*	*112*	*112*	*112*	*168*
Annual Power Purchase from	*/*	*19*	*76*	*104*	*92*[7]	*51*	*51*	*95*[8]

[2] Tonglu leomax WHR project feasibility study report, TCDRI,2006,Page25
[3] The Tonglu WHR captive power station will operate.
[4] The Tonglu cement grinding station will start building.
[5] Jiande leomax WHR project feasibility study report, TCDRI,2006,Page28
[6] The clinker lines were commissioning in 2004
[7] The Jiande WHR captive power station will operate.

ECPG (GWh)								
Guangde Cement Plant								
Annual Demand (GWh), E_{CEMENT}	*112*[9]	*/*	*88*	*114*	*110*	*110*	*110*	*110*
Annual Power Purchase from ECPG (GWh)	*/*	*/*	*88*	*114*	*85*[10]	*55*	*55*	*55*

From Table B4-1, it can be shown that the project owner have imported all of their electricity from the East China Power Grid. After the project activity is implemented, the total electricity consumption will increase but a part of it will be supplied by the project activity and the rest from the ECPG.

All of the technically feasible options are listed below:

Scenario 1) Proposed project activity not undertaken as a CDM project activity;

The project entity may adopt waste heat recovery utilization systems for power generation to generate electricity. However, this alternative faces series of barriers (as detailed in Section B.5.) making it predictably prohibitive.

Scenario 2) Continuation of import of equivalent electricity from ECPG

Currently, the project entity imports electricity from East China Power Grid. In the absence of the project activity, the Grid will annually provide 354 GWh to the cement plants. Without project activity, the project entity will continue importing electricity to satisfy the demand of the clinker production from East China Power Grid. This scenario does not face any technique barriers, so it is a technically option.

Scenario 3) Installation of a new thermal power plant

The project entity can generate equivalent amount of power using thermal power plant. There are no onsite power stations for the cement production lines as all power comes from the Grid. This would require the installation of three power stations to meet the demand.

Step 2: Compliance with regulatory requirements:

The scenarios listed in the ***Step1*** are outlined.

Scenario 1) Proposed project activity not undertaken as a CDM project activity;

The scenario is consistent with prevailing laws and regulations and as such the project feasibility study was officially approved on the 9th January 2007(Tonglu), 18th May 2006(Jiande) and 9th November 2006(Guangde).

Scenario 2) Continuation of importing equivalent electricity from ECPG;

It is in compliance with all applicable legal and regulatory requirements. According to the regulation and policies currently governing the Chinese power market, the East China Power Network will have to guarantee power to meet the demand of the growing industrial and commercial sectors of the region.

Scenario 3) Installation of a new thermal power plant

As per Chinese power regulations, thermal power plants of less than 135MW[11] are prohibited. As the installed capacity is only 25.3MW which is less than 135MW, the construction and operation one thermal power plant does not comply with the legal and regulatory requirements. Therefore this scenario can be excluded from the baseline scenario.

Step 3: Undertake economic analysis of all options that meets the regulatory requirements.

From the analysis above, all the options meet the regulatory requirements are as below:

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[8] The Jiande cement grinding station will start building.

[9] Guangde Leomax WHR project feasibility study report, TCDRI, 2005, Page31

[10] The Guangde WHR captive power station will operate.

[11] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, decree No. 2002-6.

Scenario 1) Proposed project activity not undertaken as a CDM project activity;

Scenario 2) Continuation of importing equivalent electricity from ECPG

The Net Present Value (NPV) analysis for the two options above has been done to identify the most attractive option. The discount rate is 12% which is the financial benchmark rate of return (after tax) of Chinese Cement Industry. The NPV analysis was done as below:

Step 1: Basic parameters used for the NPV analysis

All of the input values for investment analysis of the project activity are adopted from the approved feasibility study reports (FSR). These FSRs were prepared by Tianjin Cement Industry Design & Research Institute Co., Ltd. (TCDRI), who is accredited as grade B by the Ministry of Construction of China.

Table B 4-2 The main parameters used for the NPV analysis

		Used for NPV analysis	Actual values	Comments
Electricity tariff (RMB/KWh)	Tonglu	0.302	0.294	Referred to the actual electricity purchase invoice of project entity in 2007
	Jiande	0.308	0.301	
	Guangde	0.297	0.295	
Fixed investment (million)	Tonglu	58.11	/[12]	Referred to the agreement of construction, equipments and other related items of project.
	Jiande	52.94	53	
	Guangde	58.77	58.78	
Annual power savings (MWh)	Tonglu	61,930	/	Referred to the actual record of project entity.
	Jiande	59,880	59,979	
	Guangde	57,540	50,350	

From above comparisons, the actual electricity tariffs of the three plants are all lower than the values used for NPV analysis. The actual fixed investment and annual power savings of Jiande and Guangde plants are all higher than the values used for NPV analysis except the annual power savings of Jiande. The actual annual power savings of Jiande is a little higher (1.65%, below 10.49% used in the sensitivity analysis in B.5) than the estimated value in the FSR/PDD (59880 MWh). Even using 59979 MWh for NPV analysis, the Scenario 1 is still lower than the Scenario 2. So the values used to the NPV analysis are valid, applicable, appropriate and conservative.

Step 2: Comparison of NPV for Scenario 1 and Scenario 2

The basic cash flow structures of the NPV comparison analysis are shown as follows:

Table B4-3 NPV Analysis For Project Activity

	Project Activity without CDM	Baseline Scenario without Project Activity
Cash Inflow	CI	CI

[12] Tonglu plant is still in construction, so the actual total investment and power supply are not available. However, the design institute and the owner of Tonglu plant, Jiande plant and Guangde plant are the same and from the actual values of Jiande and Guangde, it can be seen that the estimated parameters in the FSR are similar with the actual values.

Cash Outflow	PC EPA	EPB

Note： All the symbols denote absolute present value

Where, CI = total cash inflow from project activity business activities

PC = WHR Project Costs

EPA = Electricity Purchase from the Grid with Project Activity

EPB = Electricity Purchase from the Grid in Baseline Scenario, i.e. without project activity

In order to show the Project Activity is not financially attractive, it is necessary to prove:

CI – (PC + EPA) < CI – EPB,

Or

PC+EPA > EPB

As shown above,,

the Electricity Savings = EPB – EPA, which shows the reduction in power purchase from the Grid.

Then it is to show that

PC > Electricity Savings

And this is how to make the comparison in table format, as below in Table B4-4.

Table B 4-4 Comparative Analysis For Project Activty

	Project Activity without CDM Alternative 1	Baseline Scenario without Project Activity Alternative 2
Cash Inflow	0	0
Cash Outflow	PC 0	Electricity Savings 0

It can be seen from the table above, the table presentation is not a NPV analysis since it does not have all the cashflow components, including the impact of Electricity Savings which results a reduction of Electricity Purchase from the Grid to a lower level. If the PC can be shown to b greater than Electricity Savings, then the NPV analysis will also stand. The result of NPV calculation shows, for example, Tonglu Plant, the Project Cost (PC) is 130.45 million, which is greater than the Electricity Savings of 123.24 million in Alternative 2, by 7.21 million. And therefore, the Project Activity for Tonglu Plant is not financially attractive. The analyses for the other two plants lead to the same conclusion as shown in the table B4-5.

Table B4-5 The NPV of project activity (Unit: RMB million)

	Tonglu	Jiande	Guangde
Project Cost (Alternative 1)	-130.45	-128.44	-122.01
Electricity Savings (Alternative 2)	-123.24	-121.41	-112.72
Alternative 1-Alternative 2	-7.21	-7.03	-9.29

As described in Table B4-5, the NPV of Scenario 1 is less than Scenario 2.which means the Scenario 2 is more attractive than Scenario 1. And the project activity is still financially unattractive even if the variable parameters were chosen for the investment analysis, the calculation process can be referred to the attached spreadsheet.

From the identified Scenarios above it can be found that the scenario 2 is only one plausible baseline scenario. The baseline scenario is "**Continuation of import of equivalent electricity from ECPG**".

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 project uses the 'Tool for the Demonstration and Assessment of Additionality' (version 03), which is revised in EB 29, to demonstrate its additionality. The tool includes the following steps:

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

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

Alternatives have been defined as following:

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

Alternative 2: Continuation of equivalent import of electricity from East China Power Grid;

Alternative 3: Installation of a new thermal power plant

Sub-step 1b: Enforcement of applicable laws and regulations

Alternative 1: Proposed project activity not undertaken as a CDM project activity;

The alternative is consistent with prevailing laws and regulations and as such the project feasibility study was officially approved on the 9th January 2007(Tonglu), 18th May 2006(Jiande) and 31st August 2006(Guangde).

Alternative 2: Continuation of import of equivalent electricity from ECPG;

It is in compliance with all applicable legal and regulatory requirements. According to the regulation and policies currently governing the Chinese power market, the East China Power Network will have to guarantee power to meet the demand of the growing industrial and commercial sectors of the region.

Alternative 3: Installation of a new thermal power plant

As per Chinese power regulations, thermal power plants of less than 135MW[13] are prohibited. As the installed capacity is only 25.3MW which is less than 135MW, the construction and operation onethermal power plant does not comply with the legal and regulatory requirements.

[13] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, decree No. 2002-6.

From the analysis above, it can be found that alternative 1 and 2 are the alternative of the project activity will be discussed on the next step.

Step 2 Investment analysis

The purpose of this step is to determine whether the project activity is economically or financially attractive than other alternatives without additional revenue/funding, possibly from the sale of emission reductions (CERs). The investment analysis was conducted in the following steps:

Sub-step 2a: Determine appropriate analysis method

'Tools for the demonstration and assessment of additionality' suggest three analysis methods including simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the project will earn the revenues not only from the CDM incentive but also electricity sales, option I is not the appropriate method. Investment comparison analysis method is applicable to project whose alternatives are similar investment projects. The alternative baseline scenario of the project is continuation of electricity import from East China Power Grid rather than new investment projects. Therefore option II is not an appropriate method. The project will use benchmark analysis method based on the consideration that benchmark IRR of the cement industry is available.

Sub-step 2b: Benchmark Analysis Method (Option III)

According to the 'Tool for the Demonstration and Assessment of Additionality' (version 03), the benchmark indicator has to be equity IRR because there is only one investor for the project. With reference to "Project Economic Evaluation Methods and Parameters", the equity investment IRR (after tax) for cement industry accounts for 12%[14]. The project activity has adopted this benchmark rate in the following financial analysis.

Sub-step 2c: Calculation and comparison of financial indicators

(1) Basic parameters for calculation of financial indicators

Based on the feasibility study report of the project, basic parameters for calculation of financial indicators are shown in table B 5-1 (below):

Site	Parameter		Value
Tonglu County	Installed capacity		9 MW
	Estimated annual power supply		61,930MWh
	Project lifetime		20 years
	Total investment		RMB 59.63million
	Equity investment		RMB 17.86million
	Electrical tariff		0.302 RMB/KWh
	Tax rate	Value added tax	17%
		Income tax	25%[15]
		The urban construction and maintenance tax	7% of VAT[16]
		The additional educational levy	3% of VAT[17]

[14] The third edition of "Project Economic Evaluation Methods and Parameters", 2006,page 74

[15] http://news.xinhuanet.com/politics/2007-03/19/content_5866048.htm

[16] Provisional Regulation of the People's Republic of China on The Urban Construction and Maintenance Tax Refer No.: Guo Fa (1985) No. 19

[17] Provisional Regulations of the People's Republic of China on Additional Educational Levy. Refer No. Guo Fa (1986) NO.5017

AND Urgent Notice on Additional Educational Levy by State Department. Refer No. Guo Fa Ming Dian (1994) No.2

Jiande City	Installed capacity		7.5MW
	Estimated annual power supply		59,880MWh
	Project lifetime		20years
	Total investment		RMB 53.39million
	Equity investment		RMB 21.36million
	Electrical tariff		0.308 RMB/KWh
	Tax rate	Value added tax	17%
		Income tax	25%
		The urban construction and maintenance tax	7% of VAT
		The additional educational levy	3% of VAT
Guangde County	Installed capacity		8.8MW
	Estimated annual power supply		57,540MWh
	Project lifetime		20 years
	Total investment		RMB 59.13million
	Equity investment		RMB 29.57million
	Electrical tariff		0.297 RMB/KWh
	Tax rate	Value added tax	17%
		Income tax	25%
		The urban construction and maintenance tax	7% of VAT
		The additional educational levy	3% of VAT

Table B 5-1 Basic parameters from the feasibility study report

- Crediting period: 10 years
- Expected CER price: USD8 /tCO_2

(2) Comparison of IRR and NPV for the project and the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators (such as IRR and NPV) of the project are lower than the benchmark or in other words a negative NPV, the project is considered as financially unattractive.

Table B 5-2 Financial parameters of the project activity

Site	Parameters	IRR(against entity) Benchmark=12%	NPV(against entity) unit: million
Tonglu County	Without CDM	7.47%	-7.21
	With CDM	14.34%	3.37
Jiande City	Without CDM	8.07%	-7.03
	With CDM	13.73%	2.91
Guangde County	Without CDM	7.92%	-9.37
	With CDM	12.08%	0.18

Table B 5-2 shows the IRR of the project, with and without CDM revenues. Without CDM, the IRR of equity IRR is lower than the benchmark 12%. Therefore, the project is not financially attractive. With CDM, CERs revenue will significantly improve equity IRR, which exceed the benchmark. Thus, the project, without CDM revenue, can not be considered as financially attractive to investors.

The IRR determination reflects common practice in the Chinese Cement Industry. The investment decisions were taken based on IRR calculations adhering to the official guideline "Economic Assessment method and Parameters for Construction Project" (issued by National Development and Reform Commission of China). This guideline recommends the use of fixed input prices (for electricity tariffs and O& M costs) in the economic assessment of projects, due to high uncertainty of future input price development[18]

Nevertheless, the PDD includes below a hypothetical scenario whereby the impact of increasing electricity tariffs and O& M costs is discussed. In this scenario the IRR of the three projects remains below the financial hurdle rate of 12%.

From the statistical data over the time period, the PDD has used the combination of the highest annual increase in power tariff (4.2%) with the average annual increase for O&M costs (5.2%) to calculate IRR and NPV carries the analysis in an extremely conservative manner. The following table summarizes the scenario; the spreadsheet of calculation process will be submitted:

Table 5-3 The IRR and NPV when used the combination of the highest annual increase in power tariff with the average annual increase for O&M costs

Rate increase assumption	Tonglu		Jiande		Guangde	
	IRR	NPV (million)	IRR	NPV (million)	IRR	NPV (million)
Electricity Tariff (4.2%) O&M (5.2%)	10.34%	-2.84	10.37%	-3.13	10.72%	-3.25

The results show that the IRRs are lower than the benchmark with negative NPV. It means that the project activity is still financially unattractive even if the variable parameters were chosen for the investment analysis.

The O&M costs constitute for at least 65% of total cash outflows each year and therefore a marginal change in percentage would have a significant impact on both IRR and NPV, please refer to the table 2 below.

Table 5-4 the average annual O&M costs and annual cash outflows of project activity (Unit: million)

	Tonglu	Jiande	Guangde
The average annual O&M costs (a)	12.03	11.88	9.80
Annual cash outflows (b)	16.21	15.71	14.07
The ratio of annual O&M costs in cash outflows (a/b× 100%)	74.24%	75.62%	70.00%

The growth rate in salary, material costs, and water (together known as O&M costs) over the next 20 years will definitely escalate faster than electricity tariff as electricity tariff is a commodity under the intervention of the Chinese government. Based on the above analysis, the increase in O&M over the period tends to cancel out most of the increase in electricity tariff which has a minimum effect on the IRR. This also explains why the PDD has used fixed input parameters when preparing for the investment analysis.

Sub-step 2d: Sensitivity analysis

[18]The guide to the price system, Chapter 1.9, page 84 states: "Regarding the price of inputs and outputs, the increase rate is highly unpredictable for the relatively long operating period and the reliability of prediction is hardly guaranteed. Therefore, the regular practice is to predict the price in initial operation and this price will be fixed in the whole operation period

The objective of sensitivity analysis is to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in support of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

For the project, the following parameters were selected for the sensitive analysis
(1) Total investment
(2) Annual O&M costs
(3) Power Output
(4) Electricity purchase price.
When the equity IRR of the project activity (after tax) increases to the benchmark (12%) level, the above four financial indicators vary to different extent (see table B 5-3).
Table B 5-5 variety of the financial indicators when the equity IRR of the project activity equal to the benchmark

	Tonglu	Jiande	Guangde
Total investment (%)	-22.65	-23.10	-25.60
Annual O&M costs (%)	-15.48	-15.85	-24.75
Annual electricity supply (%)	+10.20	+10.49	+14.55
Grid tariff (%)	+10.20	+10.49	+14.55

It can be seen from table B 5-3 that when the total investment decreases 22.65%, the project achieve benchmark. However, it is impossible to implement the project if reducing the total investment by at least 22.65%, due to a fact that the price index of capital goods has increased 3.5% on year-on-year basis in 2006 and estimated to raise around 2%-3% in 2007[19](official statistics from the Price Office of NDRC) .

As indicated by the above table, the project would be taken as financially attractive when the annual O&M costs decrease 15.48%; However, the salary to the working staff increased 12.8% and 12.7% (excluding inflation) in 2005 and 2006[20] (according to the official statistics from Ministry of Labour and Social Security), therefore, it is unlikely to decrease the annual O&M costs by such percentage.

When annual electricity supply increases 10.20%, the project achieves benchmark, but there is no possibility to achieve this, because it would require an increase of annual operation time to at least 8100 hours which is impossible to the three plants the operation time of which is less-than 7800h in last two years. In the most recent two years, the operation time of three plants is less than 7800h.

Based on the above analysis, without support from CERs income, the project is not economically attractive, the project entity would not invest in the project and would continue to purchase power from ECPG and would use their free capital to invest in their core business, cement production.

Step 3 Barrier analysis
Sub-step 3a: Identify Barriers
The project entity faces various barriers in the construction of the project.
I. Investment Barriers
The total investment of the project activity is RMB 172.34 millions which means a great amount of funds

[19] http://www.dcement.com/Article/200701/40878.html
http://www.ntwj.gov.cn/onews.asp?id=502
[20] http://www.gongshang120.com/readArticle.asp?id=1452
http://www.molss.gov.cn/gb/news/2007-05/18/content_178167.htm

to the project entity and it will inevitably be confronted with different barriers in financing and also in the decision making.

Under the dual pressure of the market competition and the macro-control economic policy of the government, all the three plants of the project entity, Tonglu Cement Plant, Jiande Cement Plant and Guangde Cement Plant, were in red financially in 2006. Among them, Tonglu and Jiande cement plants were also in red in 2005. Besides, the project entity is suffering from the high debt ratio in the two years. The reason of the high debt ratio is the heavy bank loan for the new clinker lines which were built early this century when the cement industry was in a hot market at that time. A great deal of interests has to be paid to the bank every year and the bankers were hesitated to provide new loans to the project entity.
In addition, the project entity is neither a domestic listed company nor an internationally listed company. Therefore, it has no access to capital markets for the funds needed for the WHR projects.

II. Technological Barriers

After a long and careful consideration, the project entity decided to adopt domestic power generation technology and equipments in the project activity. Obviously, the domestic technology using low-temperature industrial waste heat for power generation has made much progress in recent years. However, there are still several major technological barriers in comparison to the advanced foreign ones.

The advanced foreign technology and equipments have higher generating efficiency, lower operating costs and can run more steadily, but the unit investment (In RMB/kW) is much higher than that of the domestic ones (About 60% higher)[21]. Facing the serious investment barriers mentioned above, the project entity had to put the budget control in the first consideration. Domestic equipments with lower price are the logical choice for the project entity that as a result has had to face the various technological barriers related to the domestic equipments.

A typical barrier of this kind is the dust content in exit gases from SP during clinker production. The dust content is very high and the dust particles are sticky at high temperature. This makes waste heat recovery process very difficult as a large amount of dust collects at the heat exchanger surfaces. The heavy dust may lead to complete choking of the heat exchanger, and may even induce the closing down of the kiln[22]. It was in early Oct, 2007 in Jiande Cement Plant, the AQC boiler abraded heavily and the pipelines of the AQC boiler were broken in the first month of the test running period just because of the heavy dust. The project entity suffered a lot from the great costs for the repair of the equipments and the losses from the non-operation.

Lack experience in power generation
What is more, the project entity, which is a cement production company, lacks Power generation experience by utilizing industrial waste heat. To meet the demands for skilled staffs, the project entity has made a great deal of efforts both in employing and training. All the staffs who will work in the waste heat power station have finished their training courses in similar cement plants. All these mean extra costs to the project activity.

Furthermore, there are great differences between cement production and power generation from waste heat. The successful operation of WHR captive power generation stations requires the cooperation/collaboration of these two teams which will undoubtedly increase the difficulty of the

[21] Zhang Yi. The comparison of the waste heat for power generation between the domestic and foreign equipment. China Building Material. 2005, 6: 43~46;
[22] Tang Jinquan, Chang Zigang. Several Problem of Low-temperature Waste Heat Recovery for Power Generation in Cement Kiln. Cement, 2005, 4: 5~10;

operation of the project activity and its operating costs.

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):
The alternative 2 (Continuation of import of equivalent electricity from East China Power Grid) would not be prevented by the above mentioned barriers. The alternative 2 does not need the huge investment of the project activity thus no barriers would be aroused from the investment. The alternative 2 does not need the construction of the captive power plant thus would not face the various technological barriers from the construction and operation. So the barriers identified in Sub-step-3a would not prevent the continuation of importing electricity from East China Power Grid.

Step 4 Common practice analyses
Sub-step 4a: Analyze other activities similar to the proposed project activity
The numbers of cement plants in Zhejiang province and Anhui province reach 237[23] and 175[24] by the end of 2006. According to the attainable information by the end of 2006[25], there are 9 cement companies in Zhejiang province installed waste heat utilization boilers for power generation, but only 2 cement companies are of a similar scale and used the similar technology. There is only one cement company (Anhui Ningguo Cement Co. Ltd) in Anhui province which has installed WHR system by the end of 2006. The information of the three companies is shown in Table 5-4.
Table 5-4 the information of the three similar projects in Anhui province and Zhejiang province

Name of the company	scale	Facilitating circumstances	Project status
Anhui province			
Anhui Ningguo Cement Co. Ltd.	4,000t/d	Japanese NEDO granted equipment	In operating
Zhejiang Province			
Shenhe Cement Plant	2,500 t/d	Supported by GEF	In operating
Zhongxinyuan Cement Plant	2,500 t/d	Supported by Zhejiang Province saving-energy fund	In operating

Sub-step 4b: Discuss any similar options that are occurring:
Zhejiang Shenhe Cement Co. Ltd, Zhongxinyuan Cement Plant and Anhui Ningguo Cement Co. Ltd did not face the barriers like the project activity. Zhejiang Shenhe Cement Co. Ltd got the support from GEF[26]. Zhongxinyuan Cement Plant got the support of Zhejiang Province saving-energy fund[27]. Anhui Ningguo Cement Co. Ltd was supported by NEDO of Japan and utilizes imported Japanese equipment[28]. At present, ten Cement companies in Zhejiang province and Anhui province are planning to install the waste heat utilization projects which have been taken as CDM project, and have also obtained the approval of Chinese DNA[29].

At the beginning of 2005, the cement industry in China faced the dual pressure of the market competition and the macro-control economic policy of the government. And at this time, the project developer (Shanghai Chuanji Investment Management Co., Ltd) introduced the concept of CDM to the project

[23] http://www.dcement.com/Article/200709/59045.html
[24] http://www.dcement.com/anhui/Index.asp
[25] The letter from Zhejiang cements association to Jiande plant.
[26] http://news.xinhuanet.com/newscenter/2005-07/21/content_3249773.htm
[27] http://news.hz66.com/main/news/hz/qx/2006121508571094.htm
[28] http://green.cei.gov.cn/doc/LY31/200204192475.htm
[29] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1536.pdf

proponent. For the huge investments for the WHR projects, the project proponent started to consider the help from CDM. In December 2005, the FSR of the project was finished and demonstrated that the project activity lacked financial attraction[30]. The project proponent signed the development contract with the CDM developer in January 2006[31] and signed the TermSheet with the buyer in Sep 2006[32]. And the bank agreed to offer loans in August 2006 due to the fact that the project was being developed as a CDM project[33]. Then the project started on 30 October 2006. This demonstrates that the incentive from CDM was considered prior to the start date of the project activity.

In conclusion, the proposed project activity passes all the necessary steps of additionality analysis, and is additional. In the absence of the proposed project activity, the project entity will continue importing electricity from the regional grid, and the power plants (coal-fired) that provide this electricity will keep on discharging carbon dioxides into the air.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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According to the approved consolidated baseline methodology AM0024 (version 01), Calculate the emissions reductions of the project activity are calculated as below:

$$ER_y = EB_y - PE_y \qquad \text{(B. 6-1)}$$

where:

EB_y is the baseline emissions in year y, expressed in tCO2.

PE_y is the project emissions due to possible fuel consumption changes in the cement kilns, of the cement works where the proposed project is located, as a result of the project activity in year y, expressed in tCO_2.

Step 1 Determination of baseline emissions:

The baseline scenario applicable to the project activity is “import of electricity from the grid”. Therefore, the baseline emission factor for displaced electricity has been calculated in accordance with Version 06 of the methodology ACM0002.

According to the latest rules to project boundary of version 06 of ACM0002, the project entity can:

1) Use the delineation of grid boundaries as provided by the DNA of the host country if available; or
2) Use, where DNA guidance is not available, the following definition of boundary.

According to the file[34] published by China NDRC in Aug 9, 2007, the East China Power Grid is one of the seven regional grids of China. The project entity would import electricity from the East China Power Grid in the absence of the project activity.Thus, Central China Power Grid has been selected as the project boundary.

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[30] FSR, TCDRI, 2005,Page 57
[31] Formal development contract between project entity and project developer, 2006.
[32] TermSheet between project entity and the buyer, 2006
[33] The letter from Hangzhou Commerce Bank to project entity, 2006.
[34] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

The electricity baseline emission factor (EF_y) is calculated as a combined margin (CM) as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$).

The steps of baseline emissions calculation as follows:

Sub-Step 1 **Calculate the Operating Margin Emission Factor(s) (** $EF_{OM,y}$ **)**

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.
Each method is described as below.

Method (a) Simple OM

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount grid generating output. Among the total electricity generations in 2001-2005 of the East China Power Grid where the project connected into, the low-cost/must run resources constitute less than 50% of total amount grid generating output. The detailed information could be seen in Table B 6-1.

Table B 6-1 Annual electricity generation of East China Power Grid 2001-2005

year	Electricity generation (GWh)			Proportion of low cost and must run resources. %
	Total generation	Thermal power	Hydropower etc.	
2001[35]	326,647.8	289,436.7	37,211	11.39
2002[36]	367,443	324,195.1	43,247.9	11.77
2003[37]	429,327	382,112	47,015	11.0
2004[38]	488,010	440,411	47,598	9.75
2005[39]	574,467	505,855	68,62	11.94

Method (b) Simple adjusted OM

The simple adjusted OM needs the annual load duration curve of the grid. As the detailed data of dispatch of East China Power Grid and power plants are often taken as confidential information, those data are not publicly available. It is difficult to adopt Method (b) for the calculation of the baseline emission factor of operating margin ($EF_{OM,y}$).

Method (c) Dispatch data analysis OM

Dispatch data analysis OM should be the first methodological choice if the dispatch data are available, because the method can truly reflect the substitutable relationship between the amount of electricity output from power plants of the baseline grid and from the project activity and the emission reductions generated. However, Method (c) cannot be adopted for the project because of unavailability of the dispatch data of the East China Power Grid.

Method (d) Average OM

Method (d) can be used only when low-cost/must run resources constitute more than 50% of total amount of grid output. According to the calculation of Table B 6-1, the project doesn't apply to the method, so it is not suitable for the project.

Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of Operating

[35] China Electric Power Yearbook 2002 P 625
[36] China Electric Power Yearbook 2003 P 593
[37] China Electric Power Yearbook 2004 P 709
[38] China Electric Power Yearbook 2005 P 485
[39] China Electric Power Yearbook 2006 P 572

Margin ($EF_{OM,y}$) for the project.

In accordance with ACM0002/Version06, the Simple OM emission factor ($EF_{OM,y\,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. The formula of $EF_{OM,\sin ple,y}$ calculation is as below:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad \text{(B. 6-2)}$$

Where:

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

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports[40] 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 CO_2 emission coefficient $COEF_{i,j,y}$ is then obtained from the following equation as

$$COEF_i = NCV_i \times EF_{CO2,i} \times OXID_i \qquad \text{(B. 6-3)}$$

Where:

NCV_i is the net calorific value per ton of standard coal equivalent (GJ/tce) ;

$OXID_i$ is the oxidation factor of coal;

$EF_{CO2,i}$ is the CO_2 emission factor per GJ of coal (tCO_2/GJ).

According to the suggestions by EB[41], if without plant data, the aggregated generation/power supply, coal consumption of generation/power supply and emission coefficient of fuel types of each plant could be weighted, and the average emission factor for the grid for each fuel type can be used to estimation of OM emission coefficient.

Therefore, in formula (B.6-2):

$COEF_{i,j}$ is the CO_2 emission coefficient of fuel *i* consumed (tCO_2e/mass or volume unit of the fuel),

$GEN_{j,y}$ is the electricity (MWh) delivered to East China Power Grid,

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by years *y* of East China Power Grid,

j refers to East China Power Grid, not including low-operating cost and must-run power plants.

The Operating Margin Emission Factor ($EF_{OM,y}$) could be calculated according to above equation and data of the East China Power Grid in 2003-2005 in Annex 3. The result is:

$EF_{OM,y}$ = 0.9416 tCO_2/MWh

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40 As per ACM0002 (version06), an import from a connected electricity system should be considered as one power source

41 http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

Sub-Step 2.Calculation of the Build Margin Emission Factor ($EF_{BM,y}$ ***)***

The Build Margin Emission Factor ($EF_{BM,y}$) is calculated according to ACM0002/Version06:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \text{(B. 6-4)}$$

Where

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

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

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

Calculate the Build Margin emission factor $EF_{BM,y}$ ex ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either:

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

As per the clarifications are given by EB[42], the project activity can:

1) Use of capacity additions during last 1-3 years for estimating the build margin emission factor for grid electricity.
2) Use of weights estimated using installed capacity in place of annual electricity generation to calculate BM emission coefficient.
3) 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.

As the limit of data obtained for calculation the proportion of Coal-fired, Gas-fired and oil-fired power capacity to the total power capacity in East China Power Grid, this PDD will adopt the following method to calculate BM emission factor:

① Use the data of fuel consumption in the latest year to calculate the proportion of the GHGs emissions of Coal-fired, Oil-fired and Gas-fired resources to the total GHGs emissions, the proportion is given by:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad \text{(B.6-5)}$$

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

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

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{(B.6-7)}$$

Where:

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

$COEF_{i,j,y}$ 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*,

② 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, and the above data to calculate the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad \text{(B.6-8)}$$

where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ the emission factor of efficiency level of Coal-fired, Oil-fired and Gas-fired respectively of the best technology commercially available.

③ Use the data obtained in ② and the increased percentages of thermal power to calculate Build Margin emission factor of East China Power Grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad \text{(B.6-9)}$$

Where,

CAP_{Total} is the total newly added capacity of power capacity,

$CAP_{Thermal}$ is the newly added capacity of thermal power.

The Building Margin Emission Factor ($EF_{BM,y}$) is calculated according to above data:

$EF_{BM,y}$ =0.8672 tCO_2/MWh

The BM emission factor ($EF_{BM,y}$) is calculated ex ante and needn't to be updated ex post.

Sub-Step 3 Calculation of the Baseline Emission Factor (EF_y ***)***

Based on ACM0002/Version06, the baseline emission factor EF_y was calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$).

$$EF_y = W_{OM} \times EF_{OM,y} + W_{BM} \times EF_{BM,y} \quad \text{(B. 6-10)}$$

Default weights of 50% as specified in ACM0002/Version06 are employed in this project.

$W_{OM} = W_{BM} = 0.5$

Hence $EF_y = 0.5 \times EF_{OM,y} + 0.5 \times EF_{BM,y}$

$EF_y = 0.5 \times 0.9421 + 0.5 \times 0.8672$

=0.9044 (tCO_2/MWh)

The above calculation is shown as follows, and this calculation is done **ex-ante**, and needn't to be update ex-post.

Table B 6-3 Calculation of baseline emission factors

OM *tCO_2e/MWh*	*BM* *tCO_2e/MWh*	*CM* *tCO_2e/MW）*
A	*B*	*C=A×0.5+B×0.5*
0.9416	*0.8672*	*0.9044*

Sub-Step 4. Calculation of the Baseline Emissions (BE_y)

According to ACM0002 (Version06), the baseline emissions (BE_y) are calculated as:

$$BE_y = EG_y \times EF_y \quad \text{(B. 6-11)}$$

Where:

BE_y is the baseline emission of East China Power Grid in year y,

EG_y is the amount of power generated by the project and supplied to the grid,

EF_y is the emission factor in year y

As per the Feasibility Report of the project activity and the baseline emission factor as calculated in step 6.1-3., baseline emissions are listed in table B 6-4.

Table B 6-4 the baseline emissions of the project activity

site	Tonglu County	Jiande City	Guangde County	Total
Power displaced by the project activity (MWh)/a	61,930	59,880	57,540	179,350
The expected annual baseline emissions (tCO_2e）	56,009	54,155	52,039	162,203

Step 2 Determinations of Project Emissions

Project emission (PEy) is the difference in CO2 emissions from use of fossil fuel in the clinker making process in cement manufacturing unit, where the project is being implemented, before and after the project implementation.

PEy, is determined as following

$$PE_y = (EI_{p,y} - EI_B) * O_{clinker,y} * COEF_{fuel,y} \quad \text{(B.6-12)}$$

where:

EI_B is the pre-project energy consumption per unit output of clinker in TJ/ton of clinker produced (i.e. measured before the Project activity goes into operation).

$EI_{P,y}$ is the ex-post energy consumption per unit output of clinker for given year, y, in TJ/ton of clinker produced.

$COEF_{clinker,y}$ is the carbon coefficient (tCO2 / TJ of input fuel) of the fuel used in the cement works in year y to raise the necessary heat for clinker production.

$O_{clinker,y}$ Is the clinker output of the cement works in a given year y.

$$EI_B = \frac{F_B}{O_{clinker,B}} \quad \text{(B.6-13)}$$

where:

F_B is the average annual energy consumption, expressed in TJ, of clinker making process

prior to the start of operation of the project activity. At least one full year of data should be used.
If a year's worth of pre-Project Activity data is not available, then the Project Developer should outline the plan for ensuring conservativeness based on a combination of the ex-ante design estimate of energy consumption plus available measured data.

$O_{clinker,B}$ is the average annual output, expressed in tonnes, of clinker prior to the start of operation of the project activity. At least one full year of data should be used.

$$EI_{P,y} = \frac{F_{P,y}}{O_{clinker,y}} \qquad \text{(B.6-14)}$$

where:

$F_{P,y}$ is monitored annual energy consumption in a year y, expressed in TJ, of clinker making process;

$O_{clinker,y}$ is monitored annual output, expressed in a year y, in tonnes of clinker.

$$COEF_{Fuel,y} = (EF_{CO2,fuel,y} * OXID_{fuel,y}) / NCV_{fuel,y} \qquad \text{(B.6-15)}$$

where:

$NCV_{fuel,y}$ is the net calorific value (energy content) per mass or volume unit of a fuel used in clinker making process in year y;

$OXID_{fuel,y}$ is the oxidation factor of the fuel , expressed as percentage;

$EF_{CO2,fuel,y}$ is the CO2 emission factor per unit of energy of the fuel used in year y, expressed as tCO2 per unit mass or volume unit.

The ex-ante estimate of PE_y can be calculated using the following formula:

$$PE_y = \sum \Delta EI_i * \left[O_{clinker,i}\right] * COEF_{fuel,i} \qquad \text{(B.6-16)}$$

where:

i is the index for each clinker production line in the cement plant where the project activity is being implemented;

ΔEI_i is the ex-ante design estimate of the change in the energy consumption of each clinker kiln in TJ / ton Clinker, due to project implementation.

The calculation process of PE_y is in Annex 3. Clinker calcinations are a predetermined production process; it is can not be changed arbitrarily. Clinker production requires a predetermined blend of raw materials (limestone and coal) to produce a tonne of clinker, the balance of these raw materials can not be adjusted and therefore the coal requirement per tonne of clinker produced does not change, so the waste heat is therefore exactly that and electricity production cannot be increased by increasing the quantity of coal used to produce clinker. As such there will be no project emissions from the project activity, and the PE_y of Jiande WHR power station which has operated for 2 months is -1,429tCO_2e. So the PE_y of project activity is estimated as zero and will be monitored in whole fixed crediting period.

Step 3 Determination of Leakage

According to the methodology (AM0024), the project activity could lead to the following leakages:

Construction and fuel handling: the main indirect emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). Corresponding emissions are negligible and can therefore be ignored.

Step 4 Determinations of Emission Reductions
Emission reductions due to the project activity during year y are calculated as follows:

$$ER_y = BE_y - PE_y$$

ER_y are the emission reduction by the project activity in year *y*, expressed in tCO_2.
EB_y are the baseline emissions in year y, expressed in tCO_2.
PE_y are the project emissions due to possible fuel consumption changes in the cement kilns, of the cement works where the proposed project is located, as a result of the project activity in year *y*, expressed in tCO_2.

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

>>

Data / Parameter:	*Installed capacity of East China Power Grid*
Data unit:	*MW*
Description:	*Installed capacity of East China Power Grid in 2003-2005*
Source of data used:	*China Electric Power Yearbook (2004- 2006)*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Deriving from official statistical data*
Any comment:	*To calculate the Build Margin emission factor*

Data / Parameter:	EG_{GEN}
Data unit:	*GWh*
Description:	*Power generation from East China Power Grid in 2003-2005*
Source of data used:	*China Electric Power Yearbook (2004-2006)*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Deriving from official statistical data*
Any comment:	*To calculate percent of low-cost/must run resources to total amount of grid power generation and Operation Margin emission factor*

Data / Parameter:	*Thermal power plant self-use rate*
Data unit:	*%*
Description:	*Thermal power plant self-use rate of East China Power Grid in 2003-2005)*
Source of data used:	*China Electric Power Yearbook (2004-2006)*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of	*Deriving from official statistical data*

measurement methods and procedures actually applied :	
Any comment:	*To calculate Operation Margin emission factor*

Data / Parameter:	$F_{i,j}$
Data unit:	$10^4 t$ or $10^8 m^3$
Description:	*Amount of fuels consumed by the power sources delivering electricity to East China Power Grid*
Source of data used:	*China Energy Statistical Yearbook (2004-2006)*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Deriving from official statistical data*
Any comment:	*To calculate the Operation Margin emission factor*

Data / Parameter:	NCV_i
Data unit:	$TJ/10^4 t$, $10^8 m^3$, $10^4 tce$
Description:	*It is the net calorific value (energy content) per mass or volume unit of the fuel consumed by the power sources delivering electricity to East China Power Grid.*
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Deriving from official statistical data*
Any comment:	*To calculate the Operation Margin emission factor*

Data / Parameter:	$OXID_i$
Data unit:	*%*
Description:	*The oxidation rate of the fuel consumed by the power sources delivering electricity to East China Power Grid.*
Source of data used:	*2006 IPCC Guidelines: page 1.23*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Deriving from official statistical data*
Any comment:	*To calculate the Operation Margin emission factor*

Data / Parameter:	$EF_{C,i}$
Data unit:	*%*
Description:	*Carbon emission factor of the fuel consumed by the power sources delivering*

	electricity to East China Power Grid.
Source of data used:	*2006 IPCC Guidelines: page 1.23*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*Default values*
Any comment:	*To calculate the Operation Margin emission factor*

Data / Parameter:	F_B
Data unit:	*TJ*
Description:	*Average annual energy (fuel) consumption of clinker making process prior to project implementation.*
Source of data used:	*Monitoring record.*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$O_{clinker,B}$
Data unit:	*Ton*
Description:	*Average annual production of clinker prior to project implementation.*
Source of data used:	*Monitoring record.*
Value applied:	*Refer to Annex 3*
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	E_{cement}
Data unit:	*MWh*
Description:	*Electricity consumption of cement works prior to project*
Source of data used:	*Monitoring record.*
Value applied:	Tonglu County: 498GWh (2004-2007); Jiande City: 199GWh (2004-2006); Guangde County: 202GWh(2005-2006)
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

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

>>
The emission reductions of the project activity will be calculated ex-ante as:
Step 6.3-1 Estimated anthropogenic emissions by sources of greenhouse gases of the baseline
Table B 6-5 the baseline emissions

Site	Tonglu County	Jiande City	Guangde County	Total
The net power supply （MWh）	61,930	59,880	57,540	179,350
Baseline Emissions （tCO_2e）	56,009	54,155	52,039	162,203

Step 6.3-2 Estimate of project emission
The project emission is ex-ante estimated as zero in section B6.1.

Step 6.3-3 Estimate leakage
As per AM0024 (version 01), the leakage is not considered.

Step 6.3-4 Estimate emission reductions of the project activity
The emission reduction of the project activity in the proposed year *y* is the difference between the baseline emission (BF_y) and the project emission (PF_y).

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

>>
Table B 6.4-1 the ex-ante estimation of emission reductions in Tonglu County

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)***
09/2008-12/2008	*0*	*18,670*	*0*	*18,670*
2009	*0*	*56,009*	*0*	*56,009*
2010	*0*	*56,009*	*0*	*56,009*
2011	*0*	*56,009*	*0*	*56,009*
2012	*0*	*56,009*	*0*	*56,009*
2013	*0*	*56,009*	*0*	*56,009*
2014	*0*	*56,009*	*0*	*56,009*
2015	*0*	*56,009*	*0*	*56,009*
2016	*0*	*56,009*	*0*	*56,009*
2017	*0*	*56,009*	*0*	*56,009*
01/2018-08/2018	*0*	*37,339*	*0*	*37,339*
Total tonnes of CO_2e	***0***	***560,090***	***0***	***560,090***

Table B 6.4-2 the ex-ante estimation of emission reductions in Jiande City

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)*
09/2008-12/2008	*0*	*18,052*	*0*	*18,052*
2009	*0*	*54,155*	*0*	*54,155*
2010	*0*	*54,155*	*0*	*54,155*
2011	*0*	*54,155*	*0*	*54,155*
2012	*0*	*54,155*	*0*	*54,155*
2013	*0*	*54,155*	*0*	*54,155*
2014	*0*	*54,155*	*0*	*54,155*
2015	*0*	*54,155*	*0*	*54,155*
2016	*0*	*54,155*	*0*	*54,155*
2017	*0*	*54,155*	*0*	*54,155*
01/2018-08/2018	*0*	*36,103*	*0*	*36,103*
Total tonnes of CO_2e	***0***	***541,550***	***0***	***541,550***

Table B 6.4-3 the ex-ante estimation of emission reductions in Guangde County

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)*
09/2008-12/2008	*0*	*17,346*	*0*	*17,346*
2009	*0*	*52,039*	*0*	*52,039*
2010	*0*	*52,039*	*0*	*52,039*
2011	*0*	*52,039*	*0*	*52,039*
2012	*0*	*52,039*	*0*	*52,039*
2013	*0*	*52,039*	*0*	*52,039*
2014	*0*	*52,039*	*0*	*52,039*
2015	*0*	*52,039*	*0*	*52,039*
2016	*0*	*52,039*	*0*	*52,039*
2017	*0*	*52,039*	*0*	*52,039*
01/2018-08/2018	*0*	*34,693*	*0*	*34,693*
Total tonnes of CO_2e	***0***	***520,390***	***0***	***520,390***

Table B 6.4-4 the ex-ante estimation of emission reductions of the project activity

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)*
09/2008-12/2008	*0*	*54,058*	*0*	*54,058*
2009	*0*	*162,203*	*0*	*162,203*
2010	*0*	*162,203*	*0*	*162,203*
2011	*0*	*162,203*	*0*	*162,203*
2012	*0*	*162,203*	*0*	*162,203*
2013	*0*	*162,203*	*0*	*162,203*
2014	*0*	*162,203*	*0*	*162,203*
2015	*0*	*162,203*	*0*	*162,203*
2016	*0*	*162,203*	*0*	*162,203*
2017	*0*	*162,203*	*0*	*162,203*
01/2018-08/2018	*0*	*108,135*	*0*	*108,135*
Total tonnes of CO_2e	***0***	***1,622,030***	***0***	***1,622,030***

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$NCV_{fuel,y}$
Data unit:	TJ/ton
Description:	Calorific Value of fuel used in Clinker Production lines
Source of data to be used:	Monitoring record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$F_{P,y}$
Data unit:	TJ
Description:	Average annual energy (fuel) consumption of clinker making process after project implementation

Source of data to be used:	Monitoring record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement and calculation.
QA/QC procedures to be applied:	
Any comment:	The Quantity of consumption ($Q_{fuel,y}$) and Calorific Value of fuel ($NCV_{fuel,y}$) will be measured and used to calculate $F_{P,y}$ as below: $F_{P,y} = Q_{fuel,y} \times NCV_{fuel,y}$

Data / Parameter:	$O_{clinker,y}$
Data unit:	ton
Description:	Average annual production of clinker after project implementation
Source of data to be used:	Monitoring record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EG_{CP,y}$
Data unit:	MWh
Description:	Quantity of electricity supplied to cement plant
Source of data to be used:	Monitoring record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Tonglu County: 61,929 MWh; Jiande City: 59,880 MWh; Guangde County: 57,540 MWh
Description of measurement methods and procedures to be applied:	Direct measurement
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$OXID_{fuel,y}$
Data unit:	%
Description:	Oxidation ratio of fuel used in Clinker Production
Source of data to be used:	2006 IPCC Guidelines: page 1.23
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%
Description of measurement methods and procedures to be applied:	Deriving from official statistical data
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EF_{CO2,fuel,y}$
Data unit:	tCO_2/ton
Description:	Emission factor of fuel used in Clinker production.
Source of data to be used:	Monitoring record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement and calculation.
QA/QC procedures to be applied:	The carbon content of fuel ($EF_{C,fuel,y}$) will be measured and used to calculate $EF_{CO2,fuel,y}$ as below: $EF_{CO2,fuel,y} = EF_{C,fuel,y} \times 44/12$
Any comment:	

B.7.2. Description of the monitoring plan:

>>
The baseline scenario of the project activity has been identified in accordance with AM0024 as to continue import the equivalent amount of electricity from ECPG. Therefore, the monitoring plan was designed as required by AM0024.

1 Guideline

Monitoring plan is a guide on the arrangement of monitoring tasks and schedules. Monitoring personnel should carry out monitoring activities in accordance with the monitoring plan and ensure effective monitoring. The monitoring plan should ensure that monitoring information is real and measurable so as to provide DOE with real, reliable and transparent emission reduction calculation data. The monitoring planning should also ensure that the emission reductions are real and solid to CERs buyers.

2 Monitoring

The main contents of the monitoring:

- $EG_{CP,y}$ Quantity of electricity supplied to cement plant;
- $O_{clinker,y}$ Average annual production of clinker after project implementation;
- $F_{P,y}$ Average annual energy (fuel) consumption of clinker making process after project implementation;
- $NCV_{fuel,y}$ Calorific Value of fuel used in Clinker Production lines; $EF_{CO2,fuel,y}$ Emission factor of fuel used in Clinker production.
- The Quantity of consumption ($Q_{fuel,y}$) and Calorific Value of fuel ($NCV_{fuel,y}$) will be measured and used to calculate $F_{P,y}$ as below:

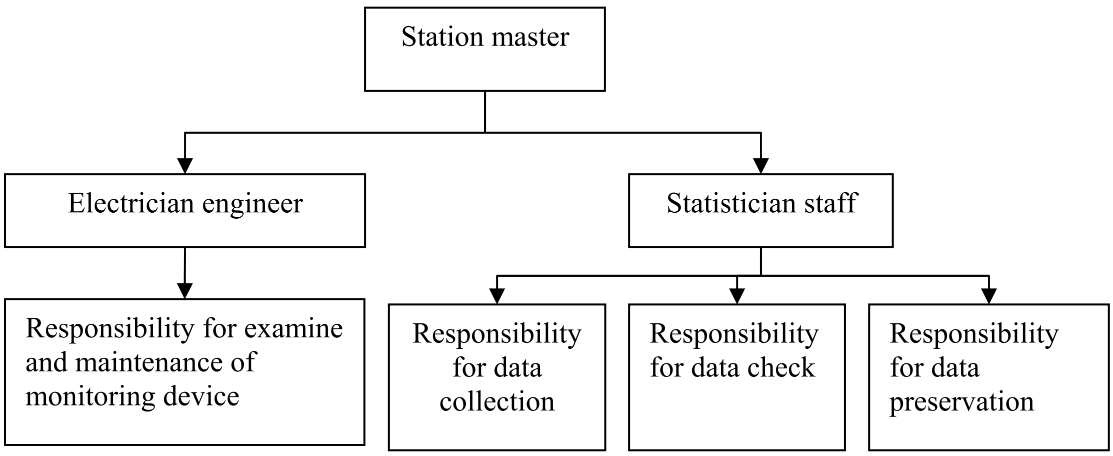
  $$F_{P,y} = Q_{fuel,y} \times NCV_{fuel,y}$$

  The carbon content of fuel ($EF_{C,fuel,y}$) will be measured and used to calculate $EF_{CO2,fuel,y}$ as below:

  $$EF_{CO2,fuel,y} = EF_{C,fuel,y} \times 44/12$$

3 Management system

The power station will set up a complete data management system, and the structure is demonstrated in the following graph:



4 Monitoring device and its installation

The meter(s) used to measure the Electricity Generated, Auxiliary Electricity by the project and Electricity supplied to cement plant will be in accordance with the National Guidelines（DL/T448-2000 version） for accuracy and reliability. The meters accuracy rate shall be 1.0. The meters will be maintained by the project entity according the National Guidelines（DL/T448-2000 version）.

The quantity of fuel consumption and clinker production will be measured by the electric balance; the data of fuel's calorific Value will be measured by the heat measuring equipment; the Emission factor of fuel will be measured according the National Guidelines (GB483-87). The electric balance and heat measuring equipment will be installed and maintained according the Operation Explanation.

5 Data collection and calculation

- The calculation of expected emission reductions will accord to quantity of electricity supplied to cement plant. The difference between quantity of electricity generated and quantity of electricity consumed by the project activity will be the back-up.

- The quantity of fuel consumption and clinker production from the monitoring record of project entity will be used to calculate.
- The data of fuel's calorific Value and emission factor from the record of lab will be used to calculate.
- The monitoring records of project entity will used for verification by DOE.

6 Calibration

Calibration will be carried out according the National standard (JJG596-1999) by the independent and authoritative organizations, Bureau of Quality and Technical Supervision in Tonglu County, Bureau of Quality and Technical Supervision in Jiande County and Bureau of Quality and Technical Supervision in Guangde County after which the meters are sealed. The frequency of the calibration will be once a year at least.

The relevant instruments should be calibrated, repaired and replaced if the reading error of instruments exceeds the permitted error range. And meter inspections are carried out with all parties to the meter reading being present to witness the reading.

The electric balance and heat measuring equipment will be calibrated by project entity according to the Operation Explanation. The equipments used to measure the Emission factor of fuel will be calibrated by the local Bureau of Quality and Technical Supervision.

7 Recording and preservation of relevant data

The monitoring data will be daily recorded, and then saved in the video disc. The writing of monitoring data must be standard and can not be optionally altered. If the monitoring data assuredly need be corrected, it will be modified after being approved by the vice power station master. The person who modified the monitoring data must make a signature in the place where monitoring data will be modified. In reference column, the reason why the monitoring data are modified and modifying data will be written, and the signature also will be made.

The authenticity, veracity, timeliness and standardization of the monitoring data should be checked by the vice power station master. If something wrong is found, it will be corrected immediately. Based on daily monitoring report, the menstrual monitoring report will be formed. And it will be submitted to the power station master, who will verify this menstrual monitoring report.

All monitoring data will be preserved throughout the whole 10 years crediting period and the following two years. Necessary back-up of monitoring data will be done at regular intervals.

8 Quality control system for monitoring data

Once the reading error of instruments exceeds the permitted error range or the instrument is found to be malfunctioning, the project entity should inform the related bureau of quality and technical supervision, and the following action should be taken under the local bureau of quality and technical supervision: (1) the measurement data of the meter that need be repaired, calibrated or replaced should be copied; (2) the project entity was responsible for examining for the meters, and the local bureau of quality and technical supervision was responsible for detection, calibration and lead sealing of the meters.

Under normal condition, the project entity was responsible for operation and maintenance of the meters in the WHR captive power stations.

9 Training of relevant personnel

In order to ensure the proper installation and smooth-running of the WHR captive power station, the project entity has planned to invite technical and management personnel for construction and operation of the WHR captive power station. Plans were also made to train the staffs that are mostly recruited from the cement plant and know little about the WHR power station.

Before the WHR captive power stations start operating, personnel related to management, operation and maintenance of the power station will be sent for a two-month training course to a power company. All the trainees will take a test at the end of their training, those who passed it will receive qualification certificate and those who didn't will have to be retrained and retested, and in case he fails the test again, he will not be qualified for positions in the power station.
After the WHR captive power stations become operating, the project entity will invite experts to train personnel related every year.

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

>>

Date of completing the baseline and monitoring methodology study	*15/06/2007*
Person determining the baseline study and monitoring methodology:	*CHEN Ximing*
Tel:	*+86-21-64394196*
Fax:	*+86-21-64394170*
Email:	*cdm009@163.com*
Organization:	*Shanghai Chuanji Investment Management Co., Ltd. (the project developer)*
Assistants:	*MA Ranqiu (Shanghai Chuanji Investment Management Co., Ltd.)* *MA Zhiwei (Shanghai Chuanji Investment Management Co., Ltd.)* *ZHAN Yanhui (Shanghai Chuanji Investment Management Co., Ltd.)*

Shanghai Chuanji Investment Management Co., Ltd. is not the 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:

>>
30/10/2006

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

>>
20 years

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

>>
The project uses fixed crediting period.

C.2.1. Renewable crediting period

>>
Not applicable – left open on purpose.

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:

>>
10/09/2008 or the date after registration

C.2.2.2. Length:

>>
10 years

SECTION D: Environmental impacts

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

>>
By displacing electricity from East China Power Grid, the project activity will reduce GHGs emissions related to firing of fossil fuels in the power plants supplying to the grid, which include carbon dioxide, sulphur oxides, nitrogen oxides etc. It will also help to conserve the natural resource-coal/natural gas etc. These will greatly contribute to the regional and global benefits.
Considering the environmental impacts associated with such a project activity, the project entity had considered the following environmental impacts, and proper measures have been adopted to mitigate those impacts.

Air Environment Impact

In the absence of the project activity, the project entity imports electricity from East China Power Grid. After the implementation of the project activity, part of the power demands from the project entity will be met by the WHR power station which burns no fossil fuels and generate no GHGs emissions, thereby reducing GHGs emissions of East China Power Grid. Moreover, the WHR boilers will catch a large portion of the fine dust particles originally directly discharged into the air by the cement production line; this will undoubtedly contribute to the well-being of ambient air quality. And it is expected to reduce the CO_2, SO_2 and NO_x emissions as reducing combustion of fossil fuel in East China Power Grid after implementation of the project activity.

Acoustical Environment Impact

Noise sources include construction noise and noise from the equipment installed during the construction phase. Noise from turbine, fans, centrifugal pumps, electric motors etc is the major noise sources after the implement of the project activity. The proper measures will be adopted to mitigate the influence of noise as follows:

• Noise from the blast blowers, the induce draft fans are reduced by providing silencers in the duct. Power generation equipments will be placed in noise-containing room so as to limit noise pollution to vicinity.

• The East control room, where has a high concentration of management and operation personnel, will adopt noise-proof designs. The working area will be sealed away from the power generation equipment to reduce noise pollution, while greening will be reinforced to provide a natural noise silencer for the power station.

Impact on Water Environment

There is no poisonous and harmful substance in wastewater generated from the project activity. The wastewater will be discharged to the drainage system after it has been carefully treated. So, the project activity has little obvious impact on the Water Environment.

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:

>>

As discussed above, the environmental impacts of the project activity are considered to be positive.

SECTION E: Stakeholders' comments

>>

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

>>

Since November, 2004, the project entity solicited the opinions of the major shareholders and presented the plan and later on the feasibility study of the project activity to relevant authorities, research institutes and governing bodies.

- As a result, three open conferences were held in November 2004, August 2006 and September 2006 respectively. More than 49 representatives and experts were obtained by interview and meetings. The representatives and experts are from Trade Committee of Zhejiang Province, Trade Committee of Hangzhou, Anhui development and reform committee, the Electricity Bureau of Zhejiang Province, Environmental Protection Bureau of Zhejiang Province, Tianjin Cement Design and Research Institute, Anhui Electric Design and Research Institute－see Exhibit 1.

- The project entity collected the opinions from its staffs and the residents around the site of the project activity. Three open conferences were held at the meeting rooms of the project entity with the local residents and representatives from the company attended in December 2006, October 2005 and March 2006 respectively. The results of conferences were posted in announcement board, and provided an opportunity to post comments by e-mail or by telephone.－see Exhibit 2.

- The project entity also conducted a sampled questionnaire survey in the local residents near the project activity in April 2005, September 2006 and March 2007—see Exhibit 3

E.2. Summary of the comments received:

>>

All experts meetings approved of the project activity and concerned are convinced that the project activity is eco-friendly and can significantly improve the energy consumption efficiency of the cement plants.

1. The investment in the project activity far exceeds the construction a coal-based captive power plant. The project entity should take effectively measures to lower down the investment risks.

2. The project activity is not a common practice in East China, and is extremely different from what the project entity's major business scope - cement production. The unfamiliar technology may bring some unexpected risks.

On the local residents meetings, all of the residents approved of the project activity and few questions were asked about environmental impact of the project, such as wastewater, air and noise problems.

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

>>

1. If the project activity implements as a CDM project activity, the project entity will get carbon credits from the transaction in international market. The revenues from the carbon credits will offset the high primary investment and mitigate the high investment risk.

2. The project entity has planned to invite some senior engineers to mange the power station and provide necessary trainings to the workers in the WHR captive power plant. In this way, the risks associated with the unfamiliar technology in the project activity will be mitigated.

3. The project activity will have no negative impact except positive impact on the ambient air quality of the project activity. The noise will be kept below the permissible level by building a sound insulation wall. The wastewater will be discharged to the drainage system after treated up to the effluent standard.

Exhibit 1: One of the Photos of the experts meeting

Exhibit 2: Photo of the local residents meeting

Exhibit 3: Photo of sampled questionnaire survey

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from any Annex I parties are involved in the project activity.

Annex 3

BASELINE INFORMATION

1) Calculation of Operation Margin emission Factor

Table 3-1 Annual electricity generation of East China Power Grid 2001-2005

year	Electricity generation (GWh)			Proportion of low cost and must run resources. %
	Total generation	Thermal power	Hydropower etc.	
2001[51]	326,647.8	289,436.7	37,211	11.39
2002[52]	367,443	324,195.1	43,247.9	11.77
2003[53]	429,327	382,112	47,015	11.0
2004[54]	488,010	440,411	47,598	9.75
2005[55]	574,467	505,855	68,612	11.94

[51] China Electric Power Yearbook 2002 P 625
[52] China Electric Power Yearbook 2003 P 593
[53] China Electric Power Yearbook 2004 P 709
[54] China Electric Power Yearbook 2005 P 485
[55] China Electric Power Yearbook 2006 P 572

Table 3-2 Operating margin data for the East China Power Grid （2003）

Fuel type	Unit	East China Power Grid Shanghai	 Jiangsu	 Zhejiang	 Anhui	 Fujian	Sub-total	Carbon Emission Factor （**tc/TJ**）	Fraction of Carbon Oxidized （**%**）	Average Low Calorific Value （**MJ/t,km3**）	**GHG Emssions（tCO_2e）** **J=G*H*I*F*44/12/10000 （mass）**
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J=G*H*I*F*44/12/1000 (volume)**
Raw Coal	10^4t	2618	6417.74	3442.4	2669.67	1754	**16901.81**	25.8	100	20908	334300359.13
Cleaned Coal	10^4t						**0**	25.8	100	26344	0.00
Other washed coal	10^4t						**0**	25.8	100	8363	0.00
Coke	10^4t						**0**	29.2	100	28435	0.00
Coke Oven Gas	10^8m^3	1.99	0.06				**2.05**	12.1	100	16726	152125.76
Other Coal Gas	10^8m^3	66.34					**66.34**	12.1	100	5227	1538454.90
Crude Oil	10^4t						**0**	20	100	41816	0.00
Gasoline	10^4t							18.9	100	43070	0.00
Diesel	10^4t	1.26	14.71	13.99			**29.96**	20.2	100	42652	946463.80
Fuel Oil	10^4t	95.49	0.76	174.48		18.89	**289.62**	21.1	100	41816	9369683.52
PLG	10^4t						**0**	17.2	100	50179	0.00
Refinery Gas	10^4t	0.49	0.96				**1.45**	15.7	100	46055	38442.88
Natural Gas	10^8m^3						**0**	15.3	100	38931	0.00
Other Petroleum Products	10^4t	18.91	5.3	15.04			**39.25**	20	100	38369	1104387.72
Other Coking Products	10^4t						**0**	25.8	100	28435	0.00
Other Energy	10^4t	5.68		7.08			**12.76**	0	100	0	0.00
										Sub-total	347449917.70

Data from China energy statistical yearbook 2004

Table 3-3 Operating margin data for the East China Power Grid （2004）

Fuel type	Unit	East China Power Grid					Sub-total	Carbon Emission Factor （tc/TJ）	Fraction of Carbon Oxidized （%）	Average Low Calorific Value （MJ/t,km3）	**GHG Emssions（tCO_2e）** **J=G*H*I*F*44/12/10000 （mass）**
		Shanghai	Jiangsu	Zhejiang	Anhui	Fujian					
		A	**B**	**C**	**D**	**E**	**F=A+B+ C+D+E**	**G**	**H**	**I**	**J=G*H*I*F*44/12/1000 (volume)**
Raw Coal	10^4t	2779.6	7601.9	4008.9	2906.2	2183.7	19480.3	25.8	100	20908	385300230.33
Cleaned Coal	10^4t						0	25.8	100	26344	0.00
Other washed coal	10^4t		5.46			4.63	10.09	25.8	100	8363	79826.01
Coke	10^4t						0	29.2	100	28435	0.00
Coke Oven Gas	10^8m^3	2.59					2.59	12.1	100	16726	192197.91
Other Coal Gas	10^8m^3	72.46					72.46	12.1	100	5227	1680380.49
Crude Oil	10^4t						0	20	100	41816	0.00
Gasoline	10^4t						0	18.9	100	43070	0.00
Diesel	10^4t	2.69	27.17	6.23			36.09	20.2	100	42652	1140116.11
Fuel Oil	10^4t	58.52	55.07	202.89		23.26	339.74	21.1	100	41816	10991147.99
PLG	10^4t						0	17.2	100	50179	0.00
Refinery Gas	10^4t	0.77	0.55				1.32	15.7	100	46055	34996.27
Natural Gas	10^8m^3		0.14				0.14	15.3	100	38931	30576.41
Other Petroleum Products	10^4t	21.22	1.37	24.89			47.48	20	100	38369	1335957.42
Other Coking Products	10^4t						0	25.8	100	28435	0.00
Other Energy	10^4t	6.43		15.48			21.91	0	100	0	0.00
										Sub-total	400785428.93

Data from China energy statistical yearbook 2005

Table 3-4 Operating margin data for the East China Power Grid （2005）

Fuel type	Unit	East China Power Grid Shanghai	 Jiangsu	 Zhejiang	 Anhui	 Fujian	Sub-total	Carbon Emission Factor （tc/TJ）	Fraction of Carbon Oxidized （%）	Average Low Calorific Value （MJ/t,km3）	**GHG Emssions（tCO_2e）** **J=G*H*I*F*44/12/10000 （mass）**
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J=G*H*I*F*44/12/1000 (volume)**
Raw Coal	10^4t	2847.31	9888.06	4801.52	3082.9	2107.69	22727.48	25.8	100	20908	449526099.64
Cleaned Coal	10^4t						0	25.8	100	26344	0.00
Other washed coal	10^4t						0	25.8	100	8363	0.00
Coke	10^4t			0.03			0.03	29.2	100	28435	913.33
Coke Oven Gas	10^8m^3	1.68	1.38		1.71		4.77	12.1	100	16726	353970.67
Other Coal Gas	10^8m^3	83.72	24.97	0.06	30		138.75	12.1	100	5227	3217675.86
Crude Oil	10^4t			27.01			27.01	20	100	41816	828263.45
Gasoline	10^4t						0	18.9	100	43070	0.00
Diesel	10^4t	1.25	16	4.52		1.67	23.44	20.2	100	42652	740491.04
Fuel Oil	10^4t	59.39	13.22	153.22		7.45	233.28	21.1	100	41816	7546991.82
PLG	10^4t						0	17.2	100	50179	0.00
Refinery Gas	10^4t	0.57	0.83				1.4	15.7	100	46055	37117.26
Natural Gas	10^8m^3	1.09	1.85	0.62			3.56	15.3	100	38931	777514.36
Other Petroleum Products	10^4t	21	8.38	34.8			64.18	20	100	38369	1805849.77
Other Coking Products	10^4t						0	25.8	100	28435	0.00
Other Energy	10^4t	12.36		15.29			27.65	0	100	0	0.00
										Sub-total	464834887.21

Data from China energy statistical yearbook 2006

Table 3-5 the emission factor of Yangcheng Power station

Year	*Coal consumption per kWh generated by the power source gce/kWh*	*NCV GJ/tce*	*Carbon Emission Factor (tc/TJ)*	*Emission Factor of the exporting power source*
	A	*B*	*C*	*E=A×B×C×D×44/12/10^5*
2003	*343*	*29.271*	*25.8*	*0.949780*
2004	*341*	*29.271*	*25.8*	*0.944241*
2005	*339*	*29.271*	*25.8*	*0.938703*

Table 3-6 the power output of thermal power plant in East China Power Grid

Region	Power output （10^8 kWh)	Power output （MWh)	Proportion of own power demand （%）	Power Supply(MWh)
The power output of thermal power plants in 2003 (China Electric Power Yearbook 2004)				
Shanghai	694.44	69444000	5.14	65,874,578
Jiangsu	1332.77	133277000	5.9	125,413,657
Zhejiang	830.89	83089000	5.31	78,676,974
Anhui	541.56	54156000	6.06	50,874,146
Fujian	421.46	42146000	5.07	40,009,198
Total				360,848,554
The power output of thermal power plants in 2004 (China Electric Power Yearbook 2005)				
Shanghai	711.27	71127000	5.22	67,414,171
Jiangsu	1635.45	163545000	5.93	153,846,782
Zhejiang	952.55	95255000	5.68	89,844,516
Anhui	598.75	59875000	6.03	56,264,538
Fujian	504.9	50490000	6.07	47,425,257
Total				414,795,263
The power output of thermal power plants in 2005 (China Electric Power Yearbook 2006)				
Shanghai	746.06	74606000	5.05	70,838,397
Jiangsu	2114.29	211429000	5.96	198,827,832
Zhejiang	1081.1	108110000	5.59	102,066,651
Anhui	629.18	62918000	5.9	59,205,838
Fujian	486	48600000	4.57	46,378,980
Total				477,317,698

Table 3-7 the electricity exchange between East China Power Grid and other regional grids[48]

Year	*Grid*	*Imported power amount MWh*	*Emission Factor of the Exporting Grid*	*GHG Emission of the Exporting Grid (tCO_2)*
2003	*Central China Power Grid*	*13,756,040*	*0.797346*	*10,968,320*
	Yangcheng Power Plant, Shanxi	*10,705,870*	*0.949780*	*10,168,216*
2004	*Central China Power Grid*	*26,933,850*	*0.826448*	*22,282,885*
	Yangcheng Power Plant, Shanxi	*11,649,610*	*0.944241*	*11,000,045*
2005	*Central China Power Grid*	*160,410,000*	*0.771225*	*123,862,090*
	Yangcheng Power Plant, Shanxi	*77,244,000*	*0.938703*	*72,509,206*

Table 3-8 the OM of the baseline

Parameter	*CO_2 emissions tCO_2*	*Power supply in East China Power Grid MWh*	$EF_{OM,simply,y}$ *tCO_2/MWh*	*OM tCO_2/MWh*
2003	*368,586,454*	*385,310,464*	*0.956596*	*0.9422*
2004	*434,068,359*	*453,378,723*	*0.957408*	
2005	*661,206,183*	*714,971,698*	*0.924800*	

[48] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591157181.xls

2) calculation of Build Margin emission Factor

Table 3-9 Calculation of λ_{Coal} , λ_{Oil} and λ_{Gas}

		Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Carbon emission factor	Calorific Value	Oxidation	Emissions
Fuel type	unit	A	B	C	D	E	G=A+B+C+D+E	H	I	J	K=G*H*I*J*44/12
Raw Coal	10^4t	2847.31	9888.06	4801.52	3082.9	2107.69	22727.48	25.8	209	100%	449,526,099.64
Clean Coal	10^4t						0	25.8	263	100%	0.00
Other Washed Coal	10^4t						0	25.8	83.63	100%	0.00
Coke	10^4t			0.03			0.03	29.2	284.35	100%	913.33
Sub-total	**449,527,013**										
Crude Oil	10^4t			27.01			27.01	20	418.16	100%	828,263.
Gasoline	10^4t						0	18.9	430.7	100%	0.00
Kerosene	10^4t						0	19.6	430.7	100%	0
Diesel	10^4t	1.25	16	4.52	0	1.67	23.44	20.2	426.52	100%	740,491
Fuel Oil	10^4t	59.39	13.22	153.22	0	7.45	233.28	21.1	418.16	100%	7,546,992
Other Coking Products	10^4t	21	8.38	34.8	0	0	64.18	20	383.69	100%	1,805,850
Sub-total	**10,921,596**										
Natural gas	10^8m^3	1.09	1.85	0.62			3.56	15.3	389.31	100%	777,514
Coke Gas	10^8m^3	1.68	1.38	0	1.71	0	4.77	12.1	167.26	100%	353,971
Other Gas	10^8m^3	83.72	24.97	0.06	30	0	138.75	12.1	52.27	100%	3,217,676
PLG	10^4t	0	0	0	0	0	0	17.2	501.79	100%	0
Refinery Gas	10^4t	0.57	0.83	0	0	0	1.4	15.7	460.55	100%	37,117
Sub-total	**4,386,278**										
Total	**464,834,887**										

Data source: China Energy Statistical Yearbook 2006

As per the above date and the related formulation in the PDD: λ_{Coal} =96.71%， λ_{Oil} =2.35%， λ_{Gas} =0.94%.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9372$$

Table 3-10 the installed capacity in East China Power Grid

Installed capacity	Shanghai	Jiangsu	Zhejiang	anhui	Fujian	Total
The installed capacity of East China Power Grid in 2003 (China Electric Power Yearbook 2004)						
Thermal power (MW)	11,092.6	22,245	15,321.2	9,284.9	7,092.8	6,5036.5
Hydropower (MW)	0	137.8	6,054.5	649.1	6761.1	13,602.5
Nuclear (MW)	0	0	2406	0	0	2406
Others (MW)	0	0	39.7	0	12	51.7
Total (MW)	11,092.6	22,382.7	23,821.4	9,934	13,865.8	81,096.5
The installed capacity of East China Power Grid in 2004 (China Electric Power Yearbook 2005)						
Thermal power (MW)	12,014.9	28,289.5	21,439.8	9,364.5	8,315.4	79,424.1
Hydropower (MW)	0	126.5	6,418.4	692.8	7,180.1	14,417.8
Nuclear (MW)	0	0	3056	0	0	3056
Others (MW)	3.4	17.6	39.7	0	12	72.7
Total (MW)	12,018.3	28,433.6	30,953.9	10,057.3	15,507.5	96,970.6
The installed capacity of East China Power Grid in 2005 (China Electric Power Yearbook 2006)						
Thermal power (MW)	13,113.5	42,506.4	27,688.1	11,423.2	9,345.4	104,077
Hydropower (MW)	0	142.6	6,952.1	749.8	8,224.9	16,069.4
Nuclear (MW)	0	0	3066	0	0	3066
Others (MW)	253.3	58.8	37.2	0	52	401.3
Total (MW)	13,366.8	42,707.8	37,743.4	12,173	17,622.3	123,613

Table 3-11 Increased percentages of capacities 2003~2005

	2003	2004	2005	Different between the installed capacity from 2004-2005	Increased percentages (%)
	A	B	C	D=C-B	%
Thermal power (MW)	65,036.5	79,424.1	104,076.6	24,652.5	92.53%
Hydropower (MW)	13,602.5	14,417.8	16,069.4	1,651.6	6.20%
Nuclear (MW)	2406	3056	3,066	10	0.04%
Others (MW)	51.7	72.7	401.3	328.7	1.23%
Total (MW)	81,096.7	96,970.6	123,613.3	26,642.8	100.00%

Table 3-12 BM emission factor of the baseline

Emission factor of thermal power (tCO$_2$e/MWh)	*Increased percentages of thermal power %*	*BM emission factor (tCO$_2$e/MWh)*
0.9372	*92.53*	*0.8672*

2) Calculation of Combined Margin emission Factor

Table 3-13 Combined Margin of the baseline

OM emission factor tCO_2e/MWh	*BM emission factor* tCO_2e/MWh	*CM emission factor* tCO_2e/MWh
A	*B*	*C=A×0.5+B×0.5*
0.9422	*0.8672*	*0.9047*

4. Calculation of project emission of Jiande

Table 3-15 Energy consumption of clinker production (Jiande)

Parameter	Energy consumption before the operation of the project activity				Energy consumption after the operation of the project activity[49]			
	$O_{Clinker,B}$	$Q_{fuel,B}$	$NCV_{fuel,B}$	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$EI_{p,y}$
	A	B	C	D=B×C/A	E	F	G	H=F×G/E
Unit	t	t	GJ/t	GJ/t	t	t	GJ/t	GJ/t
Source	Project Entity	Project Entity	Project Entity	Calculation	Project Entity	Project Entity	Project Entity	Calculation
Value	1,755,082	277,010	23.046	3.64	340,340	52,792	23.096	3.58

[49] The documents after the operation of the project activity are only Oct and Nov, 2007.

Table 3-16 Project emission of Jiande in Oct and Nov, 2007.

Parameter	EI_B	$EI_{p,y}$	$NCV_{fuel,y}$	$OXID_{fuel}$	% Carbon in coal	$EF_{CO_2,fuel,y}$	$COEF_{fuel,y}$	$O_{Clinker,y}$	PE_y
	A	B	C	D	E	F=E×44/12	G= (D×F)/C/100	H	I=(B - A) ×G×H
Unit	GJ/t	GJ/t	GJ/t	%	%	tCO_2e/t	tCO_2e/GJ	t	tCO_2e
Source	Calculation	Calculation	Project Entity	IPCC 2006	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation	Initial value provided by Project Entity	Calculation
Value	3.64	3.58	23.096	100	45	1.65	0.070	340,340	-1,429

4. Calculation of project emission

Table 3-17 Energy consumption of clinker production (Tonglu)

Parameter	Energy consumption before the operation of the project activity				Energy consumption after the operation of the project activity			
	$O_{Clinker,B}$	$Q_{fuel,B}$	$NCV_{fuel,B}$	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$EI_{p,y}$
	A	B	C	D=B×C/A	E	F	G	H=F×G/E
Unit	t	t	GJ/t	GJ/t	t	t	GJ/t	GJ/t
Source	Project Entity	Project Entity	Project Entity	Calculation	Initial value provided by Project Entity	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation
Value	1,760,000	284,582	23.214	3.75	1,760,000	284,582	23.214	3.75
Memo	To be updated ex-post at the start of project	To be updated ex-post at the start of project	To be updated ex-post at the start of project	To be updated ex-post at the start of project	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually

Table 3-18 Energy consumption of clinker production (Jiande)

Parameter	Energy consumption before the operation of the project activity				Energy consumption after the operation of the project activity			
	$O_{Clinker,B}$	$Q_{fuel,B}$	$NCV_{fuel,B}$	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$EI_{p,y}$
	A	B	C	D=B×C/A	E	F	G	H=F×G/E
Unit	t	t	GJ/t	GJ/t	t	t	GJ/t	GJ/t
Source	Project Entity	Project Entity	Project Entity	Calculation	Initial value provided by Project Entity	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation
Value	1,755,082	277,010	23.046	3.64	1,755,082	277,010	23.046	3.64
Memo	To be ex-ante determine	To be ex-ante determine	To be ex-ante determine	To be ex-ante calculated	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually

Table 3-19 Energy consumption of clinker production (Guangde)

Parameter	Energy consumption before the operation of the project activity				Energy consumption after the operation of the project activity			
	$O_{Clinker,B}$	$Q_{fuel,B}$	$NCV_{fuel,B}$	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$EI_{p,y}$
	A	B	C	D=B×C/A	E	F	G	H=F×G/E
Unit	t	t	GJ/t	GJ/t	t	t	GJ/t	GJ/t
Source	Project	Project	Project	Calculatio	Project	Project	Project	Calculati

	Entity	Entity	Entity	n	Entity	Entity	Entity	on
Value	1,691,200	259,088	24.098	3.69	1,691,20 0	259,088	24.098	3.69
Memo	To be ex-ante determine	To be ex-ante determine	To be ex-ante determine	To be ex-ante calculated	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually	To be updated ex-post annually

Table 3-20 Ex-ante estimate of project emission（Tonglu）

Parameter	EI_B	$EI_{p,y}$	$NCV_{fuel,y}$	$OXID_{fuel}$	% Carbon in coal	$EF_{CO_2,fuel,y}$	$COEF_{fuel,y}$	$O_{Clinker,y}$	PE_y
	A	B	C	D	E	F=E×44/12	G= (D×F)/C/100	H	I=(A-B) ×G×H
Unit	GJ/t	GJ/t	GJ/t	%	%	tCO_2e/t	tCO_2e/GJ	t	tCO_2e
Source	Calculation	Calculation	Initial value provided by Project Entity	IPCC 2006	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation	Initial value provided by Project Entity	Calculation
Value	3.75	3.75	23.214	100	50	1.83	0.080	1,760,000	0
Memo	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post

Table 3-21 Ex-ante estimate of project emission（Jiande）

Parameter	EI_B	$EI_{p,y}$	$NCV_{fuel,y}$	$OXID_{fuel}$	% Carbon in coal	$EF_{CO_2,fuel,y}$	$COEF_{fuel,y}$	$O_{Clinker,y}$	PE_y
	A	B	C	D	E	F=E×44/12	G= (D×F)/C/100	H	I=(A-B) ×G×H
Unit	GJ/t	GJ/t	GJ/t	%	%	tCO_2e/t	tCO_2e/GJ	t	tCO_2e
Source	Calculation	Calculation	Initial value provided by Project Entity	IPCC 2006	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation	Initial value provided by Project Entity	Calculation
Value	3.64	3.58	23.096	100	45	1.65	0.070	1,755,082	0
Memo	To be ex-ante determine	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post

Table 3-23 Ex-ante estimate of project emission（Guangde）

Parameter	EI_B	$EI_{p,y}$	$NCV_{fuel,y}$	$OXID_{fuel}$	% Carbon in coal	$EF_{CO_2,fuel,y}$	$COEF_{fuel,y}$	$O_{Clinker,y}$	PE_y
	A	B	C	D	E	F=E×44/12	G= (D×F)/C/100	H	I=(A-B) ×G×H
Unit	GJ/t	GJ/t	GJ/t	%	%	tCO_2e/t	tCO_2e/GJ	t	tCO_2e
Source	Calculation	Calculation	Project Entity	IPCC 2006	Initial value provided by Project Entity	Initial value provided by Project Entity	Calculation	Initial value provided by Project Entity	Calculation
Value	3.69	3.69	24.098	100	48.49	1.78	0.0736	1,691,200	0
Memo	To be ex-ante determine	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post	To be updated ex-post

Annex 4

MONITORING INFORMATION

The information of monitoring is in chapter B.7.2.