CLEAN DEVELOPMENT MECHANISM

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

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Jiangsu Qingshi Cement Plant's Low Temperature Waste Heat Power Generation Project

Version of document: 05

Date of document: 10th,01,2008

A.2. Description of the project activity:

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The project locates in the plant of Jiangsu Qingshi Cement Co. Ltd in Hufu Town, Yixing City, Jiangsu Province. The project utilizes the waste heat resources from rotating kilns of the existing 1000t/d, 2000t/d and 5000t/d new type non-slurry cement production lines to construct two sets of pure low temperature waste heat power generators. The 1000t/d cement line was put into production in 2002, the 2000t/d cement line was put into production in 2004, and the 5000t/d cement line was put into production in 2006.09. Every line is expected to have a mean time of production with 310 days a year. The annual expected total production is 3,800,000t/yr. CDM affairs are considered in 02/2006. Stakeholders' symposium was carried on March 12th 2006. Feasibility report was finished in 11/2006. Main equipments bidding started in 10/2006. Construction on-site was started on 08/03/2007. Scheduled project completion time is 11/2007. Expected Starting date of the first crediting period is on Jan 1st, 2008.

According to the plant location, the 1000t/d cement production line and the 2000 t/d cement production line are in the same area, and the 5000 t/d cement production line is in another area. It is about 1km between these two areas, so two sets of power station system are taken into consideration: a set of waste heat power station is matched for the 1000t/d cement production line and the 2000t/d cement production line, with the installation capacity of 6MW; and another set of waste heat power station is matched for the 5000t/d cement production line, with the installation capacity of 7.5MW. The total installation capacity is 13.5MW and total annual power generation ("gross electricity") of these two sets of power generation units will be 97.92GWh (39.60+58.32), and the annual power supply ("net electricity") will be 90.08GWh (36.43+53.65).

In the past, a part of the waste heat from cement production line was utilized to heat the clinker preparation, and the rest were emitted to the atmosphere. The project activity utilized the part of waste heat emitted to the atmosphere to generate electric power, which will not affect the heat recycling utilization in the production process.

The waste heat power plant will carry out paralleling with the current power system, and the operation mode is to parallel with the power grid but not to connect to the power grid, which is in order to substitute the part of electricity purchased from East China Power Grid during the cement production course. At the same time, CO_2 emission during the corresponding power generation course could also be avoided, and GHG emission reductions will be carried out. The proposed project will replace a part of electric power produced by some fossil fuel power plants in East China Power Grid, consequently mitigate the CO_2 emission; after the construction completed, the annual CO_2 emission reductions will reach 81,491t.

The project's construction is in line with the choice of China energy industry's prior area, it could be back up the sustainable development of host party country and the local place in the following aspects:

- Promoting the clean production of cement industry and the development of recycling economy, and increasing the sustainable capability;
- Increasing the employment chances, and offering 32 jobs;
- Benefiting for spreading the low temperature waste heat power generation technology in the cement industry;
- Mitigating the emission of GHG and other polluting materials comparing to normal power generation manner.

A.3. Project participants:

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The participants of the proposed project include:

Table1. Information of 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)	Jiangsu Qingshi Cement Co. Ltd. (Project Owner)	No
Japan	Marubeni Corporation	No

Detailed contact information on the Participants and other Parties are provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Jiangsu Province

A.4.1.3. City/Town/Community etc:

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Hufu Town, Yixing City

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

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The project locates in Hufu Town, Yixing City, in the southern mountainous area of Jiangsu Province, The specific site location is at longitude 119°48′12.9″E and at latitude 31°14′20.5″N. The project is near to the Lake Taihu in the east, and it has the common boundary with Zhejiang Province and Anhui Province in the south. 104 state highway(Ningbo to Hangzhou Section) is 4km far from the plant area, and Tangsheng highway also passes by the plant area. Tangsheng Highway is the provincial main line, the highway could directly reach to the district of Yixing, Changzhou, Jintan and Wuxi etc, and has connected with Huning Speedway and Xiyi Speedway. The completed Xinchang Railway also passes by the plant, and a railway freight station is 2km far from the plant area. The plant area is close to Huaxi River, where the 200t-lighter is open to navigation, and could reach to Lake Taihu and Grand Canal, so both of the landway and waterway transportation are very convenient. The location of the project is shown in the map of Figure1 and Figure2.

Figure 1. Sketch Map for Jiangsu Qingshi Cement Low-temperature Waste Heat Power Plant

Figure 2 Geography Location of Jiangsu Qingshi Cement Low-temperature Waste Heat Power Plant

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

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The project falls within the sectoral scope1: Energy Industries.

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

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The waste heat recovery system consists of Suspension Preheater boiler(SP boiler) , Air Quenching Chamber (AQC boiler), steam turbine generator, controlling system and water circulation system etc. The waste heat is fed into the SP and AQC boilers where steam is produced. Then , the steam from SP and AQC boiler is fed into the steam turbine generator to produce electricity. The waste heat recovery system is demonstrated in figure 3.

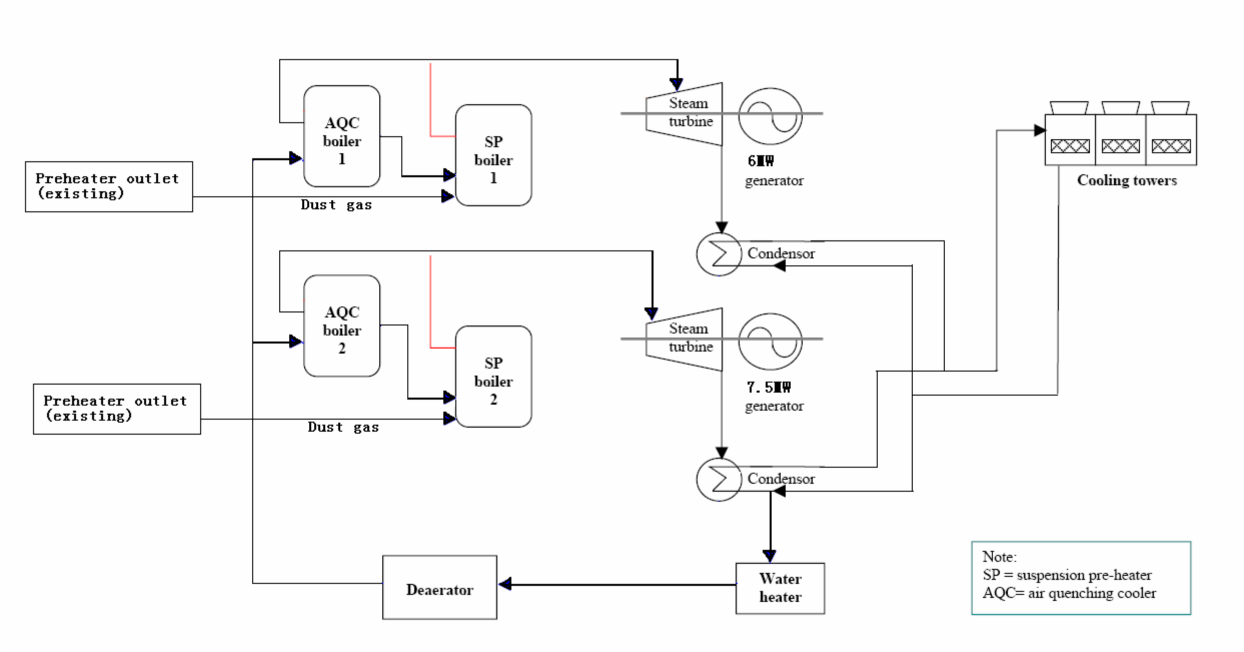

Figure 3 Waste Heat Recovery System

The main parameter of the equipments employed are showed in the following table.

Power generation 1（6MW）

Name	Number	Technical Parameter
Steam Turbine	1	Model: N6—0.9 Nominal capacity: 6MW Nominal speed: 3000r/min Feed temperature: 300℃
6MW Generator	1	Nominal capacity: 6MW Nominal speed: 3000r/min Nominal voltage: 10.5kV
1000t/d AQC Boiler	1	Waste gas cons: 51,600Nm^3/h Steam Output: 3.4t/h-1.0MPa-310℃ Hot Water Output: 10.2t/h—170℃ Feed Water Temperature: 10.2t/h—42℃ Type: Open air

1000t/d SP Boiler	1	Waste gas cons： 85700m^3/h—335℃ Steam outlet temperature： 210℃ Steam Output： 6.4t/h—1.0MPa—310℃ Feed Water Temperature： 6.65t/h—170℃ Type： Open air
2000t/d AQC Boiler	1	Waste gas cons： 116700Nm^3/h Steam Output： 10.4t/h-1.0MPa-330℃ Hot Water Output： 20.2t/h－170℃ Feed Water Temperature： 20.2t/h－42℃ Type： Open air
2000t/d SP Boiler	1	Waste gas cons： 178500m^3/h—305℃ Steam outlet temperature： 216℃ Steam Output： 9.4t/h—1.0MPa—290℃ Feed Water Temperature： 9.7t/h—170℃ Type： Open air

Power generation 2（7.5MW）

Name	Number	Technical Parameter
Steam Turbine	1	Model： N7.5－0.9 Nominal capacity： 7.5MW Nominal speed： 3000r/min Feed temperature： 310℃
7.5MW Generator	1	Nominal capacity： 7.5MW Nominal speed： 3000r/min Nominal voltage： 10.5kV
5000t/d AQC Boiler	1	Waste gas cons： 243400Nm^3/h Steam Output： 21t/h-1.0MPa-330℃ Hot Water Output： 48.8t/h－170℃ Feed Water Temperature： 48.8t/h－42℃ Type： Open air
5000t/d SP Boiler	1	Waste gas cons： 350000m^3/h—340℃ Steam outlet temperature： 216℃

		Steam Output：　26t/h—1.0MPa—320℃ Feed Water Temperature：　27t/h—170℃ Type：　Open air

According to *the feasibility report of the project*, in the project, except for the pipeline pressure and the temperature loss, waste heat from four boilers of rotating kilns on the 1000t/d and 2000t/d cement production lines is mixed to be 29.3t/h-0.9MPa-300℃ steam-gas, which is with the enthalpy value of 3055kJ/kg, the emission enthalpy value of 2465kJ/kg, and the efficient enthalpy drop of 590kJ/kg. Therefore, the steam-gas produced by waste heat boilers totally possesses power generation capability of 5500kW. Except for the pipeline pressure and the temperature loss, waste heat from the two boilers of rotating kilns on the 5000t/d cement production lines is mixed to be 29.3t/h-0.9MPa-300℃ steam-gas, which is with the enthalpy value of 3076kJ/kg, the emission enthalpy value of 2465kJ/kg, and the efficient enthalpy drop of 611kJ/kg. Therefore, the steam-gas produced by waste heat boilers totally possesses power generation capability of 8100kW. Therefore, 6MW and 7.5MW condensing steam turbines with corresponding kiln hood and kiln end waste heat boilers are respectively installed in the two power stations.

The turbines utilized in the project are all low- pressure condensing steam turbines, with the respective power of 6MW and 7.5MW. Main steam parameters are respectively to be 0.9MPa－300℃ and 0.9MPa －310℃. Discharge pressure is 0.008MPa, the rotate speeds of both turbines are 3000r/min, and both of the speed regulation systems are electro-hydraulic controlling.

The project utilizes recycling water supply system, and the indirect recycling utilization rates of both turbines are 97.7%. The recycling water system of 6MW turbine needs $50m^3/h$ makeup water, and the annual consumption of water is $36\times10^4m^3$; the recycling water system of 7.5MW turbine needs $81m^3/h$ makeup water, and the annual consumption of water is $58.32\times10^4m^3$.

The generator terminal voltage is 10.5kV, and the 10kV generatrixes of the power stations utilize the single-generatrix connection manner. 10kV electric power generated by 6MW generator is directly conveyed to the 2000t/d production line; 10kV electric power generated by 7.5MW generator is conveyed to a substation with the specification of 110/10kV.The waste heat power station will connect with the existing power system, and the its operation manner is to connect with the power grid but not supply to the power grid.

There is no environmentally safe and sound technology be transferred to the host Party.

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

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The project will apply 7*3 years credit period, and will generate an ex-ante estimated 544,804 tCO_2e over the first 7-year credit period of the project 2008-2014.

The first crediting period of 7 years (Jan.1st, 2008-Dec.31st2014)	
Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2008	**81,491**

2009	**81,491**
2010	**81,491**
2011	**81,491**
2012	**81,491**
2013	**81,491**
2014	**81,491**
Total estimated reductions (tonnes of CO_2e)	**570,437**
The number of the first crediting years	**7**
Total number of crediting years	**21**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**81,491**

A.4.5. Public funding of the project activity:

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No official funds of Parties included in Annex I have been involved in the project.

SECTION B. Application of a baseline methodology

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

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Baseline and Monitoring Methodology ACM0004: "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation" (ACM0004/Version 02, Sectoral Scope: 01, 03 March. 2006). The detail information sees also on http://cdm.unfccc.int/methodologies/approved.

Baseline and monitoring methodology ACM0002: "Consolidated baseline and monitoring methodology f or grid-connected electricity generation from renewable sources" (ACM0002/Version 06, Sectoral Scope: 01, 19 May 2006). The detail information sees also on http://cdm.unfccc.int/ methodologies/approved.

Tool for the demonstration and assessment of additionality (Version 03 ， EB29 ） 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:

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The methodology lists some applicability criteria and all of these applicability crtieria clearly apply to this project activity:
1. The project activity generate electricity from heat to displace electricity generation with fossil fuels in the power grid, it's satisfied with the methodology applicability of "The project that displace electricity generation with fossil fuels in the electricity grid or displace captive electricity generation from fossil

fuels."
2. There is no fuel switch in the project activity, it's satisfied with the methodology applicability of "The project where no fuel switch is done in the process, where the waste heat or pressure or the waste gas is produced, after the implementation of the project activity."
3. The project activity belongs to existing facility; it's satisfied with the methodology applicability of "The methodology covers both new and existing facilities."

Therefore, the methodology ACM0004 is applicable for the proposed project.

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

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The boundary of the project includes the rotating kiln generating the waste heat of the project,waste heat recovery equipment, power production equipment and the power plants involved in East China Power Grid, the power grid will be affected by the project activities.

According to "Explain about confirming baseline emission factor of regional power grid in China" announced by Office of National Coordination Committee on Climate Change , National Development and Reform Commission (NDRC) of China (DNA of China) on Dec. 15th, 2006[1]. East China Power Grid is a regional grid in China, 5 provinces of Shanghai, Jiangsu, Zhejiang, Anhui and Fujian are included.

	Emission source	Gas		Instruction
Baseline	East China Grid electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplifying. This is conservative
		N_2O	Excluded	Excluded for simplifying; This is conservative
	Captive electricity generation	CO_2	Excluded	There is no captive electricity generation for this project.
		CH_4	Excluded	Excluded for simplifying
		N_2O	Excluded	Excluded for simplifying
Project activities	On-site fossil fuel consumption due to the project activity	CO_2	Excluded	There is no assistant fuel.
		CH_4	Excluded	Excluded for simplifying
		N_2O	Excluded	Excluded for simplifying
	Combustion of waste gas for electricity generation	CO_2	Excluded	The project will not burn waste gas.
		CH_4	Excluded	Excluded for simplifying
		N_2O	Excluded	Excluded for simplifying

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

[1] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf

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The baseline scenario alternatives should include all possible options that provide or produce electricity for in-house consumption and/or sale to grid and/or other consumers. The project participant shall exclude baseline options that:

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

The project participant shall provide evidence and supporting documents to exclude baseline options that meet the above mentioned criteria.

The possible alternative scenarios in absence of the CDM project activity would be as follows:

1) The proposed project activity not undertaken as a CDM project activity;
2) Import of electricity from the grid;
3) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;
4) A mix of options 2) and 3), in which case the mix of grid and captive power should be specified;
5) Other uses of the waste heat and waste gas.

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

The project owner may adopt waste heat recovery utilization systems for power generation to generate electricity. It is in compliance with all applicable legal and regulatory requirements. Although China Government encourage the cement plant to recovery the waste heat from the process of cement production[2], however, there is no legal binding in China cement industry to implement the Project Activity, and because of series of barriers (more details in B5) ,this alternative is predictably prohibitive. So, alternative 1 is not taken as baseline scenario.

Alternative 2)- Import of electricity from the grid;

The current situation and the most usual practice of the project owner is to purchase all the electricity from East China Power Grid, which would result in an equivalent amount of CO_2 emissions corresponding to the power generation in the grid connected fossil fuel power plants. This alternative is in compliance with all applicable legal and regulatory requirements and there will be no additional investment and cost, it is economically attractive.

Currently, the project owner purchases 218,935 MWh/yr of electricity from the East China Power Gird for cement production. This alternative scenario is actually what the Qingshi Cement plant has been taken before the proposed Project Activity. So, alternative 2 can be taken as baseline scenario for the project.

Alternative 3)- Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;

According to the electric power rules in China, fossil fuel power plant with the capacity below 135MW is prohibited to construct if the district is covered by a big power grid[3], and thermal power units with the single-unit capacity below 100MW[4] are strictly controlled to be constructed. Therefore, constructing a

[2] http://www.bmlink.com/news/html/news_Info82_092641817.html

[3] *Notification from State Council on Prohibiting Constructing Thermal Power Units with the Installation Capability under135 Thousand KWh,* 2002.

[4] Temporary Rules on Small-scale Thermal Power Units' Construction Management (August, 1997).

fossil fuel (*included coal, diesel, natural gas etc.)* power plant with equal capacity (13.5MW) will violate the requirements of national rules and laws. Therefore it is not a credible baseline scenario.

According to China Electric Power Yearbook 2005, fuel fired power's proportion is 99.5% in Jiangsu Province, hydro power is only 0.44% and wind power is less than 0.06%. There is no usable hydro resource at the project site; wind power has a small installed capacity in Jiangsu province and the cost of wind power is higher than purchase electricity from electricity[5,6]. And, there is no other energy sources such as diesel, natural gas available locally. So, alternative 3 can not be taken as baseline scenario.

Alternative 4)- A mix of options 2) and 3), in which case the mix of grid and captive power should be specified;

Alternative 3) is not feasible, so it's not feasible of alternative 4) (A mix of options 2) and 3),); So, alternative 4 can not be taken as baseline scenario.

Alternative 5)- Other uses of the waste heat and waste gas;

Currently, most of waste heat from clinker production has been emission into the air. The cement plant lies in southeast of China where civil heating is not demanded. There are no any other potential demands for heating or other industry utilization of the additional waste heat locally. Therefore, alternative 5 can not be taken as baseline scenario.

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[5] Zhou Zhiqiang. Discuss of Electricity Structure and Nuclear Power in Jiangsu Province. ENERGY RESEARCH AND UTILIZATION, 1998(2): 8-10.

[6] Gu Zhipeng. Healthy Development of Electricity Industry in Jiangsu Province. CHINA REFORM, 1998(3):66-67.

Economic comparison of alternatives for baseline scenario determination

Item	*Alternative 1）- Proposed project without CDM support*	*Alternative 2)- Import of Electricity from Grid*	*Alternative 3)- New captive power generation on-site, using* wind *energy*	*Alternative 3)- New captive power generation on-site, using* coal, diesel, natural gas *energy etc.*	*Alternative 3)- New captive power generation on-site, using* hydro *energy, etc.*	*Alternative 4) A mix of option 2) & 3), in which case the mix of grid and captive power should be specified;*	*Alternative 5) Other uses of the waste heat and waste gas.*	*Proposed project with CDM support*
Per Unit Investment/ (RMB YUAN/kW)	6MW: 7622.39 7MW: 7569.99 (Source: Feasibility Study Report, Chapter 8)	No new investment needed.	More than 10000 (Source: http://www.solar168.cn/2007/wind_power/wind_power_buy/2007/123/071232315191G83AE7H11KJ606A276J.html)	Is prohibited by national regulation. <Notice on strictly prohibiting the installation of thermal power units with capacity of 135MW or below> released by State Council on 15th April 2002 (http://www.gov.cn/gongbao/content/2002/content_61480.htm) and <Temporary rules on construction management of small-scale thermal power units> (http://www.chinapower.com.cn/yearbook/article/1998/50303017.html) released	There are no these kind of energy sources such as hydro energy on project site.	Alternative 3) is not feasible, so it's not feasible of alternative 4) (A mix of options 2) and 3),);	Currently, most of waste heat from clinker production has been emission into the air. There are no any other potential demands for heating or other industry utilization of the additional waste heat locally. Therefore, alternative 5 can not be taken as baseline scenario.	10 US$/$tCO_2$e; 81,491 tCO_2e/y;7years; Per Unit investment reducing about 3169(RMB YUAN/kW)

Generation Cost	Compared with coal power generation, wind power generation cost is 33%-60% higher.(http://www.infra-vest.com/SC/5-1-5-2.html) For more, according to market analysis (http://www.huaxiawind.com.cn/detail.asp?infoId=4194), the average cost of per unit investment is 10000 RMB Yuan, take favorable tax and even CDM income, to achieve a reasonable profit, the electricity price is expected to be at least 0.60 RMB Yuan/kWh, but the actual bidding price is 0.50 in average. This also means wind power generation, especially small scales one, is not economically attractive.							
Analysis	1. High capital investment. 2. Extra jobs need to be done to require approvals from the regulatory bodies.	1. No capital investment. Electricity could be imported from East China Grid Immediately. 2. Being the existing practice, no clearances/approvals required. 3. Project owner will not face any resistance from the regulatory bodies.	1. Higher capital investment compared to waste heat power generation. 2. Extra jobs need to be done to require approvals from the regulatory bodies.					Noticeable profits from CERs and improve the financial situation greatly
Conclusion	Considering all the points mentioned above, it is clear that excluding the alternatives prohibited by law and regulations, Alternative *2) - Import of Electricity from Grid* was found to be the most economically attractive option for the project owner. And therefore, as per the methodology, this alternative option is the baseline scenario. This is further substantiated by the fact that this scenario was the status quo of existing before CDM project implementation.							

Therefore, import equivalent amount of the annual power output of East China Power Grid (Alternative 2) where the project connected into is the project's baseline scenario. East China Power Grid is a mixed grid of coal-fired and hydro power; coal-fired power takes a most proportion and this situation will not be changed in the near future.

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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Step1. Identification of alternatives to the project activity consistent with current laws and regulations

The objective of Step1 is to decide the actual and feasible substitutable scheme by the following sub-steps. These actual and feasible substitutable scheme will become (a part of) baseline scenario.

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

Plausible and credible alternatives available to the project that provide outputs or services comparable with the proposed CDM project activity include:

1) The proposed project activity not undertaken as a CDM project activity;
2) Import of electricity from the grid;
3) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas, such as coal, diesel, natural gas, hydro, wind, etc;
4) A mix of options 2) and 3), in which case the mix of grid and captive power should be specified;
5) Other uses of the waste heat and waste gas.

According to B4, considering in technology feasibility, alternative 5) is not the feasible alternative scenario; and hydro power, wind power, solar energy and biomass energy in alternative 3) are all not the feasible scenarios.

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

According to B4:

Alternative 3)

According to the electric power rules in China, fossil fuel power plant with the capacity below 135MW is prohibited to construct if the district is covered by a big power grid[7], and thermal power units with the single-unit capacity below 100MW[8] are strictly controlled to be constructed. Therefore, constructing a fossil fuel power plant with equal capacity will violate the requirements of national rules and laws. And it is not a feasible baseline scenario.

Alternative 4)

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[7] *Notification from State Council on Prohibiting Constructing Thermal Power Units with the Installation Capability under135 Thousand KWh,* 2002.

[8] Temporary Rules on Small-scale Thermal Power Units' Construction Management (August, 1997).

Alternative 3) is not feasible, so it's not feasible of alternative 4) (A mix of options 2) and 3),);

Therefore, alternative 1) and 2) is alternative scenarios in laws, regulations and technology. According to investment analysis and barriers analysis as follow, Alternative 1) is not the baseline scenario.

Step 2. Investment Analysis

The purpose of the step is to determine whether the project activity is economically or financially less attractive than other alternatives without an additional revenue/funding, possibly from the sale of certified 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 suggests three analysis methods, i.e. simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the proposed project will obtain the revenues not only from decreasing electricity purchase but also from CDM, the simple cost analysis method (option I) is not appropriate. Investment comparison analysis method (option II) is applicable to projects whose alternatives are also investment projects. Only on such basis, comparison analysis can be conducted. The alternative baseline scenario of the project is the East China Power Grid rather than new investment projects. Therefore the option 2 is not an appropriate method for the decision-making context. The project will use benchmark analysis method based on the consideration that benchmark IRR of the power sector is available.

Sub-step 2b- Option III. Apply Benchmark Analysis

With reference to *Inform on Economic Assessment method and parameter of Construction Projects by SDPC and MOC,* the financial benchmark rate of return (after tax) of Chinese building materials industries accounts for 12% of the total investment IRR. Presently, the financial benchmark rate of return is used in the analysis of the majority of cement projects in China. On the basis of above benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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 as follows:

Installed capacity:	13.5MW (Chapter 8)
Estimated annual grid-electricity:	90.08GWh (Chapter 8)
Project lifetime:	21yrs (Chapter 8)
Total investment:	RMB 99.62 million Yuan (Chapter 8)
Prospective pool purchase price:	RMB 0.342Yuan/kWh (excluding VAT) (Chapter 8)[9]

[9] "Notice about adjust electricity purchase price of East China Power Grid from NDRC" (No.FaiGaiJiaGe［2006］1230); http://www.ndrc.gov.cn/zcfb/zcfbtz/tz2006/t20060630_75077.htm

Tax:	income tax rate is 33%; value added tax rate is 17%, city construction maintenance tax is 7% of VAT, education appended fee is 4% of VAT (Chapter 8)
Operation cost:	0.27 Yuan/kWh (6MW), 0.274 Yuan/kWh (7.5MW) (Chapter 8)
Crediting period:	7yrs (renewable)
Expected CERs price:	Euro 8€ /t CO_2e (Exchange rate: 1:10) (Term Sheet for the Purchase of CERs)

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

IRR and NPV of the Project, with and without CDM revenues, are shown in Table 2. Without CDM revenue, the IRR of total project investment is 8.22%, which is much lower than 12.0%.The proposed project can be considered as financially unattractive to investors. It is infeasible in business.

With the CDM revenue (according to Euro 8/t CO_2e, 7×3years crediting period), CERs revenue will significantly improve both IRR and NPV. IRR of total investment will be brought up more than 6 percent. Therefore, the project with CDM revenue can be considered as financially attractive to investors, and the business feasibility will also be improved.

Table 2. Financial indicators of Qingshi Cement Plant's Low Temperature Waste Heat Power Generation Project

	IRR(total investment)benchmark=8%
Without CDM	8.22%
With CDM	14.37%

Sub-step 2d. Sensitivity analysis

For the proposed project, the following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

1) Total static investment

2) Pool purchase price (not including VAT)

3) Annual O&M cost

The impacts of total investment, pool(electricity) purchase price and annual O&M cost of the project on IRR of total investment were analyzed. Provided the three parameters fluctuate within the range of -10%-+10%. The corresponding impacts on IRR of the project's total investment are shown in Table 3 and Figure 3 for details.

Table 3 IRR sensitivity to different financial parameters of the project (total investment, without CDM)

	-10%	-5%	0	+5%	+10%
Total static investment	9.72%	8.94%	8.22%	7.56%	6.95%
Annual O&M cost	10.58%	9.42%	8.22%	6.97%	5.66%
Pool purchase price (excluding VAT)	3.82%	6.12%	8.22%	10.18%	12.03%

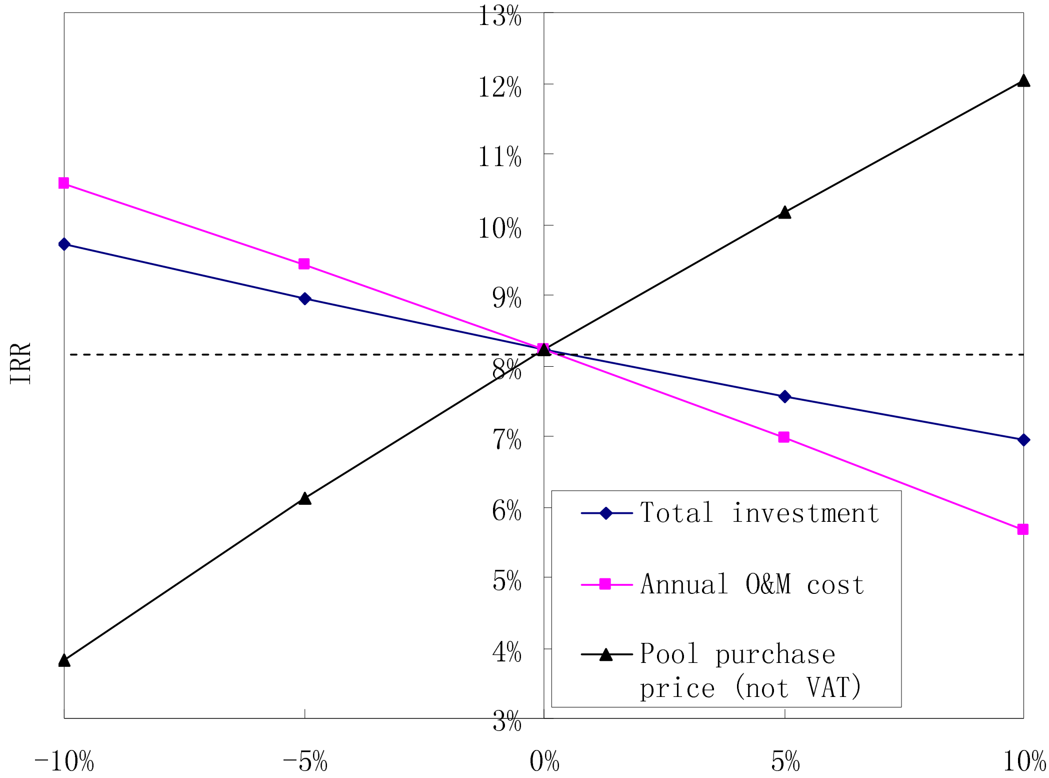

Figure 3. IRR sensitivity to different financial parameters of the Project (total investment, without CDM)

When the three financial parameters above fluctuated within the range from -10% to +10%, the IRR of total investment of the project without CDM revenue varies to different extent.

When pool (electricity) purchase price has risen 10%, the IRR of the project will exceed 12%. According to the supply-need status of power in China, pool purchase price will be stable in the future and will not rise greatly. So scenario of pool purchase price rising 10% is supposed not to appear (according to Jiangsu Yearbook2005, energy price rising is 7.6% in 2005[10]; total electricity need is $2193.45*10^5$ MWh ,

[10] http://www.jssb.gov.cn/sjzl/tjnj/2006/nj00/nj0001.htm

total electricity generated is $2098.69*10^5$MWh[11], there is no big shortage in electricity need in Jiangsu Province.).

When other parameters fluctuated, the investment analysis will not exceed 12%, as shown in table 3 and figure 3. So, the three parameters will not affect the investment analysis.

Step3 Barrier Analysis

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

Determine that if there are some barriers, which would prevent the implementation of the type of project activity from being carried out when the project activity was not registered as a CDM activity. Those barriers include:

Technological barriers:

Pure low temperature waste heat recycling power generation is a relatively mature technology in most developed countries. The implementation of these technologies in China has been prevented to some degree by the high cost of advanced imported equipment. This can be demonstrated by the fact that although the NEDO demonstration project was highly successful, the manufacturer of the waste-heat utilization technology has been unable to build up substantial sales to other cement plants in China due to the high cost of its equipment.[12] The high cost of equipment prevents Chinese companies from implementing these technologies.

Domestic industrial technology companies have been developing waste heat utilization technologies, but these technologies have not yet achieved the same standards in efficiency and in particular reliability as foreign manufacturers[13]. In addition the technologies have only become operational recently and the reliability remains unproven. This creates uncertainty with respect to future income and costs and presents significant risk to the project.

Besides, the project owner has no experience on operation of power generation, they have been faced many challenges from power station. The project owner has made special arrangement for its staff to become familiar with waste heat capture and utilization technology. Staff of the project attended the training sessions in order to operate and maintain the waste heat utilization equipment. All of these is trying to decrease the technological operation risk .For all mentioned above, the project do face technological barriers.

Investment barriers:

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[11] http://www.jssb.gov.cn/sjzl/tjnj/2006/nj08.htm

[12] The first applications of advanced waste heat utilization technology in the Chinese cement industry was a demonstration project at the Anhui Ningguo Cement Plant supported by the New Energy and Industrial Technology Development Organization (NEDO) of Japan and the State Development and Planning Commission which became operational in 1998.

[13] See for more information on energy efficiency promotion policies: Global Environment Institute(2005), Financing of Energy Efficiency Improvement for Cement Industry in China, GEI Report, January 2005.

It has been a common sense that it is very difficult for small and medium size private enterprises to finance from banks. It is no more discussing whether it is a fact in the financial circle today. The focus has been shifted to the topic of how to solve the problem in the future[14].

The banking system in China carries out bank loan assessments based on simple collateral and profitability requirements. The bank lack expertise to assess technological aspects and are unfamiliar with energy saving technologies such as waste heat utilization. The risks associated with the implementation of advanced technology is sufficient reason for a bank not to extend a loan to the project owner and availability of alternative investment instruments (such as risk capital) provided through the investment services sector is limited in China.

It has also great barriers for the project entity to raise funds in capital markets. The project entity is neither listed in domestic security markets nor in foreign security exchanges, thus impossible to get the investment for the project activity from stocks. The project entity has no access to Chinese bond market under the current regulations[15]. As to industrial investment funds in China, the relevant regulations are still in an endless process of legislation and only very few pilot cases are in operation now[16].

So the project can't obtain investment approach because it's lack of economic and finance feasibility. The project owner is a private company, and as a building materials practitioner the project owner is lack of experience and advantage in power investment, so the investment risk is greater. For all mentioned above, the project do face investment barriers.

In conclusion, for the technology barriers, investment barriers, the project as not a CDM activity (alternative 1)) will face a lot of barriers on operation. Therefore, the project owner hopes to get higher CDM revenue to make the project feasible. And the local government ratified the project's construction for the possibility on application of CDM revenue[17].

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

As mentioned on above, the alternative 2), i.e. provision of equivalent amount of the annual power output by the grid where the project connected into, the part of electric power will be provided by the fossil fuel power plants or hydro power plants run by East China Power Grid, and the barriers on investment, fossil fuel price and pool purchase price will be not in existence any more.

Step 4 Common practice analysis

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

According to information from *2005 Jiangsu Yearbook*, there are 279 cement companies in Jiangsu, and 95.48% cement production is from new dry cement line[18],that means most of the cement production lines

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[14] http://www.66wen.com/02jjx/jingjixue/caizheng/06825/19960.html

[15] http://www.smelz.gov.cn/news/57514.htm

[16] http://www.gutx.com/news/jryw/395571.htm

[17] Ratification letter from Jiangsu Provincial Economic and Trade Commission on pure low temperature power generation project of Jiangsu Qingshi Cement Co. Ltd.: Sujingmaohuanzihan No. [2006]114.

[18] http://www.dcement.com/xw_1_1.asp?id=6977&sortid=31

are similar to the production lines of Qingshi cement company. And according to statistic data from *Economy and Commerce Commission of Jiangsu Province*, there are only 10 cement plants in Jiangsu Province which intend to implement Waste Heat Recovery project and try for CDM (including the proposed project Qingshi project itself)[19].The information of 2 projects of them is shown in the following table.

Table 2. Basic situation of cements with similar dimensions in Jiangsu

Project Name	Location	Scale	Comment
Jiangsu Henglai Building Materials Co. Ltd	Xizhuang Village, Yanggang Town, Yixing City	2000 t/d +2000 t/d +5000 t/d	Start working, and try for CDM http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1282.pdf
Zhonglian Julong Cement Co. Ltd	Beijiao, Xuzhou City	3700t/d+5000 t/d	Start working, and try for CDM http://cdm.unfccc.int/Projects/Validation/DB/XMK60RVVULIX0O18721IZHCTCAPAFY/view.html

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

The existence of above projects will not affect the additionality of the proposed project. Because:

Among them, similar cement plants in Jiangsu province are applying CDM actively, and which take a very small part, that means there is no penetration of this technology in Jiangsu Province. So these projects do not affect the additionality of the proposed project, the proposed project has a strong additionality.

To summarize, it can be proved that the project activity is not a baseline scenario. Without support from CDM, the project scenario will not occur, instead, the power grid where the project connected into will provide the electricity equivalent to that of the project. Under the current circumstances, the GHG emissions of substitute electric power in the East China Power Grid have been calculated in section B.6. If the project fails to be registered as a CDM project, this portion of emission reduction can not be realized. Based on the above analysis, it can be proved that the project meets the additionality criteria in the aspect of environment, investment and technology. The additionality analysis provides essential evidence.

[19] Source: Local government statistic data from ***Economy and Commerce Commission of Jiangsu Province***

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The project will calculate GHG emission reductions carried out by the project activity according to methodology ACM0004.

The project activity carries out GHG emission reductions by substituting part of electric power produced by fossil fuel plant with cement plant's waste heat recycle and utilization. The emission reductions (ER_y) of the project activity in year *y* are the difference between baseline emission (EB_y) and project emission (PE_y), and the calculation formula is as follow:

$$ER_y = EB_y - PE_y \quad (1)$$

Where:

EB_y are the avoided baseline emissions in year y, expressed in tCO2.

PE_y are the project emissions due to 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 tCO2.

The calculation methods of project emission and baseline emission which determine the emission reductions will be instructed in the follow.

This PDD refers to the Operating Margin (OM) Emission Factor and the Build Margin (BM) Factor published by the Chinese DNA on Dec.15th 2006. We will refer to these emission factors as the "published emission factors". More information can be found at :
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1361.pdf
calculation result of the baseline emission factor of Chinese power grid;
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
calculation process of the baseline OM emission factor of Chinese power grid;

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1359.pdf

calculation process of the baseline BM emission factor of Chinese power grid.

Step1: Estimate the Baseline Emission (EB_y)

Baseline emissions are emissions from electricity generation source(s) that would have supplied to the cement works and due to the electricity exported to the grid, which would have otherwise been generated by the operation of grid-connected power plants in absence of the proposed CDM project. The baseline emission in year y is calculated as follow:

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

Where:

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

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

Step2: Determine Baseline Emission Factor (EF_y)

According to ACM0002, The detailed steps on calculating Baseline Emission Factor (EF_y) are enumerated as following:

Substep1. Calculation of the Operation Margin Emission Factor ($EF_{OM,y}$)

Methodology ACM0002 provides the following four options to calculate Operation Margin Emission Factor ($EF_{OM,y}$):

(a) The Simple Operation Margin Emission Factor (S-OM);

(b) The Simple Adjusted Operation Margin Emission Factor;

(c) Dispatch data analysis Operation Margin Emission Factor;

(d) The average Operation Margin Emission Factor.

Where the option (a) —— The Simple OM method (a) can only be used where low-operating cost/must run power plants less than 50% of total grid generation. Typical low cost/must run power plants usually comprise of power generation by water energy, terrestrial heat, wind energy, low-operating cost biomass energy, nuclear power and solar energy. According to the historical generating capacity data of East China Power Grid in last 5 years, power generation from hydropower and other renewable energy accounted for the proportion far less than 50% (according to China Electric Power Yearbook, average proportion of 2000-2004 is 10%), so it meet the condition that the proportion of low-operating cost/must run power plants is less than 50% of the total grid generation. Therefore, the option (a) of Simple Operation Margin Emission Factor could be employed on calculating the project's Operation Margin Emission ($EF_{OM,y}$).

Option(b)——the option of Simple Adjusted Operation Margin Emission Factor will require the power grid to provide annual Load Duration Curve. However, Chinese electric power industry is experiencing the reforming period of "separating power grids from power plants", and most power grids and power plants take their specific dispatching data and the fuel consumption data as business secrets, so they won't release these kinds of data in public. Under most conditions, it is difficult to take the option (b) to calculate OM. With the same reason, the project also could not gain the detailed dispatching data from East China Power Grid. Therefore, option (b) is inaccessible.

Option (c)——Calculation of OM from grid dispatch data analysis can give the most reliable estimation of emission reduction since this method counted in the actual portion of the grid generation which will be substituted by output of the proposed project. However this option requires detailed running dispatch data of the connected-grid power plants. For the same reason with option (b), the project couldn't gain the complete dispatching data from East China Power Grid. Therefore, the option (c) is inaccessible.

Option (d) —— the option of average OM is suitable for low cost/must run power plant surpass 50% of the power generation of the grid, and the detailed data to apply option (b) is unavailable, and the detailed data of option (c) is unavailable. However, within the 5 years' power generation of East China Power Grid, the proportion of thermal power is far beyond 50%, so the project doesn't meet the condition of low cost/must run power plant must surpass 50%, and option (d) can't be applied.

According to the above analysis, option (a)—the option of Simple Operation Margin Emission Factor is the only appropriate option to calculate the Operation Margin Emission Factor. Therefore, the project will take option (a) to calculate the Operation Margin Emission Factor.

According to the description of ACM0002, The Simple OM emission factor ($EF_{OM, simple, y}$)is calculated as the generation-weighted average emissions per electricity unit (tCO_2e/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. The calculating formula of $EF_{OM\,simple\,y}$ is shown in formula (3):

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \quad (3)$$

Where $F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by power plant sample 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 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 power plant sample 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.

According to the Formula (4), CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO_2,i} \cdot OXID_i \quad (4)$$

Where:

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

$OXID_i$ is the oxidation factor of the fuel (see 2006 Revised IPCC Guidelines for default values);

$EF_{CO2 \cdot i}$ is the CO2 emission factor per unit of energy of the fuel i (tCO_2/TJ).

Based on East China Power Gird data from China Power Yearbook and China Energy Statitics Yearbook, the OM Emission Factor of East China Power Grid under the current power generation structure could be obtained as 0.9421 tCO_2/MWh.

Substep2. Calculation of the Build Margin Emission Factor ($EF_{BM,y}$)

According to the methodology ACM0002, Formula (5) is adopted to calculate baseline Build Margin Emission Factor.

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

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

$COEF_{i,m,y}$ 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 power plant sample m and the percent oxidation of the fuel in year(s) y, and

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

Project participants shall choose between one of the following two options to calculate Build Margin Emission Factor ($EF_{BM,y}$):

Option 1: 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 in most recent, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option2. For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above. Sample groups' choice is similar to the *Option 1*.

The proposed project chooses the *Option 1,* i.e. calculating the Build Margin emission factor $EF_{BM,,y}$ *ex-ante*. However, under the current circumstance of China, the power plants take the Build Margin data as important business data and won't let them published. Therefore, it is difficult to get the data of five power plants that have been put into operation most recently or the newly built power plant capacity additions in the electricity system that comprise 20% of the system generation. In allusion to the situation, CDM EB approves the following methodology deviation[20]:

(1) Estimating power grid's Build Margin Emission Factor according to the new increasing capacity in the past 1~3 years;

(2) Substituting installed capacity with annual power generation to estimating weighted, and suggesting to take the most advanced commercial technology efficiency level of provincial/ regional/ national power grid as a kind of conservative approximation.

The sample *m* of the proposed project according to the newly increased installed capacity of East China Power Grid of recent 1-3 years. Back to the year 2002, the accumulated newly increased installed capacity occupy 20.97% of the total installed capacity, which is the nearest to the 20% in the recent 1-3 years.

Because current statistics data can't separate coal, oil and gas fueled power, firstly the PDD make use of the latest energy balance data to calculate all sorts of emission scale in total emission from coal, oil and gas fueled power; then based on the emission factor under the business best technology, calculated the fueled power emission factor of the grid; last multiply the fuelled power emission factor and fuelled power proportion of the total power, it's the BM of the grid. Particular step and formula as follow:

1: Calculate the proportion of the CO_2 emission from coal, oil and gas fuelled power in total emission

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[20] EB guidance for "Request for guidance: Application of AM0005 and AMS-ID in China, 2005.10.7": Request for clarification on use of approved methodology AM0005 for several projects in China. http://cdm.unfccc.int/Projects/Deviations

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (8)$$

$F_{i,j,y}$ is the consumption of fuel i in number j province y year（tce）；

$COEF_{i,j}$ is emission factor of fuel i（tCO_2/tce），considering the carbon content and oxidation rate in y year;

COAL、OIL and GAS are feet of coal, oil and gas fuel.

2:: Calculate the emission factor of fueled power

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (9)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are emission factors of the business best efficiency of fueled coal, fueled oil and fueled gas power.

3: Calculate the BM of the Grid

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (10)$$

CAP_{Total} is the new added capacity, $CAP_{Thermal}$ is the new added fueled power capacity.

The Build Margin Emission Factor ($EF_{BM,y}$) of East China Power Grid could be obtained to be: 0.8672CO_2/MWh.

Substep3. Calculate the Baseline Emission Factor (*EFy*)

According to methodology ACM0002, the Baseline Emission Factor (*EFy*) was calculated as a combined margin (CM), consisting of the weighted average of both the resulting OM and the resulting BM as following:

$$EF_y = \omega_{OM} \cdot EF_{OM,y} + \omega_{BM} \cdot EF_{BM,y} \quad (11)$$

Where the weights ω_{OM} and ω_{NM} , by default, are 0.5, i.e. the weights of Operation Margin Emission Factor and Build Margin Emission Factor are equal.

According to the formula, the Baseline Emission Factor is obtained to be:

$$EF_{CM,y} = 0.5 \times 0.9421 + 0.5 \times 0.8672 = 0.90465 tCO_2 / MWh$$
.

Step3: Estimate the Project Emission (*PE_y*)

According to the baseline and monitoring methodology ACM0004, project emission (PE_y) is the project emission fueled assistant fossil fuel.

Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler.
There are no auxiliary fuels in the project activity, so $PE_y = 0$.

Step4: Estimating leakage (*LE_y*)

According to ACM0004, the leakage effect of the project activity could be neglected.

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

The detailed data and parameter used in the baseline calculation as follow.

Data / Parameter:	1.EF_{OM}
Data unit:	tCO_2/MWh
Description:	Operation Marginal Emission Factor
Source of data used:	Calculation
Value applied:	0.9421
Justification of the choice of data or description of measurement methods and procedures actually applied :	Make the ex ante estimation according to the 3 years' average data
Any comment:	Quote from DNA data

Data / Parameter:	2.EF_{BM}
Data unit:	tCO_2/MWh
Description:	Build Marginal Emission Factor
Source of data used:	Calculation
Value applied:	0.8672
Justification of the choice of data or description of measurement methods	Make the ex ante estimation according to the weighted emission factor of 20% recently constructed power plants

and procedures actually applied :	
Any comment:	Quote from DNA data

Data / Parameter:	3. $EF_{CO2, i}$
Data unit:	tc/TJ
Description:	Emission Factor of fuel i
Source of data used:	Quote
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Quote from DNA data
Any comment:	Update according to DNA data

Data / Parameter:	4. $OXID_i$
Data unit:	%
Description:	Carbon Oxygenation Rate of fuel i
Source of data used:	Quote
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Quote from DNA data
Any comment:	Update according to DNA data

Data / Parameter:	5.NCV_i
Data unit:	MJ/t,km^3
Description:	Net Caloric Value of fuel i
Source of data used:	Quote
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Quote from DNA data
Any comment:	Update according to DNA data

B.6.3 Ex-ante calculation of emission reductions:

The PDD apply ex-ante calculation of emission reductions.

According to B.6.1, the emission reduction of the project activity in the proposed year y is the difference between the baseline emission (EB_y) and the project emission (PE_y). The calculation formula is as follow:

$$ER_y = BE_y - PE_y$$

According to the feasibility study report, the annual average electric power supply of the project is EG_y=90.08GWh (totally supply for cement production)

According to B6.1, the baseline emission factor of the proposed project is calculated to be 0.864tCO_2/MWh by the baseline and monitoring methodology ACM0002. According to the baseline emission calculation formula in the section B.6.1, the annual GHG emission of the project's baseline is:

$$BE_y = EG_y \times EF_y = 90.08 \times 0.90465 \times 1000 = 81{,}491 \text{ tCO}_2$$

As narrated in the section B.6.1, The annual GHG emission of the project activity PE_y is 0.

Therefore, the ex-ante value of the project's annual emission reductions is:

$$ER_y = BE_y - PE_y = 81{,}491 - 0 = 81{,}491 \text{ tCO}_2$$

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

The estimated value of the project activity's net emission reduction in the first 7years' crediting period is 544,804tCO_2e.

Year	Estimation of baseline emissions (tCO_2e)	Estimation of the project activity emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2008	81,491	0	0	81,491
2009	81,491	0	0	81,491
2010	81,491	0	0	81,491
2011	81,491	0	0	81,491
2012	81,491	0	0	81,491
2013	81,491	0	0	81,491
2014	81,491	0	0	81,491
Total emission reductions (tCO_2e)	570,437	0	0	570,437

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

B.7.1 Data and parameters monitored:

Data / Parameter:	1.EG_y
Data unit:	MWh
Description:	Net electricity supplied
Source of data to be used:	Watt hour meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	90.08*1000
Description of measurement methods and procedures to be applied:	Measured by watt hour meter
QA/QC procedures to be applied:	The readings of measure watt hour meter; rechecking with the document from power grid company.
Any comment:	Recording watt hour meter data

Data / Parameter:	2.EG_{in}
Data unit:	MWh
Description:	Electricity used by the power station
Source of data to be used:	Watt hour meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	7.84*1000
Description of measurement methods and procedures to be applied:	Measured by watt hour meter
QA/QC procedures to be applied:	Sum of readings of two auxiliary watt hour meters, rechecking with the document from power grid company.
Any comment:	Recording watt hour meter data

Data / Parameter:	3.$EG_{generation}$
Data unit:	MWh
Description:	Total electricity generated by the power station
Source of data to be used:	Watt hour meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	97.92*1000
Description of measurement methods and	Measured by watt hour meter

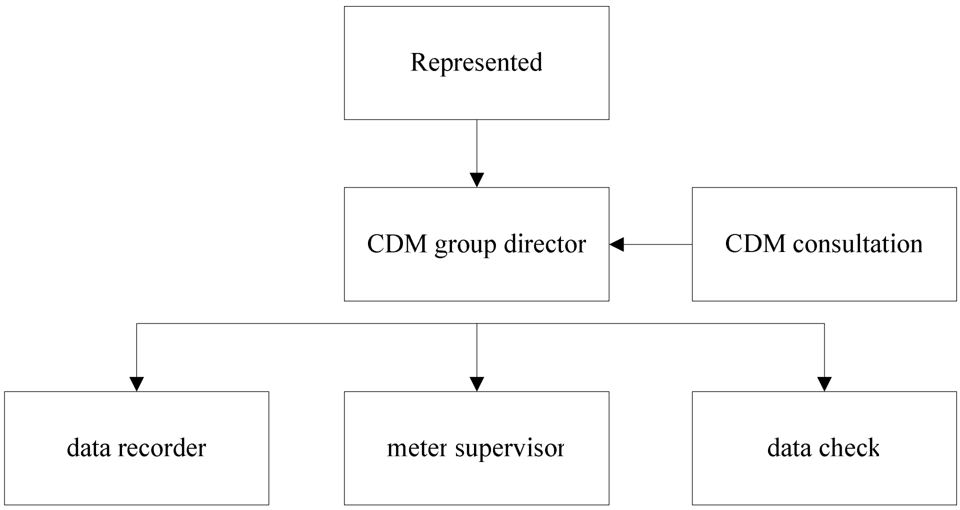
procedures to be applied:	
QA/QC procedures to be applied:	Sum of readings of two auxiliary watt hour meters, rechecking with the document from power grid company.
Any comment:	Recording watt hour meter data

B.7.2 Description of the monitoring plan:

The monitoring plan will be responsibly implemented by the project owner, it will ensure the emission reduction of the project during crediting period.

1. Monitoring organization

The project owner will set up a special CDM group to take charge data collection, supervision, verification and recordation. The group director will be trained and supported in technology by CDM consultation, the organization of the monitor group as follows:



CDM group director: Responsibility everything for developing, operating, monitoring, maintaining and communicating.

Data recorder: Responsibilities for record monitor data and pack up periodical.

Meter supervisor: responsibility for examine and maintenance of monitor meters, inspect and lead sealing of meters with third party (power grid company).

Data check: Responsibilities for supervising of monitor data and verify monitor data with power grid company.

2. Monitoring data

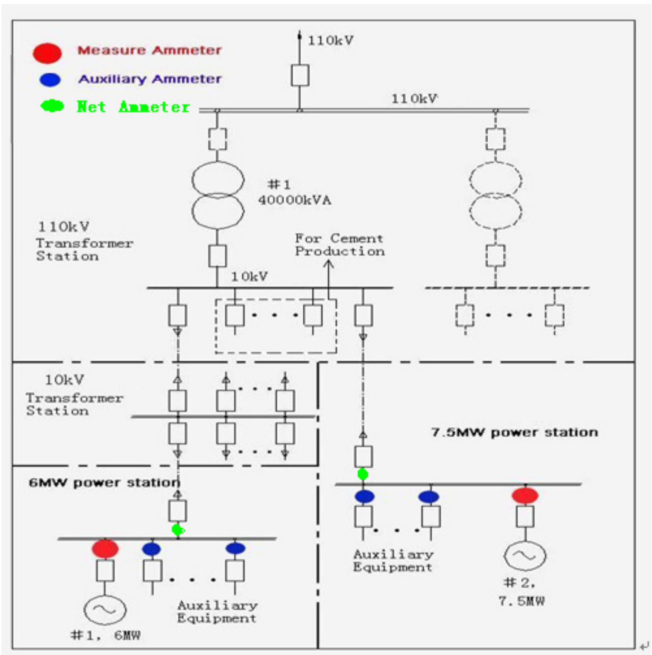
Because the baseline emission factor is ex-ante calculated, gross electricity generated, electricity used by power station of the project are mostly monitoring data.

3. Monitoring equipment and installation

Power measure equipment installation should be calibrated according "Technique Management Regulation of Power Measure Equipment" (DL/T448-2000, issued by State Economic and Trade Commission on Nov.03, 2000 and implemented on Jan.1, 2001). Before the power measure equipment operation, the project owner and power grid company should check and accept according "Technique Management Regulation of Power Measure Equipment" (DL/T448-2000).

Totally 8 watt hour meters should be installed for the project and 4 watt hour meters should be installed for every power unit. The first watt hour meter is a measure watt hour meter, should be installed at the export of the generator (measure watt hour meter) to measure net electricity generated from the unit, it's managed by power grid company; the other 2 watt hour meters should be installed at the import of the power station (auxiliary watt hour meter) to measure electricity used by the power station, it's managed by the project owner, sum of the two watt hour meters are auxiliary electricity of each power unit. The fourth watt hour meter should be installed to measure the net electricity of each power unit. Net electricity supplied to facility (net electricity) should be the measured electricity generated(gross electricity) subtract the auxiliary electricity(also can be read from net electricity watt hour meter).

Simplified electrical diagram is shown in the following figure:



4. Data collection

The steps of monitoring net electricity supplied to facility as follows:

(1) The project owner and power gird company should read and note data from measure watt hour meter and auxiliary watt hour meters at 24:00 clock on last day every month;

(2) The project owner should periodical read and note data from measure watt hour meter and auxiliary watt hour meters on every day;

(3) The power gird company should offer gross electricity generated and auxiliary electricity every month;

(4) The project owner should offer reading record of watt hour meters.

If reading of watt hour meters is not within allowed precision range at any month or watt hour meter function is not abnormal, net electricity supplied to facility should be confirmed as follow:

(1) Firstly, the power grid company offer one data of gross electricity generated confirmed by the project owner;

(2) The project owner should offer one data of auxiliary electricity confirmed by the power grid company.

(3) If the project owner and power grid company can't compass consistent idea about the method to estimate reading, it should be arbitrated according to conventional process to confirm consistency of reading estimated.

5. QC

The project owner should sign an agreement with power grid company that regulated quality control process of measure and adjust to ensure measure precision of net electricity supplied to facility. Seasonal watt hour meter inspection and locale check should be implemented according to standard and regulations of state electric power industry. After inspection and locale check, watt hour meters must be sealed. The project owner and power grid company should inspect and seal the watt hour meters together, no one can remove seal or modify the watt hour meter when other one (or its representative) is absent.

All the installed watt hour meters should be tested by measure inspection institution entrusted by the project owner and power grid company together, 10 days after something unexpected happened as follows:

(1) Measure error of measure watt hour meter and check watt hour meter exceeds the permitted error range;

(2) Watt hour meter has been repaired as parts trouble of watt hour meter.

6. Data management

The CDM group appointed by the project owner should keep monitoring data in the electron archives at every month end, electron document should be copied and printed to save as letter documents. The project owner should keep electricity sell/purchase invoice. Letter documents, as map, form, EIA report etc, should use with monitoring plan to check authenticity of data. In order to expediently obtain involved document and information of the project by verification team of DOE, the project owner should offer index of project document and monitoring report. All of the letter data and information should be keep in the archives by CDM group, all of the document should have one copy backup. All of the data should be saved after 2 years of crediting period.

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

The study of the baseline and the monitoring methodology was completed on 5th Nov., 2006.

The key individuals involved in the baseline study include:

1. **Mr. Wang Can**, canwang@tsinghua.edu.cn, Department of Environmental Science and Engineering， Tsinghua University. Department of Environmental Science and Engineering，Tsinghua University, Beijing , Tel: (8610)62785610-17

2. **Mr. Li Wangfeng**, liwangfeng@tsinghua.org.cn, Tsinghua University. Room 407, Block B, Xueyan Building, Tsinghua University, Beijing, Tel:(8610)62785857-703.

The above individuals or organizations are not the project participants.

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:

>>

March 08st, 2007

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

>>

21 years

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

C.2.1. Renewable crediting period

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

>>

Jan 1st, 2008

C.2.1.2. Length of the first crediting period:

>>

7years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Environmental impacts

>>

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

>>

The environmental impact assessment (EIA) report was approved by the Environmental Protection Administration of Jiangsu Province in April 30th, 2006.

The environmental impacts arising from the Project are analyzed in the following two phases:

Construction Phase

◆ Atmosphere impact

During the construction period, the constructing machine and the conveyance will discharge exhausted gas. Earthwork, loading and unloading of the construction materials, dump and transportation process will produce dust. So management in constructing area will be strengthen, workplace and hillock will be watered properly, and the constructing area will be set up barriers. By taking these measures, the environmental quality of atmosphere during the construction period could reach the standard.

◆ Noise impact

Running of constructing machines and conveyances in the construction period will bring noise pollution. Fitment, installation of electric saw and crane will also produce noises. Mix of these noises will produce higher sound and broader radiation scope. Work time will be properly arranged, constructing measures with less noises will be taken as possible, number and density of motor vehicles will be cut down to guarantee that the noises will not exceed the standard during the construction period.

◆ Waste water impact

Waste water during the construction period mainly comprises of living waste water and production waste water. The production waste water is composed by slurry, cooling water of machines and the cleaning water, which contains some soil and greasy dirt. Living waste water will be mainly produced by construction team, including washing water and flushing water, which contains lots of organic matters and pathogenic agents. Improper disposing of the waste water will affect the health of water body and the workers. Waste water production will be reduced and water collection pool will be constructed. Waste water will be collected up to be discharge into municipal pipeline grid and disposed by waste water treatment plant. By taking these measures, waste water produced during the construction period will be guaranteed to not discharge outside, and the surrounding water environmental quality will not be affected.

◆ Solid waste impact

Solid waste produced during the construction period mainly composes of construction waste and domestic garbage produced by the construction team. Dust will be produced if the construction waste is not cleaned up in time. Mosquitoes and diseases will be induced if the domestic garbage is not cleaned up in time, and the environment will also be affected. The solid waste will be collected in specialty, which will be disposed by the environmental sanitation department, and secondary pollution will be avoided.

Operation Phase

◆ Atmosphere impact

The project itself will not produce atmosphere pollutants. But after the exhausted gas from production lines passes by the heat surface, a part of dust will be subsided and conveyed back to the cement production line by the transportation system, and the tail gas of waste heat boilers will be back to the production lines; implementation of the power generation system will improve the situation of dust in cement kilns which has reached the standard. Therefore, implementation of the project will improve the surrounding atmosphere quality in some degree.

◆ Waste water impact

After the pre-treatment, the waste water will be cooled by circulating water system and be utilized in the cement production lines to cool the production equipment. The waste water will not be discharged outside and will not affect the surrounding water environment.

◆ Noise impact

The turbo-generator plant of the project utilizes semi-closed plant, and the waste heat boiler is installed with anechoic equipment. After the disposal, the noises will be mitigated a lot. It is estimated that the contribution value of the noises mitigation to the plant boundary will be 42.5dB(A), which is lower than discharge standard. After adding to the primary value of the noise in the plant boundary, the primary level will be kept up. Because the primary noise around the plant could not reach the standard in the night, so after the construction of the project, the noises from equipment and the primary noises will still surpass the standard in the night. For the nearest resident area is 600 meters far from the plant boundary, the noises from equipments after construction of the project will not disturb these residents.

According to the environmental impact assessment report of the project, during the construction and operation course, no other ecological environmental impact and danger will be brought up, and the construction of the project will not induce new pollutants' emission. The project will affect little on outside environment, and will not change the environmental function in local place.

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

>>

According to the report of environment impacts and the ratification of relative government departments, the project's environment impacts are not considered significant. No instruction is applicable.

SECTION E. Stakeholders' comments

>>

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

>>

In order to investigate the attitudes of social strata on constructing the proposed project, the public participants comprise of the relative clerks in the government, general public, local residents and the organizations for research and design.

Local government and experts proposed some pieces of suggestion on environmental effect, water and soil erosion and biologic resource, and both of them are positive on the problem. They consider that the proposed project properly utilizes the cement plant's waste heat resource, and will promote the economic development in local place. They provide the letter of support, which could be rechecked by DOE.

In March, 2006, the project owner has pasted some bulletins in government site and factory, and investigated the residents around the power plants of the project by symposium. The summary of the symposium will be narrated in the section E.2. The result of public investigation could be rechecked by DOE.

E.2. Summary of the comments received:

>>

The assessment of stakeholders is summarized as follow:

Summary of stakeholders' symposium about Jiangsu Qingshi Cement Plant's Low Temperature Waste Heat Power Generation Project

Time: March 12th 2006

Place: Meeting room, second floor, Jiangsu Qingshi Cement Co.Ltd

Attendee: the project owner employee, local government agent, labor union agent, neighborhood resident agent

The symposium was hold on March 12th 2006 at the meeting room, 2nd floor, Jiangsu Qingshi Cement Co. Ltd. There are 2 labor union agents, 2 neighborhood resident agents, other attendees and emcee.

The meeting was emceed by Shen Bohong, director of machine department of Jiangsu Qingshi Cement Co. Ltd. He introduced the basic content, economy benefit and environment protection benefit induced by the Project. Then the attendee declares themselves.

Labor union agent: the project is benefit to improve the employment rate, increase factory income, increase worker income, decrease heat pollution etc. The project is feasible, and all of the workers support the project.

Neighborhood resident agent: the project can't bring obvious affect, reduce heat pollution, decrease the electric demand from grid, is benefit to improve local environment, and advance employment rate. The residents support the project.

Summarize: stakeholders think that the project is benefit to improve environment, advance economy benefit, energy saving and reduce electric demand.

The project owner can provide some document about the symposium.

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

>>

All of the local residents and government support the project. According to the assessment from stakeholders, there is no necessity to adjust the design, construction and operation manner of the project at present.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Jiangsu Qingshi Cement Co.Ltd.
Street/P.O.Box:	Qingshi Cement Ltd.Co, Hufu Town, Yixing City, Jiangsu Province
Building:	-
City:	Yixing
State/Region:	Jiangsu
Postfix/ZIP:	214223
Country:	People's Republic of China
Telephone:	(86) 0510-87477999
FAX:	(86) 0510-87471279
E-Mail:	Qingshi123@126.com
URL:	-
Represented by:	Ying Donghui
Title:	-
Salutation:	Mr.
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Middle Name:	-
First Name:	Donghui
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Street/P.O.Box:	4-2, Ohtemachi 1-chome, Chiyoda-ku, Tokyo, Japan
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Represented by:	IKOMA MAKOTO
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Salutation:	Sir
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No official funds from any Annex 1 country are involved in the proposed project.

Annex 3

BASELINE INFORMATION

According to Annex 1-3 of "Bulletin about confirming baseline emission factor of regional power grid in China" announced by Office of National Coordination Committee on Climate Change , National Development and Reform Commission (NDRC) of China (DNA of China) on 9th. Aug. 2007.Detrails can be fond in the following web link.

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1361.pdf
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1359.pdf

Table A1-A3 are the basic data of the East China Power Grid from 2002 to 2004, including installed capacities and annual power generation. TableA4-A9 is the calculation process of OM and BM emission factor of East China Power Grid.

Table A1. Basic data of East China Power Grid in 2003

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Sum
Fuel-fired Power	MW	11092.6	22245	15321.2	9284.9	7092.8	65036.5
Hydro Power	MW	0	137.8	6054.5	649.1	6761.1	13602.5
nuclear power	MW	0	0	2406	0	0	2406
Wind & other	MW	0	0	39.7	0	12	51.7
Sum	MW	11092.6	22382.7	23821.4	9934	13865.8	81096.5

Table A2. Basic data of East China Power Grid in 2004

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Sum
Fuel-fired Power	MW	12014.9	28289.5	21439.8	9364.5	8315.4	79424.1
Hydro Power	MW	0	126.5	6418.4	692.8	7180.1	14417.8
nuclear power	MW	0	0	3056	0	0	3056
Wind & other	MW	3.4	17.5	39.7	0	12	72.6
Sum	MW	12018.3	28433.5	30953.9	10057.3	15507.5	96970.5

Table A3. Basic data of East China Power Grid in 2005

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Sum
Fuel-fired Power	MW	13113.5	42506.4	27688.1	11423.2	9345.4	104076.6
Hydro Power	MW	0	142.6	6952.1	749.8	8224.9	16069.4
nuclear power	MW	0	0	3066	0	0	3066
Wind & other	MW	253.3	58.8	37.2	0	52	401.3
Sum	MW	13366.8	42707.8	37743.4	12173	17622.3	123613.

Data source:

China Electric Power Yearbook 2003-2005, revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A4. Simple OM calculation sheet of East China Power Grid in 2003

Fuel sort	unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	subtotal	Emission factor	Oxidation rate	Average caloric value	Emission of CO_2 （tCO_2e）
								（tc/TJ）	（%）	（MJ/t,km3）	J=G*H*I*F*44/12/10000 （quality）
		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	Ten thousand ton	2618	6417.74	3442.4	2669.67	1754	**16901.81**	25.8	100	20908	334300359.13
Wash extractive coal							**0**	25.8	100	26344	0.00
Other wash coal							**0**	25.8	100	8363	0.00
Coke							**0**	25.8	100	28435	0.00
Coke oven gas	Hundred million m^3	1.99	0.06				**2.05**	12.1	100	16726	152125.76
Other coal gas		66.34					**66.34**	12.1	100	5227	1538454.90
Crude oil	Ten thousand ton						**0**	20	100	41816	0.00
Gasoline								18.9	100	43070	0.00
Diesel oil		1.26	14.71	13.99			**29.96**	20.2	100	42652	946463.80
Fuel oil		95.49	0.76	174.48		18.89	**289.62**	21.1	100	41816	9369683.52
LPG							**0**	17.2	100	50179	0.00
Refine dry gas		0.49	0.96				**1.45**	18.2	100	46055	44564.35
Nature gas	Hundred million m^3						**0**	15.3	100	38931	0.00
Other oil production	Ten thousand	18.91	5.3	15.04			**39.25**	20	100	38369	1104387.72

	ton										
Other coke production							**0**	25.8	100	28435	0.00
Other energy	Ten thousand tce	5.68		7.08			**12.76**	0	100	0	0.00
										sum	347456039.18

Table A5. East China Grid Fuel-fired Power Generation of 2003

	Generation	Self using ratio	Power supplied								
	（MWh)	（%）	（MWh)		From Shanxi Yangcheng to East China Grid(MWh)		10,705,870				
Shanshai	69444000	5.14	65,874,578		Emission Factor of Shanxi Yangcheng		0.949780	Coal Consumed 343(gce/kWh)		From Huazhong Grid(MWh)	13,756,040
Jiangsu	133277000	5.9	125,413,657							Emission Factor of Huazhong	0.797442
Zhejing	83089000	5.31	78,676,974							Total Emmision of Huazhong (tCO2)	276,404,544
Anhui	54156000	6.06	50,874,146		Total Emmision tCO2	**368,593,903**				Total Power Supplied From Huazhong Grid (MWh)	346,613,868
Fujian	42146000	5.07	40,009,198		Total Power Supplied MWh	**385,310,464**					
Sum			360,848,554	2003[y]	Emission Factor	**0.956615**					

Table A6. Simple OM calculation sheet of East China Power Grid in 2004

Fuel sort	unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	subtotal	Emission factor	Oxidation rate	Average caloric value	Emission of CO_2 (tCO_2e)
								(tc/TJ)	(%)	(MJ/t,km3)	J=G*H*I*F*44/12/10000 (quality)
		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	Ten thousand ton	2779.6	7601.9	4008.9	2906.2	2183.7	**19480.3**	25.8	100	20908	385300230.33
Wash extractive coal							**0**	25.8	100	26344	0.00
Other wash coal			5.46			4.63	**10.09**	25.8	100	8363	79826.01
Coke							**0**	25.8	100	28435	0.00
Coke oven gas	Hundred million m^3	2.59					**2.59**	12.1	100	16726	192197.91
Other coal gas		72.46					**72.46**	12.1	100	5227	1680380.49
Crude oil	Ten thousand ton						**0**	20	100	41816	0.00
Gasoline							**0**	18.9	100	43070	0.00
Diesel oil		2.69	27.17	6.23			**36.09**	20.2	100	42652	1140116.11
Fuel oil		58.52	55.07	202.89		23.26	**339.74**	21.1	100	41816	10991147.99
LPG							**0**	17.2	100	50179	0.00
Refine dry gas		0.77	0.55				**1.32**	18.2	100	46055	40568.93
Nature gas	Hundred million m^3		0.14				**0.14**	15.3	100	38931	30576.41

Other oil production	Ten thousand ton	21.22	1.37	24.89			**47.48**	20	100	38369	1335957.42
Other coke production							**0**	25.8	100	28435	0.00
Other energy	Ten thousand tce	6.43		15.48			**21.91**	0	100	0	0.00
										sum	400791001.59

Table A7. East China Grid Fuel-fired Power Generation of 2004

	Generation	**Self using ratio**	**Power supplied**								
	（MWh)	**（%）**	**（MWh)**		From Shanxi Yangcheng to East China Grid(MWh)		11,649,610				
Shanshai	71127000	5.22	67,414,171		Emission Factor of Shanxi Yangcheng		0.944241	Coal Consumed 341 (gce/kWh)		From Huazhong Grid(MWh)	26,933,850
Jiangsu	163545000	5.93	153,846,782					0.944241		Emission Factor of Huazhong	0.826448
Zhejing	95255000	5.68	89,844,516							Total Emmision of Huazhong(tCO2)	345,671,697
Anhui	59875000	6.03	56,264,538		Total Emmision tCO2	**434,050,485**				Total Power Supplied From Huazhong Grid MWh	418,261,666
Fujian	50490000	6.07	47,425,257		Total Power Supplied	**453,378,723**					

					MWh						
Sum			414,795,263	2004[y]	Emission Factor	**0.957368**					

Table A8. Simple OM calculation sheet of East China Power Grid in 2005

Fuel sort	**unit**	**Shanghai**	**Jiangsu**	**Zhejiang**	**Anhui**	**Fujian**	**subtotal**	**Emission factor**	**Oxidation rate**	**Average caloric value**	**Emission of CO_2 （tCO_2e）**
								（tc/TJ ）	**（%）**	**（MJ/t,km3 ）**	**J=G*H*I*F*44/12/10000 （quality）**
		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	Ten thousand ton	2847.31	9888.06	4801.52	3082.9	2107.69	**22727.48**	25.8	100	20908	449526099.64
Wash extractive coal							**0**	25.8	100	26344	0.00
Other wash coal							**0**	25.8	100	8363	0.00
Coke				0.03			**0.03**	25.8	100	28435	806.99
Coke oven gas	Hundred million m^3	1.68	1.38		1.71		**4.77**	12.1	100	16726	353970.67
Other coal gas		83.72	24.97	0.06	30		**138.75**	12.1	100	5227	3217675.86
Crude oil	Ten thousand ton			27.01			**27.01**	20	100	41816	828263.45
Gasoline							**0**	18.9	100	43070	0.00
Diesel oil		1.25	16	4.52		1.67	**23.44**	20.2	100	42652	740491.04

Fuel oil		59.39	13.22	153.22		7.45	**233.28**	21.1	100	41816	7546991.82
LPG							**0**	17.2	100	50179	0.00
Refine dry gas		0.57	0.83				**1.4**	18.2	100	46055	43027.65
Nature gas	Hundred million m^3	1.09	1.85	0.62			**3.56**	15.3	100	38931	777514.36
Other oil producti on	Ten thousand ton	21	8.38	34.8			**64.18**	20	100	38369	1805849.77
Other coke producti on							**0**	25.8	100	28435	0.00
Other energy	Ten thousand tce	12.36		15.29			**27.65**	0	100	0	0.00
										sum	464840691.25

Table A9. East China Grid Fuel-fired Power Generation of 2005

	Generation	**Self using ratio**	**Power supplied**	**Generation**							
	(亿 kWh)	**(MWh)**	**(%)**	**(MWh)**		From Shanxi Yangcheng to East China Grid(MWh)		77,244,000			
Shanshai	746.06	74606000	5.05	70,838,397		Emission Factor of Shanxi Yangcheng		0.938703	Coal Consumed 339	From Huazhong Grid(MWh)	160,410,000
Jiangsu	2114.29	211429000	5.96	198,827,832					0.938703	Emission Factor of Huazhong	0.771225
Zhejing	1081.1	108110000	5.59	102,066,651							
Anhui	629.18	62918000	5.9	59,205,838		Total Emmision tCO2	**661,062,081**				
Fujian	486	48600000	4.57	46,378,980		Total Power Supplied MWh	**714,971,698**				
Sum				477,317,698		Emission Factor	**0.924599**	2005[y]			

Source: China Energy statistics yearbook 2004-2006

Emission factor of 3 yrs weighted average: 0.942102

Table A10. Proportion of CO2 Emissions of solid, liquid and gas fuel used for power generation

		Shanghai	Zhejiang	Jiangsu	Anhui	Fujian	Sum	Calorific value	Emission factor	oxidation ratio	Emission Reduction
Fuel variety	Unit	A	B	C	D	E	F=A+…+E	G	H	I	J=F*G*H*I*44/12/100
Raw coal	Ten thousand ton	2847.31	4801.52	9888.06	3082.9	2107.69	22727.48	20908	25.8	1	449,526,100
Wash extractive coal	Ten thousand ton	0	0	0	0	0	0	26344	25.8	1	0
Other wash coal	Ten thousand ton	0	0	0	0	0	0	8363	25.8	1	0
coke	Ten thousand ton	0	0.03	0	0	0	0.03	28435	25.8	1	807
Sum											**449,526,907**
Crude oil	Ten thousand ton	0	27.01	0	0	0	27.01	41816	20	1	828,263
Gasoline	Ten thousand ton	0	0	0	0	0	0	43070	18.9	1	0
kerosene	Ten thousand ton	0	0	0	0	0	0	43070	19.6	1	0
Diesel oil	Ten thousand ton	1.25	4.52	16	0	1.67	23.44	42652	20.2	1	740,491
fuel oil	Ten thousand	59.39	153.22	13.22	0	7.45	233.28	41816	21.1	1	7,546,992

	ton										
Other oil production	Ten thousand ton	21	34.8	8.38	0	0	64.18	38369	20	1	1,805,850
Sum											**10,921,596**
Nature gas	Hundred million m^3	10.9	6.2	18.5	0	0	35.6	38931	15.3	1	777,514
coke oven gas	Hundred million m^3	16.8	0	13.8	17.1	0	47.7	16726	12.1	1	353,971
Other coal gas	Hundred million m^3	837.2	0.6	249.7	300	0	1387.5	5227	12.1	1	3,217,676
LPG	Hundred million m^3	0	0	0	0	0	0	50179	17.2	1	0
Refine dry gas	Hundred million m^3	0.57	0	0.83	0	0	1.4	46055	18.2	1	43,028
Sum											**4,392,189**
Total Sum											**464,840,691**

From above table, the following can be calculated： $_{Coal}\lambda$ =96.71%， $_{Oil}\lambda$ =2.35%， $_{Gas}\lambda$ =0.94%。

Emission factor of thermal power is calculated as follow:

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

$$= 0.9372$$

Table A11. Business best efficiency of all kinds of fuel-fired power

	variable	Efficiency of power supply	Emission factor of fuel （tc/TJ）	Oxidation rate	Emission factor （tCO2/MWh）
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal	*EFCoal,Adv*	35.82%	25.8	1	0.9508
Gas	*EFGas,Adv*	47.67%	15.3	1	0.4237
Oil	*EFOil,Adv*	47.67%	21.1	1	0.5843

Table A12. BM of East China Grid calculation

	Installed capacity of 2003	Installed capacity of 2004	Installed capacity of 2005	Installed capacity of 2004-2005	Proportion of newly installed capacity
	A	B	C	D=C-B	
Fuel-fired Power	65036.5	79424.1	104076.6	24652.5	92.53%
Hydro Power	13602.5	14417.8	16069.4	1651.6	6.20%
nuclear power	2406	3056	3066	10	0.04%
Wind & other	51.7	72.6	401.3	328.7	1.23%
Sum	**81096.5**	**96970.5**	**123613.3**	**26642.8**	**100.00%**
Proportion of total installed capacity of 2005	65.60%	78.45%	100%		

$EF_{BM,y}$=0.9372×92.53%=0.8672 tCO_2/MWh。

Table A13. Calculation of BM and CM emission factor of East China Power Grid

Emission factor of fuel-fired power (tCO2e/MWh)	BM (tCO2e/MWh)	CM=(OM+BM)/2 (tCO2e/MWh)
0.9421	**0.8672**	**0.90465**

Data resource/ Calculation formula:

Change of installed capacity: this is the difference between 2003 and 2005;

Combined emission factor = (OM+BM)/2 (The default values of ω_{OM} and ω_{BM} are 0.5).

Annex 4

The monitoring plan and information sees B.7.2.