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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
Zhangping Hongshi Cement Waste Heat Recovery Project
Version: 04
16/03/2011

A.2. Description of the project activity:

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Zhangping Hongshi Cement Waste Heat Recovery (WHR) Project is (hereafter referred to as "the project activity") developed and operated by Zhangping Hongshi Cement Co., Ltd. (hereafter referred to as "the project entity") in Suilin County, Xiyuan village, Zhangping City, Fujian Province, China.

The project entity has two clinker production lines with capacities of 5,000t/d and 4,500t/d respectively. Before the implementation of the project activity, the electricity consumed by the clinker production lines is imported from East China Power Grid and most waste heat in the clinker making process is vented to atmosphere, with a portion from the SP to dry the input raw materials and fuels. Therefore, the scenario prior to the project activity is "Import of equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation.

To effectively utilize the waste heat carried by the exit gases from Suspension Preheater (SP) and Air Quenching Chamber (AQC) , the project activity has decided to install two 9MW WHR systems with a total capacity of 18MW. After the installation of 4 WHR boilers (2 for SP exit gases and 2 for AQC exit gases), two steam turbines and two generators, waste heat from SP and AQC will be used to generate power through steam power route. The expected annual electricity supplied by the project activity is 111,872MWh, which will displace an equivalent amount of electricity supplied by fossil fuel based East China Power Grid, thereby reducing approximately 87,545tCO_2e/a.

The baseline scenario of the project activity is the same as the scenario existing prior to the implementation of the project activity "Importation of electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation." (Please refer to section B.4.)

The Project activity will promote the sustainable development as follows:
- Creating more job opportunities for the professionals, workers and residents in the region.
- Reducing GHGs emission from the predominantly fossil fuels based East China Power Grid.
- Reducing emissions of NOX, SO2 and ash from fossil fuels combustion.
- Helping in conservation of natural resources i.e. fossil fuels in power generation in grid power stations.

A.3. Project participants:

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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)	Private: Zhangping Hongshi Cement Co., Ltd.	No

United Kingdom of Great Britain and Northern Ireland	Private: Natsource Asset Management Corp.	No

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

A.4. Technical description of the project activity:

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A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>
People's Republic of China

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

>>
Fujian Province

A.4.1.3. City/Town/Community etc:

>>
Suilin County, Xiyuan village, Zhangping 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 activity is located at the Zhangping Hongshi Cement Co., Ltd. in Suilin County, Xiyuan village, Zhangping City, Fujian Province, P.R.China (seen in Fig. A 4-1). Its geographical coordinates are east longitude 117°22´27.78″ and north latitude 25°21´6.08″.

Fig. A-4-1 the site of the project activity

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

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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 and Scope Number 1- Energy Industries (renewable/non-renewable sources).

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

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In the pre-project activity, the electricity consumed by the aforesaid clinker production lines is supplied by East China Power Grid, and most waste heat from AQC and SP is vented to atmosphere except a portion of the waste heat from the SP is used to dry the input raw materials and fuels. Therefore, the scenario prior to the project activity is "Importation of electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation."

And the baseline scenario of the project activity is "Import equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation" (Please refer to section B.4.). East China Power Grid includes Zhejiang Power Grid, Shanghai Power Grid, Anhui Power Grid, Fujian Power Grid, and Jiangsu Power Grid.

A qualified independent third party, Tianjin Cement Design and Research Institute Co. Ltd (TCDRI), has measured and calculated the 'actual energy demand' and 'energy available' for preheating raw materials and fuel in project scenario December 2009. The result is in the table A-4-1[1].

The measurement and calculation of the 'actual energy demand' and 'energy available' for preheating raw materials and fuel is in compliance with the national standard 'The methods for the measuring of heat balance of cement rotary kiln (No. JC/T 733-1987 (96)' and 'Methods for the calculation of heat balance

[1] The test analysis report for 1# and 2# clinker production lines, conducted by Tianjin Cement Design and Research Institute Co. Ltd, December, 2009

heat efficiency and comprehensive energy consumption of cement rotary kiln (No. JC/T 730-1984 (96) ’. The calculation of ‘actual energy demand’ is based on the measured water content and heat of vaporization. The ‘energy available’ is determined by the flux and temperature of the waste gas from the SP boiler.

Table A-4-1 The actual energy demand and available for preheating

NO.	Actual Energy demand for preheating	Energy available for preheating
1#	46.60×10^6KJ (332292 Nm3/h,86□)	102.86×10^6KJ (332292 Nm3/h,205□)
2#	43.19×10^6KJ (332811 Nm3/h,93□)	100.51×10^6KJ (332811 Nm3/h,200□)

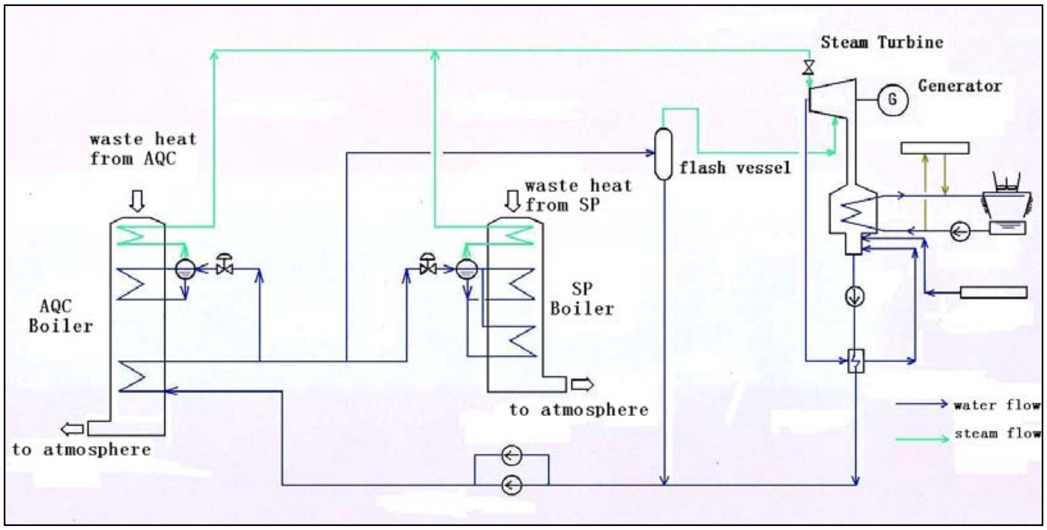
It can be seen from the table above that the energy of the exhaust gas from the SP boiler can meet the waste heat demand to preheat raw materials and fuel in the project scenario

To build a complete power generation station, the project activity will install two sets of SP and AQC boilers, two steam turbine generators, one DCS system, one water cycling system and one dust-removal system. All the equipments involved in the project activity are manufactured by domestic companies and have an average 15 years life time. The relevant information of the key facilities is listed in table A-4-1.

Table A-4-2 general information of major facilities in the project activity

Name	Set	Model / parameters		Manufacturer
Generator	2	Model number: Standard power: Standard rotational speed: Output voltage: Efficiency	QF-J9-2 9 MW 3,000r/min 10,500V 97%	Hangzhou Electric Equipment Works of Hangzhou Turbine Power
Turbine	2	Model number: Standard power: Standard rotational speed: Pressure of main gas: Temperature of main gas: Exhaust pressure:	N9-1.25 9000 kW 3,000r/min 1.25 MPa 310℃ 0.007MPa	Hangzhou Chinen Steam Turbine Power Co., Ltd.
SP Boiler	2	Inlet gas flux: Inlet gas temperature: Outlet gas temperature: Steam parameter:	350000Nm^3/h 330℃ 200℃ 26t/h-1.25Mpa-305℃	Hangzhou Boiler Group Co., Ltd.
AQC Boiler	2	Inlet gas flux: Inlet gas temperature: Outlet gas temperature: Steam parameter: Water supply parameter:	200000Nm^3/h 380℃ 85℃ 23/h-1.25Mpa-350℃ 40℃	Hangzhou Boiler Group Co., Ltd.

Fig. A-4-2 shows the thermodynamic system of the project activity.



According to the measurement and calculation of the TCDRI[2] after the operation of the 1# clinker production line in September 2007, and 2# clinker production line in December 2009, the energy demand and the amount of the waste heat for preheating raw materials and fuel in the baseline and project scenarios is in the table A-4-3 below.

The measurement and calculation of the energy demand and amount of the waste heat for preheating raw materials and fuel is according to the national standard, 'The methods for the measuring of heat balance of cement rotary kiln (No. JC/T 733-1987 (96)' and 'Methods for the calculation of heat balance heat efficiency and comprehensive energy consumption of cement rotary kiln (No. JC/T 730-1984 (96) '.

Table A-4-3 The actual energy and amount demand of waste heat for preheating

NO.	Actual Energy demand for preheating	
	Baseline Scenario	Project Scenario
1#	47.99×10^6KJ	43.19×10^6KJ
2#	49.20×10^6KJ	46.60×10^6KJ

It is believed that the project activity will produce 121,600MWh electricity annually and replace 111,872MWh electricity supplied by the fossil fuel based East China Power Grid per year. Therefore, promote sustainable development through a reduction of GHGs. The expected emission reductions of the project activity are 87,545 tCO_2e/a.

[2] The test analysis report for 1# clinker production line. Conducted by Tianjin Cement Design and Research Institute Co. Ltd, September 2007.

The test analysis report for 2# clinker production line. Conducted by Tianjin Cement Design and Research Institute Co. Ltd, September, 2009.

. The test analysis report for 1# and 2# clinker production lines, conducted by Tianjin Cement Design and Research Institute Co. Ltd, December, 2009

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For achieving actual and convincing emission reductions, the project entity has developed detailed monitoring plan. Electric meters will be installed at the input end of the transmission line to monitor the power supply. The clinker production, fuel consumption and NCV_{fuel} will also be monitored regularly. The monitoring parameters are below and the monitoring instruments and method have been specified in the section B7.2.

- $EG_{CP,y}$ Quantity of electricity supplied to cement plant from first and second WHR power station respectively;
- $O_{clinker,y}$ Annual production of clinker after project implementation for first and second cement production lines respectively ;
- $Q_{fuel,y}$ Annual fuel (only coal) consumption of clinker making process after project implementation for first and second cement production lines respectively ;
- $F_{P,y}$ Annual fuel consumption of clinker making process after project implementation for first and second cement production lines respectively;
- $NCV_{fuel,y}$ Calorific Value of fuel used in Clinker Production lines for first and second cement production lines respectively;
- $EF_{CO2,fuel,y}$ Emission factor of fuel used in Clinker production for first and second cement production lines respectively.
- $EF_{ELEC,y}$ Emission factor of electricity displaced by the project implementation
- $EI_{P,y}$ Energy consumption per unit clinker production after project implementation for first and second cement production lines respectively.
- $COEF_{fuel,y}$ Emission Factor for fuel used in clinker production for first and second cement production lines respectively
- PE_y Project emissions for first and second cement production lines respectively
- $EG_{GEN,y}$ Power generation of East China Power Grid and Central China Power Grid in recent five years
- Power consumption rate Power consumption rate of East China Power Grid and Central China Power Grid in recent three years
- $FC_{i,y}$ Amount of fuel consumed by the power sources delivering electricity to East China Power Grid and Central China Power Grid
- $NCV_{i,y}$ It is the net calorific value (energy content) per mass or volume unit of the fuel consumed by the power sources delivering electricity to Regional Power Grid.
- $EF_{CO_2,i,y}$ Carbon emission factor of the fuel consumed by the power sources delivering electricity to Regional Power Grid.
- Installed capacity Installed capacity of East China Power Grid in recent three years
- η The commercial optimized efficiency of China thermal power generation

For detailed monitor plan and measurement please refer to section B.7.1 and B.7.2.

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

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The proposed project activity adopts 10 years fixed crediting period. The total emission reductions in the crediting period are875,450 tCO_2e.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2010	51,068
2011	87,545
2012	87,545
2013	87,545
2014	87,545
2015	87,545
2016	87,545
2017	87,545
2018	87,545
2019	87,545
2020	36,477
Total estimated reductions (tonnes of CO_2e)	875,450
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	87,545

A.4.5. Public funding of the project activity:

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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 applied methodology is the approved consolidated baseline and monitoring methodology AM0024 (Version 02.1) "Methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants".

This methodology also refers to "Tool to calculate the emission factor for an electricity system" (version 02) and "Tool for the demonstration and assessment of additionality" (version 05.2).

For more information regarding the proposals and their consideration by the Executive Board please refer to 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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Applicability Criteria	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).	The electricity produced will partially meet the power demands of the project entity, and no excess electricity is supplied to East China Power Grid. All the electricity demanded in the baseline scenario of the project activity is supplied by East China Power 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 from the project activity will partially replace the East China Power Grid electricity.
The grid or identified specific generation source option is clearly identifiable.	According to the power grid division of China DNA, East China Power Grid consists of Zhejiang Power Grid, Shanghai Power Grid, Fujian Power Grid, Anhui Power Grid and Jiangsu Power Grid. The boundary of East China Power Grid is identifiable and information on NCPG is reported annually in the China Electric Power Yearbook.
Waste heat is only to be used in the project activity.	Waste heat is only to be used in the project activity as no heat demands for heating or other industry. And the waste gas from SP boilers can still meet the preheat requirements.
In the baseline scenario, the recycling of waste heat is possible only within the boundary of the clinker	The heat in clinker production can be divided into

making process.	four portions, Heat For clinker Formation, Losses, Vented and For Preheating. The waste heat generally means the heat vented from SP and AQC[3], which includes Vented portion and For preheating portion. According to the energy balance sheet[4] which is measured and calculated by a qualified independent third party, TCDRI, before the implementation of the project activity, most of the waste heat from SP and AQC in clinker production was vented to atmosphere except a portion from SP end was re-circulated to pre-heat raw materials and fuels. The detailed information of the total heat consumed and vented for 2 clinker production lines can be seen in the following Table B2-1.
Non-applicability Criteria	**The proposed project activity**
This methodology is NOT applicable to project activities 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.	In the pre-project activity, only a small portion of waste heat is used in drying of raw material and the rest was vented to atmosphere without any utilization. Therefore, the current use of waste heat or the identified alternative business as usual use of waste heat is located in the clinker making process.
This methodology is NOT applicable to project activities that affect process emissions from cement plants.	The process emissions from cement plants are mainly from clinker production line. The clinker making process is a chemical process with pre-determined material inputs and reaction temperature. The project activity will only use the vented waste heat from AQC and SP and in no way will affect the cement manufacture process. Therefore, no change will happen in the process emissions.

Table B2-1 **Energy balance out (%) of that energy received**

Production Line	**Energy balance out (%) of that energy received**			
	For preheating (%)	**Vented** (%)	**Clinker formation** (%)	**Other losses** (%)
1#	**6.83**	**32.29**	**49.43**	**11.45**
2#	**6.99**	**31.20**	**49.78**	**12.03**

[3] Assembly of waste heat power generation technology for cement kiln, March 2009, Page 8

[4] The test analysis report for 1# clinker production line. Conducted by Tianjin Cement Design and Research Institute Co. Ltd, September 2007.

The test analysis report for 2# clinker production line. Conducted by Tianjin Cement Design and Research Institute Co. Ltd, September, 2009.

Thus the project activity satisfies the applicability conditions specified in AM0024 (Version 02.1); the aforesaid methodology is applicable to the project activity.

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

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The physical boundary consists of waste heat sources (SP and AQC), WHR boilers (SP boilers and AQC boilers), steam turbine generators, the auxiliaries and all power plants physically connected to East China Power Grid. East China Power Grid includes Zhejiang Power Grid, Shanghai Power Grid, Anhui Power Grid, Fujian Power Grid, and Jiangsu Power Grid.

Table B-3-1 lists the emissions sources included or excluded from the project boundary. Fig. B-3-1 illustrates the emissions sources and gases and the monitoring variables in the project boundary.

Table B-3-1 the sources and gases included in the project activity

	Source	Gas	Included?	Justification/Explanation
Baseline	All power plants connected to East China Power Grid	CO_2	Included	Main emission source. This is conservative.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Clinker production line	CO_2	Included	Included in case of project activity does increase the energy consumption per unit in clinker production. Otherwise, the emission source excluded.
		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.

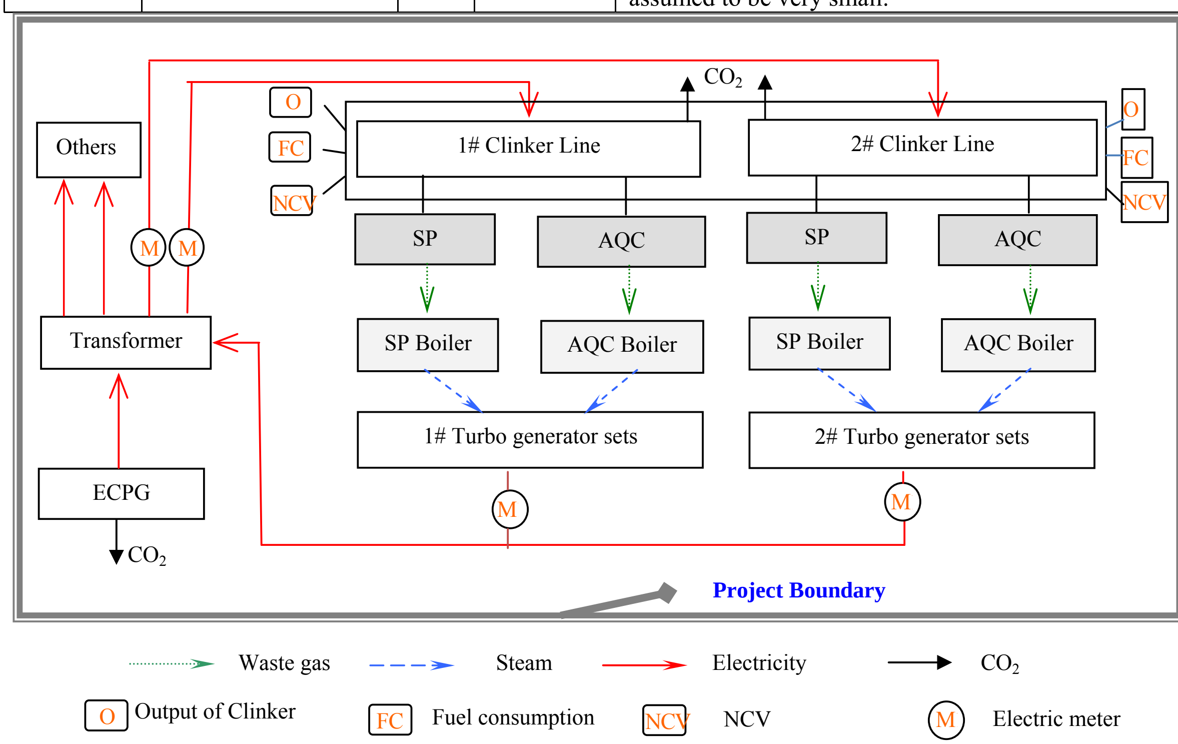

Fig. B-3-1 Project boundary of the project activity

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

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According to AM0024 (Version 02.1), the baseline scenario for the project activity will be identified through the following steps:

Step 1: Determination of technically feasible alternatives to the project activity

Sub-Step 1.A –Identify and list, within the local context, the current business, as usual utilization of, and options technically feasible for, waste heat utilization.

According to the China Cement Association[5], most of the waste heat from SP and AQC in the clinker production process is vented to atmosphere except a portion from SP end was re-circulated to pre-heat raw materials and fuels and only few companies used the waste heat to produce power in China. And according to the Fujian Development and Reformation Committee[6], most of the waste heat in the other cement companies is vented to atmosphere except a portion from SP end was re-circulated to pre-heat raw materials and fuels in Fujian Province except two cement companies used the waste heat to generate power. Both of them have sought for the support of CDM. The two project activities are 'DEED 7.5 MW Waste Heat Recovery Power Generation Project at Long Yan'7 developed by Fujian Long Lin Group, Co., Ltd., and 'Fujian Cement 4# and 5# kilns Waste Heat Recovery for Power Generation Project'8 developed by Fujian Cement Inc.

Furthermore, there are no demands for district heating or industry heating which has been validated by the auditor onsite. The project is located in rural area where there are only a few residents but no other industry plants around, which have been checked by the auditor on site. Besides, it is not financially attractive to transmit waste heat to urban residential area due to the long distance and large investment in pipe network.

Hence, there are no feasible alternatives for utilizing the additional waste heat. The waste heat released from the clinker production lines of the project entity will only be used in the proposed project activity.

Sub-Step 1.B Identify and list the source of electric energy supply for the cement plants, in the local context.

There is no other local loads and existing captive power plant in Zhangping plant, so the E_{load} and $EG_{ATEXIST}$ is zero. Table B-4-1 shows the historical and projected electrical supply and demand of project entity over the Crediting period.

Table B-4-1 Historical and Projected Supply and Demand of the project entity

Year	Estimated value	2007.5.28 ~2008.5.27	2008.5.28 ~2009.4.20[9]	2009.4.21 ~2010.4.20	2010.4.21 ~2020.4.20
Actual	319[10]	97.5	178.8	257.6	319

[5] The results of consultation for China Cement Association is in the letter from DRC of Zhangping City.

[6] The letter from DRC of Zhangping City.

[7]http://www.dnv.com/focus/climate_change/Upload/DEED%207.5%20MW%20Waste%20Heat%20Recovery%20Power%20Generation%20Project%20at%20Long%20Yan.pdf

[8] http://www.netinform.net/KE/files/pdf/080804_%20Fujian%20Cement_V02_GSP.pdf

[9] The project activity operated on 21 April, 2009.

Annual Demand (10^6KWh) Ecement					

Table B-4-1 shows that the project entity has been importing electricity from East China Power Grid and will continuously purchase electricity from the grid in the absence of the project activity as usual practice Then the possible sources of electric energy supply for the project entity include:
Scenario 1: Implementation of the project activity not undertaken as a CDM project activity
Scenario 2: Import equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation
Scenario 3: Implementation of a similar scale fossil fuels fired power station

For **Scenario 1**, the WHR technology is relatively mature recent years in China, thus no blocking technical barriers existed for implementation of the project activity.
For **Scenario 2**, no any technical barriers faced, so the electricity may be continuously imported from East China Power Grid as usual practice.
For **Scenario 3**, one fossil fuels based captive power station with a similar scale may be built, as no technically barriers existed.

Step 2: Compliance with regulatory requirements
The alternatives identified through technically feasible analysis, the following options will be discussed by compliance with regulatory requirements:
Scenario 1: Implementation of the project activity not undertaken as a CDM project activity
Scenario 2: Import equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation
Scenario 3: Implementation of a similar scale fossil fuels fired power station

S**cenario 1** is in compliance with all applicable legal and regulatory requirements. And the project Application Report was officially approved on September 13, 2007[11].
S**cenario 2** is in compliance with all applicable legal and regulatory requirements. According to the regulation and polities currently governing the Chinese power market, East China Power Grid should supply electricity to meet the demand of the growing industrial and commercial sectors of the region.
And for **Scenario 3**, as per Chinese power regulations, coal based power plants of less than 135MW and gas or diesel based power plant of less than 100MW are prohibited[12]. The installed capacity is only 18MW which is much less than 100MW and 135MW, so the construction and operation of a similar scale fossil fuel based captive power plant does not comply with the legal and regulatory requirements.

Since scenario 3 is eliminated, the project entity either continues to purchase power from East China Power Grid or undertake the project activity with or without the CDM.

Step 3: Undertake economic analysis of all options that meets the regulatory requirements
For **scenario 1**, the investment returns of this scenario have been calculated on the basis of savings from substituting power from East China Power Grid. According to the Feasibility Study Report of the Waster

[10] The estimated value is from FAR when the two cement lines operate regularly.
[11] The approval letter for Zhangping Hongshi Cement waste heat recovery project of Fujian Development and Reform Commission
[12] http://sfj.bjsjs.gov.cn/lawstar/temp/287513702law.htm

Heat Recovery Power Station, the IRR of equity investment is 7.34%, and for the detailed information please refer to **Investment Analysis** in section **B.5.**
For **scenario 2**, the project entity would continue to purchase power from East China Power Grid and vent the waste heat as usual practice. No extra investment will be required or any barriers will be faced.

According to AM0024 (Version 02.1), 'The option with the highest IRR is the baseline scenario for waste heat recovery and electricity supply to the cement works'. Therefore, **scenario 2,** Import equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation, is the baseline scenario of this project activity.

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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As a cement company, the first consideration of project entity is to expand the cement production capacity and survive the serious challenges of the structural adjustment in Chinese cement industry. The project entity would not consider the project activity which is not financial attractive. However, the parent company of the project entity--Hongshi Group, which has developed its other subsidiary companies' into a CDM project activity, suggested the project entity to apply for the help of CDM. The additional benefits from CDM can make the project activity to be financial attractive, so the project entity determined to develop the project activity as a CDM project activity.
And timeline of the project activity has been list in table B-5-1.
Table B-5-1 the timeline of the project activity

Actual/Expected Date (DD/MM/YY)	**Project Activity**	**Reference**
July 2007	Feasibility Study was completed.	Feasibility Study Report.
19/08/2007	Board Decision to proceed	The Board Decision Report.
20/08/2007	Environmental Impact Assessment	Environmental Impact Assessment Report.
25/08/2007	CDM Development Agreement signed.	CDM Development Agreement
30/08/2007	Environmental Impact Assessment Approved	Approval of Environmental Impact Assessment
20/08/2007~24/08/2007	Stakeholders consultancy	Questionnaire of the stakeholders.
13/09/2007	Approval of Feasibility Application Report (FAR) by Fujian Development & Reform Committee.	Approval of Feasibility Application Report.
30/11/2007	Equipment Purchase Contract Signed	Equipment Purchase Contract.
28/12/2007	Construction Start Date	The report of construction start.
18 /04/2008	The loan agreement signed.	The loan agreement.
06/06/2008	CER Purchase Contracts signed.	The CER Purchase Contracts
October 2008	The Chinese LOA issued by NDRC.	The LOA of China.
01/12/2008	Commissioning	The operation record of project entity.
21/04/2009	The first WHR power station operated	Grid Connection Agreement
01/10/2009	The second WHR power station operated	Operation record

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
Sub-step 1a: Define alternatives to the project activity:
In section B.4., the following credible alternatives to the project activity have been defined:

Alternative 1: Implementation of the project activity not undertaken as a CDM project activity
Alternative 2: Import equivalent electricity from East China Power Grid and vent the waste heat to atmosphere as continuation of the current situation
Alternative 3: Implementation of a similar scale fossil fuels fired power station
Sub-step 1b: Consistency with mandatory laws and regulations:
As it is shown in section B.4, **Alternative 1, Alternative 2** are in conformity with applicable laws and regulations. And **Alternative 3** is not one credible alternative as this alternative does not comply with 'Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below'.

Step 2: Investment analysis
Sub-step 2a: Determine appropriate analysis method
'Tools for the demonstration and assessment of additionality (version 05.2)' suggests three analysis methods including simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). And the **Annex: Guidance on the Assessment of Investment Analysis (Version 02)** in the 'Tools for the demonstration and assessment of additionally' further claims that 'benchmark approach should be selected in case of the alternative to the project activity is the supply of electricity from a grid'. As the alternative to the project activity is satisfied to this criterion, Benchmark Analysis Method (Option III) is considered appropriate to assess the additionality.
Sub-step 2b: Benchmark Analysis Method (Option III)
The IRR is selected as the indicator for the benchmark analysis of the project activity. With reference to the latest edition of "Project Economic Evaluation Methods and Parameters", the equity investment IRR (after tax) for cement industry accounts for 12%[13]. The project activity has adopted this benchmark rate in the following financial analysis.
Sub-step 2c: Calculation and comparison of financial indicators
Based on the feasibility study report of the project, basic parameters for calculation of financial indicators are shown in table B-5-2:
Table B-5-2 Basic parameters from the feasibility study report

No.	Parameter	Value	Sources
1	Installed capacity	2×9MW	FAR
2	Average power	2×8MW[14]	FAR
3	Operation hours	7,600h[15]	FAR
4	Estimated annual output	111,872MWh	FAR
5	Project lifetime	15 years	FAR
6	Total investment	RMB 155.97 million	FAR
7	Equity investment	RMB 61.77 million	FAR
8	The price of purchasing electricity from East China Power Grid	0.365 Yuan/kWh[16]	FAR
9	Average O&M cost over the project lifetime	RMB 21.38 million	FAR
10 11	Residual value	RMB 6.139 million	FAR
	Value added tax	17%	FAR

[13] The Third Edition of "Project Economic Evaluation Methods and Parameters", 2006,page 74
[14] The average power is based on the results of measurement of the waste heat by the FAR designer.
[15] The operation hours are based on the experience of the FAR designer.
[16] Refer to the electricity purchase invoice in 2007. (Value Added Tax not included)

12	Income tax	25%	FAR
13	Urban construction maintenance taxes	6% of Value added tax	FAR
14	Surtax for education expenses	4% of Value added tax	FAR
15	Crediting period	10 years	Selected by the project entity
16	Expected CERs price	EUR 9/tCO_2e	Imputed price

(2) Comparison of IRR for the project and the financial benchmark
In accordance with benchmark analysis (Option III), if the financial indicators (such as IRR) of the project are lower than the benchmark, the project is considered as financially unattractive.
Table B-5-3 Financial indicators of the project activity

	IRR(Equity investment) Benchmark=12%
Without CDM revenues	7.34%[17]
With CDM revenues	12.7%

Table B-5-3 shows without CDM revenue the project is not financially attractive. Despite of lower returns, the project promoters have decided to invest in the project activity just to promote waste heat recovery projects keeping in mind that the CDM benefit will improve the returns.

Sub-step 2d. Sensitivity analysis
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.
The uncertain factors, such as (1) Total investment, (2) Operating cost, (3) Electricity output and (4) Electricity tariff were selected for sensitive analysis of financial attractiveness.
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-5-4).

Table B-5-4 variety of the financial indicators when the equity IRR of the project activity equal to the benchmark

Fixed investment (%)	-21.63
Annual O&M costs (%)	-23.46
Net Generated electricity quantity (%)	+12.68
Electricity tariff (%)	+12.68

It can be seen from table B-5-4 that when the fixed investment decreases 21.63%, the project achieve benchmark. However, it is impossible to implement the project if reducing the fixed investment by at least 21.63%, 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[18](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 23.46%; However, the salary to the working staff increased 12.8% and 12.7%

[17] From FAR of the project activity
[18] http://www.dcement.com/Article/200701/40878.html
http://jgs.ndrc.gov.cn/jgqk/t20071023_166354.htm

(excluding inflation) in 2005 and 2007[19] (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 12.68%, 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 8564 hours or efficiency of generator to at least 12.68%, And it is impossible for project activity achieve to 8564 hours and the efficiency of generator is mainly above 90%, so it is impossible for the electricity supply to the benchmark.

If the electricity tariff increases by 12.68%, the project achieves the benchmark. For the electricity tariff is under strict control of the central government in China. In order to ensure price stability for the whole country, the central government controls price of basic elements, such as electricity and commodity. Adjustment of electricity tariffs involves negotiations among several government departments and may even need to be approved by the CPC Central Committee[20]. Secondly, even the electricity tariff can increase 12.68%, the equity IRR of the project can not reach the benchmark level because the electricity tariff increasing alone is not a realistic assumption. Under the real situation, the other parameters used in the investment analysis, like investment costs and O&M costs, will also increase. The rise of electricity tariff will increase the IRR whilst the rise of O&M costs will lower them. Both parameters work against each other. And if the same inflation for the products is considered, their increase will cancel out each other. It is general knowledge that the growth rate in other costs will definitely escalate faster than electricity tariff as electricity tariff is under the intervention of the Chinese Central government.

Therefore, the project activity is still lack of financial attraction, the additionality assessment proceed to step 3: Barrier Analysis.

Step 3: Barrier Analysis
The barrier analysis was not used to assess the additionality of the project activity, then proceed to step 4: Common practice analysis.

Step 4: Common practice analysis
Sub-step 4a: Analyze other activities similar to the proposed project activity:
The selected region for common practice is Fujian Province, China, in which all cement plants have similar geographical environment and the same environment with respect to regulatory framework, investment climate, access to technology and financing. There were no other waste heat recovery project activities which have been in operation until Dec. 2008 in Fujian, China, except the two WHR project for Fujian Long lin company and Fujian cement company (please refer to sub-step 4b).
Sub-step 4b: Discuss any similar options that are occurring:
By the end of 2007, 20 advanced PC lines have been in operation[21] in Fujian Province. And only two WHR power stations[22] have been installed until Dec. 2008, of which both have sought for the support of CDM. The two project activities are 'DEED 7.5 MW Waste Heat Recovery Power Generation Project at

[19] http://www.china.com.cn/economic/zhuanti/08jjbg/2008-01/23/content_9575757_2.htm
http://www.molss.gov.cn/gb/news/2007-05/18/content_178167.htm
[20] Interim Provisions for the Administration of Power Selling Prices, China NDRC, March 28, 2005.
[21] http://www.cnrmc.com/news/list.asp?id=38768

[22] The consulting reply from NDRC Zhangping Branch. NDRC Zhangping Branch is the official governmental department which has the authority to approve all new construction projects in Zhangping district, and also part of the NDRC system of Fujian province. So NDRC Zhangping Branch has access to all relevant data in Fujian Province.

Long Yan'[23] developed by Fujian Long Lin Group, Co., Ltd., and 'Fujian Cement 4# and 5# kilns Waste Heat Recovery for Power Generation Project'[24] developed by Fujian Cement Inc. There were no other waste heat recovery project activities being in construction in Fujian Province, China up to December 2008.

Therefore, this kind of project activity similar to the project activity is not common practice in Fujian, China.

In conclusion, the project activity passes all the necessary steps of additionality analysis and is additional. In the absence of the project activity, East China Power Grid will continually supply equivalent amount of power, and the coal fired power plants based East China Power Grid will keep on discharging carbon dioxides into the atmosphere.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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Calculate the emissions reductions of the project activity according to the approved consolidated baseline and monitoring methodology AM0024 (Version 02.1)**.**

Step 1 Determination of baseline emissions:

The electricity demands of the project entity would imported from the East China Power Grid in the baseline scenario. According to methodology AM0024 (Version 02.1), the calculation formulas of baseline emission express as bellow:

$$BE_y = EG_{CP,y} \times EF_{Grid,y} \qquad \text{(B6.1)}$$

Where:

BE_y	the baseline emissions in year y, expressed in tCO_2
$EG_{CP,y}$	the electricity supplied from the project activity to the cement plant, expressed in MWh
$EF_{Grid,y}$	the emissions factor of the baseline electricity supply source—East China Power Grid, expressed as tCO_2 / MWh

The baseline grid emission factor ($EF_{Grid,y}$) is calculated as the simple average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$). And the $EF_{Grid,y}$ which use the ex ante value only is for ex ante estimation, during the crediting period ex post value will be used. In accordance with "Tool to calculate the emission factor for an electricity system" (version 02), the baseline emission factor should be calculated as described below:

Sub-Step 1.1 Identify the relevant electric power system

According to "Tool to calculate the emission factor for an electricity system" (version 02), the **project electricity system** is defined as East China Power Grid as the project power generation will be physically connected to East China Power Grid. As China DNA has issued the division grid region of China[25], East

[23] http://www.dnv.com/focus/climate_change/Upload/DEED%207.5%20MW%20Waste%20Heat%20Recovery%20Power%20Generation%20Project%20at%20Long%20Yan.pdf

[24] http://www.netinform.net/KE/files/pdf/080804_%20Fujian%20Cement_V02_GSP.pdf

[25] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2875

China Power Grid includes Shanghai Power Grid, Jiangsu Power Grid, Zhejiang Power Grid, Anhui Power Grid and Fujian Power Grid.

As there are electricity transfers between East China Power Grid and Central China Power Grid and Shanxi Yangcheng Power Plant, the CO_2 emission factor for net electricity imports form Central China Power Grid and Shanxi Yangcheng Power Plant must be calculated on calculation of Operation Margin emission factor of East China Power Grid. According to "Tool to calculate the emission factor for an electricity system" (version 02), the project activity selects option (b) to calculate CO_2 emission factor for net electricity imports form Central China Power Grid and Shanxi Yangcheng Power Plant, that is "the weighted average operating margin (OM) emission rate of the exporting grid".

Sub-Step 1-2 Choose whether to include off-grid power plants in the project electricity system
According to the "Tool to calculate the emission factor for an electricity system" (version 02), project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

The East China Power Grid chosen in this project does not include any off-grid power plants in its electricity system. Hence only grid power plants are included in the calculation.

Sub-Step 1-3 Select a method to determine the operating margin (OM)
According to the "Tool to calculate the emission factor for an electricity system" (version 02), the electricity baseline emission factor ($EF_{Grid,OM,y}$) is calculated as below:

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

Each method is described as below:
The detailed dispatch data of ECPG is not publicly available, so method (b) and method (c) are not applicable.
Method (a) 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 2003-2007 of East China Power Grid where the project activity connected into, the low-cost/must run resources constitute less than 50% of total amount grid generating output. And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation. The detailed information can be seen in Table B-6-1.
Table B-6-1 Annual electricity generation of East China Power Grid of 2003-2007

No.	Year	Electricity generation/GWh			Percentage of low-cost/must run resources /%
		Total Power	Thermal power	Hydropower, etc.	
1	2003[26]	429,327	382,112	47,015	11.00
2	2004[27]	488,010	440,411	47,598	9.75
3	2005[28]	574,467	505,855	68,62	11.94
4	2006[29]	666,820	590,541	76,279	11.43
5	2007[30]	755,492	673,002	82,490	10.92

[26] China Electric Power Yearbook 2004 page. 709;
[27] China Electric Power Yearbook 2005 page. 474;
[28] China Electric Power Yearbook 2006 page. 568.
[29] China Electric Power Yearbook 2007 page. 638.

Thus, the method (a) Simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{Grid,OM,y}$) for the project activity.

Sub-Step 1-4 Calculate the operating margin emission factor according to the selected method

In accordance with "Tool to calculate the emission factor for an electricity system" (version 02), the simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. It may be calculated:

- Based on data net electricity generation and a CO_2 emission factor of each power unit (Option A), or
- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option B),

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known;and

(c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in sub-step 1-2).

As the data of the net electricity generation, fuel consumption and fuel type for every plant of the power grid are not public available, Option B is used for OM calculation. And the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel types and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y})}{EG_y} \quad \text{(B6.2)}$$

Where:

$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh);
$FC_{i,y}$	Amount of fossil fuel type i consumed in the East China Power Grid in year y (mass or volume unit);
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit);
$EF_{CO_2,i,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);
EG_y	Net electricity generated and delivered to the grid by all power sources serving the East China Power Grid, not including low-cost / must-run power plants / units, in year y (MWh);
i	All fossil fuel types combusted in power sources in the East China Power Grid in year y;
y	The relevant year as per the data vintage chosen in sub-step 3

The Simple OM Emission Factor ($EF_{grid,OM,simple,y}$) of the proposed project is calculated on the basis of

[30] China Electric Power Yearbook 2008 page 748.

the fuel consumption data for electricity generation of East China Power Grid, excluding those of low cost and must-run power sources. These data are obtained from the *China Electric Power Yearbook* (2006~2008, published annually) and *China Energy Statistical Yearbook* (2006~2008). Based on these data, the *OM* emission factor ($EF_{grid,OM,y}$) is calculated ex-ante as a 3-year average (2005~2007), based on the most recent statistics available. And the $EF_{grid,OM,simple,y}$ will be updated in whole crediting period.

The *OM* emission factor of East China Power Grid was calculated, and the resulting is 0.8825tCO_2/MWh. The details could be seen in Annex3 and the DNA's web site:
http://cdm.ccchina.gov.cn/website/cdm/upfile/file2333.pdf

Sub-step 1-5: Identify the group of power units to be included in the build margin
The sample group of power units *m* used to calculate the build margin consists of either:
(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.
Project participants should use the set of power units that comprises the larger annual generation.
As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid.

Power plant registered as CDM project activities should be excluded from the sample group m. However, if the group of power units, not registered as CDM project activity, identified for estimating the build margin emission factor includes power unit(s) that is (are) built more than 10 years ago then:
(i) exclude power unit(s) that is (are) built more than 10 years ago from the group; and
(ii)include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.
Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

In terms of vintage of data, project participants can choose between one of the following two options:
Option 1 For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
Option 2 For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The "option 2" will be appropriate to ex-post calculate the build margin emission factor of East China Power Grid. The build margin emission factor of East China Power Grid calculated need be updated in the whole crediting period.

Sub-Step 1-6 Calculate the Build Margin Emission Factor

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{(B6.3)}$$

Where

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh);
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh);
m	Power units included in the build margin;
y	Most recent historical year for which power generation data is available;

As per the clarifications are given by EB[31], 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 Calculating the percentages of the CO_2 emissions from the Coal-fired, Oil-fired and Gas-fired power plants in CO_2 emissions from total thermal power plants:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}} \quad \text{(B6.4)}$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}} \quad \text{(B6.5)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j}} \quad \text{(B6.6)}$$

Where:

λ_{Coal}, λ_{Oil} and λ_{Gas} are respectively the percentages of CO_2 emissions from the coal-fired, oil-fired, gasl-fired power plants in CO_2 emission from total thermal power plants in year *y*;

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

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

$NCV_{i,y}$ is the Net calorific value (energy content) of fossil fuel type *i* in year *y*;
$EF_{i,j,y}$ 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.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv,y} + \lambda_{Oil} \times EF_{Oil,Adv,y} + \lambda_{Gas} \times EF_{Gas,Adv,y} \quad \text{(B6.7)}$$

where $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ the emission factor of the most efficient 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.

$$EF_{Grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad \text{(B6.8)}$$

Where,
CAP_{Total} is the total newly added capacity of power capacity,
$CAP_{Thermal}$ is the newly added capacity of thermal power.

The *BM* emission factor of East China Power Grid was calculated, and the result is $0.6826tCO_2e/MWh$. The details could be seen in Annex 3.

Sub-step 1-7 Calculation of Baseline Emission Factor
It is calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$):

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \text{(B6.9)}$$

Where

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

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

w_{OM} Weighting of operating margin emission factor；

w_{BM} Weighting of build margin emission factor；

Where the weighted ω_{OM} and ω_{BM} , by default, are 50% (i.e., $\omega_{OM} = \omega_{BM} = 0.5$), $EF_{OM,simple,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh. The Building Margin Emission Factor (EF_y) was calculated according to the above data: EF_y = $0.78255tCO_2e/MWh$

Sub-step 1-8 Calculation of Baseline Emissions
According to the approved consolidated baseline and monitoring methodology AM0024 (Version 02.1), the baseline emissions for the year *y* shall be determined as follows:

$$BE_y = EG_{CP,y} \times EF_{Elec,y} + EG_{Grid,y} \times EF_{Grid,y} \quad \text{(B6.10)}$$

Where

BE_y	the baseline emission due to displacement of electricity during the year *y* in tons of CO_2e;
$EG_{CP,y}$	the electricity supplied from the project activity to the cement plant, expressed in MWh;
$EF_{Elec,y}$	the emissions factor of the baseline electricity supply source, expressed as tCO_2/MWh. If in the baseline scenario electricity is supplied from the grid, then $EF_{Elec,y}$ is the emission factor of the grid - $EF_{Grid,y}$;
$EG_{Grid,y}$	the electricity supplied from the project activity to the grid , expressed in MWh;
$EF_{Grid,y}$	the emissions factor of the electricity grid, expressed as tCO_2/MWh.

As the power generation of this project activity does supply to the project entity for clinker production, there are no extra power deliver to the Grid, then the baseline emissions will be calculated as:

$$BE_y = EG_{CP,y} \times EF_{Elec,y} \quad \text{(B6.11)}$$

Step 2 Determination of project emissions:

As per AM0024 (Version 02.1), Project emission (PE_y) is the difference in CO_2 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.

PE_y is determined as follows:

$$PE_y = (EI_{p,y} - EI_B) \times O_{Clinker,y} \times COEF_{fuel,y} \quad \text{(B6.12)}$$

Where

EI_B	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).
$EI_{p,y}$	the ex-post energy consumption per unit output of clinker for given year, *y*, in TJ/ton of clinker produced
$COEF_{fuel,y}$	the carbon coefficient (tCO_2/TJ of input fuel) of the fuel used in the cement works in year *y* to raise the necessary heat for clinker production.
$O_{Clinker,y}$	the clinker output of the cement works in a given year *y*.

$$EI_B = \frac{F_B}{O_{Clinker,B}} \quad \text{(B6.13)}$$

Where

F_B	the average annual energy consumption, expressed in TJ, of clinker prior to the start of operation of the project activity.
$O_{Clinker,B}$	the average annual output, expressed in tonnes, of clinker prior to the of the project activity.

As there're two clinker production lines in the cement plant, and for line 1, for which data is available, is calculated using F_B and $O_{Clinker,B}$ (the detailed calculation please see the Annex 3 of PDD). The specific fuel consumption for Line 2, where there is no data available for the calculation of the specific fuel consumption, is the value from Chinese industrial norm. This is consistent with the requirement of EI_B, as noted on page 12 of the methodology, i.e. "If project specific data is not available, data from industrial norm in the host country could be used". According to "The Norm

of Specific Energy Consumption" (GB16780-2007), the Energy consumption per unit clinker production is 3.51 GJ/ton for cement lines with capacity above 4000t/d. Because the capacity of the second clinker line is 4500 t/d, this is the specific fuel consumption adapted as the value for the specific fuel consumption for clinker production prior to the project activity.

$$EI_{p,y} = \frac{F_{p,y}}{O_{Clinker,y}} \quad (B6.14)$$

Where

$F_{P,y}$ monitored annual energy consumption in a year y, expressed in TJ;

$O_{Clinker,y}$ monitored annual output, expressed in a year *y*, in tonnes of clinker;

$$COEF_{fuel,y} = \frac{EF_{CO_2,fuel,y}}{NCV_{fuel,y}} \quad (B6.15)$$

Where

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

$EF_{CO_2,fuel,y}$ the CO_2 emission factor per unit of energy of the fuel used in year *y*, expressed as tCO_2 per unit mass or volume unit.

As there're two clinker production lines in the cement plant, the following formula was used for PE_y calculation.

$$PE_y = \sum_i \Delta EI_i * [O_{clinker,i}] * COEF_{fuel,i} \quad (B6.16)$$

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 the PE_y refers to Annex 3.

Step 3 Determination of leakage emissions:

As above AM0024 (Version 02.1), the leakage of the project activity is not considered, that is: $L_y = 0$.

Step 4 Estimation of emission reductions:

As per the methodology AM0024 (Version 02.1), the emission reductions by the project activity are calculated as the difference between baseline emissions and project emissions. As there are no project emissions in the project activity, the emission reductions are equivalent to the baseline emissions.

The emission reduction, ER_y during a given year y is given by:

$$ER_y = BE_y - PE_y \quad (B6.17)$$

Where

ER_y the emission reduction by the project activity in year *y*, expressed in tCO_2.

BE_y the baseline emissions in year y, expressed in tCO_2.

PE_y 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:

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Data / Parameter:	E_{cement}
Data unit:	kWh
Description:	Electricity consumption of cement works prior to the project activity.
Source of data used:	From the actual monitoring records of the project entity and FAR
Value applied:	3.19×10^{8}
Justification of the choice of data or description of measurement methods and procedures actually applied :	From the approved FAR. .
Any comment:	-

Data / Parameter:	NCV_B
Data unit:	GJ/t
Description:	It is the net calorific value (energy content) per mass or volume unit of the fuel consumed by the clinker production lines prior to the start of the project activity.
Source of data used:	The data provided by the project entity
Value applied:	Refer to Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to calculate the pre-project energy consumption per unit output of clinker in TJ/ton of clinker.
Any comment:	-

Data / Parameter:	F_B
Data unit:	TJ
Description:	Average annual energy (fuel) consumption of clinker making process prior to the start of operation of the project activity.
Source of data used:	Provided by the project entity

Value applied:	5414 for the first line. None for the second line[32].
Justification of the choice of data or description of measurement methods and procedures actually applied :	The fuel consumption consumed by 1# clinker production line. F_B is used to calculate ex-ante the pre-project energy consumption per unit output of clinker (EI_B) in TJ/ton of clinker for line one.
Any comment:	-

Data / Parameter:	$O_{Clinker,B}$
Data unit:	t
Description:	It is the average annual output, expressed in tonnes, of clinker prior to the operation of the project activity.
Source of data used:	Provided by the project entity
Value applied:	**1467676 for the first line.** None for the second line[33].
Justification of the choice of data or description of measurement methods and procedures actually applied :	The production of 1# clinker production line. $O_{Clinker,B}$ is used to calculate ex-ante the pre-project energy consumption per unit output of clinker (EI_B) in TJ/ton of clinker for line 1
Any comment:	-

Data / Parameter:	EI_B
Data unit:	GJ/t
Description:	Energy consumption per unit clinker production prior to project implementation.
Source of data used:	Calculation for the first line and industrial norm of China for second line.
Value applied:	3.69 for the first line and 3.51 for the second line.
Justification of the choice of data or description of measurement methods and procedures actually applied :	EI_B for line 1 will be calculated based on the following formula described in the baseline methodology: $EI_B = \frac{F_B}{O_{clinker,B}}$ As there is only four months data for the EI_B calculation for line 2, and

[32] As per the formula 3 on page 6 of AM0024(ver2.1), the F_B and Oclinker, $_B$ are used to calculate EI_B, and according to the page 12 of the methodology, data from industrial norm in the host country could be used as EI_B if project specific data is not available. And given that there is not a whole year of project specific data of the second cement production line, the data from industrial norm has been used for EI_B. And, the use of Norm of Specific Energy Consumption is conservative because the EI_B using the available data is 3.66 GJ/t which is higher than the industrial norm.

[33] As per the formula 3 on page 6 of AM0024(ver2.1), the F_B and Oclinker, $_B$ are used to calculate EI_B, and according to the page 12 of the methodology, data from industrial norm in the host country could be used as EI_B if project specific data is not available. And given that there is not a whole year of project specific data of the second cement production line, the data from industrial norm has been used for EI_B. And, the use of Norm of Specific Energy Consumption is conservative because the EI_B using the available data is 3.66 GJ/t which is higher than the industrial norm.

	according to the methodology, the industrial norm of China could be used as EI_B if specific data is unavailable and as the one year's worth data pre-project for the second line is unavailable, so the Norm of Specific Energy Consumption " (GB16780-2007) used for EIB of the second line. And, the use of Norm of Specific Energy Consumption is conservative because the EI_B using the available four months data is 3.66 GJ/t which is higher than the industrial norm.
Any comment:	-

Data / Parameter:	$OXID_{fuel}$
Data unit:	%
Description:	Oxidation ratio of fuel used in clinker production
Source of data used:	IPCC 2006
Value applied:	Refer to Annex 3.
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:

>>

As per methodology AM0024 (Version 02.1), the emission reductions by the project activity are calculated as the difference between baseline emissions and project emissions.

Step 6.3-1: Estimate of GHG emissions by sources

As per AM0024 (Version 02.1), project emissions are calculated and the found to be negative, and thus are ex ante considered as zero. And project emission will be monitored over the crediting lifetime as the difference in fuel per unit of clinker output before and after the project activity.

Step 6.3-2: Estimate leakage

As per AM0024 (Version 02.1), the leakage is not considered.

Step 6.3-3: Estimated anthropogenic emissions by sources of greenhouse gases of the baseline

As the baseline emission factor ($EF_{Elec,y}$) is 0.78255tCO_2e/MWh, the annual electricity displaced by the project activity ($EG_{CP,y}$) is 111,872MWh, then the annual baseline emissions of the project activity (BE_y) are 87,545 tCO_2e.

Step 6.3-4: Estimated emission reductions of the project activity

The annual emission reductions by the project activity are:

$ER_y = BE_y - PE_y$

=87,545tCO_2e.

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

>>

The proposed project activity adopts 10-year fixed crediting period. The total emission reductions in the Crediting period are875,450 t CO_2e.

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
2010	0	51,068	0	51,068
2011	0	87,545	0	87,545
2012	0	87,545	0	87,545
2013	0	87,545	0	87,545
2014	0	87,545	0	87,545
2015	0	87,545	0	87,545
2016	0	87,545	0	87,545
2017	0	87,545	0	87,545
2018	0	87,545	0	87,545
2019	0	87,545	0	87,545
2020	0	36,477	0	36,477
Total tonnes of CO_2e	0	875,450	0	875,450

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$EG_{CP,y}$
Data unit:	MWh
Description:	Power supply of the project activity
Source of data to be used:	On-site instrumentation
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	111,872MWh (55936MWh for the first and second WHR power station respectively)
Description of measurement methods and procedures to be applied:	$EG_{CP,y}$ for first and the second WHR power station will be continuously monitored by electric meters respectively and the details refer to B7.2.
QA/QC procedures to be applied:	The electric meters will be calibrated on annual interval
Any comment:	-

Data / Parameter:	$EF_{ELEC,y}$
Data unit:	tCO_2/MWh

Description:	Emission factor of electricity displaced by the project implementation
Source of data to be used:	Reported by China national development and reform committee
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	0.78255
Description of measurement methods and procedures to be applied:	N.A.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EG_{GEN,y}$
Data unit:	MWh
Description:	Power generation of East China Power Grid and Central China Power Grid in recent five years
Source of data to be used:	China Electricity Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Reliable local data used to calculate the proportion of low-cost/must run resources to total amount of grid power generation and Operation Margin emission factor (including imports).
QA/QC procedures to be applied:	
Any comment:	-

Data / Parameter:	Power consumption rate
Data unit:	%
Description:	Power consumption rate of East China Power Grid and Central China Power Grid in recent three years
Source of data to be used:	China Electricity Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	From official statistical data.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$FC_{i,y}$
Data unit:	10^4t or 10^8m^3
Description:	Amount of fuel consumed by the power sources delivering electricity to East China Power Grid and Central China Power Grid
Source of data to be used:	China Energy Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Reliable local data used to calculate the Operation Margin emission factor and Build Margin emission factor.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	MJ/t,m^3,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 Regional Power Grid.
Source of data to be used:	China Energy Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Reliable local data used to calculate the Operation Margin emission factor and Build Margin emission factor.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	tC/TJ
Description:	Carbon emission factor of the fuel consumed by the power sources delivering electricity to Regional Power Grid.
Source of data to be used:	2006 IPCC Guidelines: page 1.21-1.24
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Reliable local data used to calculate the Operation Margin emission factor and Build Margin emission factor.

QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	Installed capacity
Data unit:	MW
Description:	Installed capacity of East China Power Grid in recent three years
Source of data to be used:	China Electricity Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	To calculate the Build Margin emission factor.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	η
Data unit:	%
Description:	The commercial optimized efficiency of China thermal power generation
Source of data to be used:	Reported by China national development and reform committee
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Deriving from official statistical data
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$NCV_{fuel,y}$
Data unit:	GJ/tCe
Description:	Net calorific value(energy content) per mass unit of a fuel （only coal） used in clinker making process in year *y*.
Source of data to be used:	N.A
Value of data applied for the purpose of calculating expected emission reductions	N.A.

in section B.6.1	
Description of measurement methods and procedures to be applied:	Continuously monitored according to *Proximate analysis of coal (D21 GB / T 212 – 2001)* , during which electric balance and heat measuring equipments are used. The $NCV_{fuel,y}$ for line 1 and line 2 will be measured separately.
QA/QC procedures to be applied:	The relevant devices will be calibrated on annual interval
Any comment:	-

Data / Parameter:	$Q_{fuel,y}$
Data unit:	t
Description:	Annual fuel (only coal) consumption of clinker making process after project implementation
Source of data to be used:	N.A
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	N.A
Description of measurement methods and procedures to be applied:	Continuously monitored by Weighbridge. The $Q_{fuel,y}$ for line 1 and line 2 will be measured separately.
QA/QC procedures to be applied:	The relevant devices will be calibrated on annual interval
Any comment:	-

Data / Parameter:	$F_{P,y}$
Data unit:	TJ
Description:	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.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement and calculation. The $F_{P,y}$ for line 1 and line 2 will be calculated separately.
QA/QC procedures to be applied:	The relevant devices will be calibrated on annual interval
Any comment:	The 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:	$EI_{P,y}$

Data unit:	GJ/t
Description:	Energy consumption per unit clinker production after project implementation.
Source of data to be used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3.
Description of measurement methods and procedures to be applied:	$EI_{P,y}$ will be calculated based on the following formula described in the baseline methodology: $EI_{P,y} = \frac{F_y}{O_{clinker,y}}$ The $EI_{P,y}$ for line 1 and line 2 will be calculated separately.
QA/QC procedures to be applied:	The data will be recorded annually.
Any comment:	-

Data / Parameter:	PE_y
Data unit:	tCO_2
Description:	Project emissions
Source of data to be used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	PE_y will be calculated based on the following formula described in the baseline methodology: $PE_y = \sum_i \Delta EI_i * [O_{clinker,i}] * COEF_{fuel,i}$ The PE_y for line 1 and line 2 will be calculated separately.
QA/QC procedures to be applied:	The data will be recorded annually.
Any comment:	

Data / Parameter:	$COEF_{fuel,y}$
Data unit:	tCO_2/TJ
Description:	Emission Factor for fuel (only coal) used in clinker production
Source of data to be used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	Refer to Annex 3
Description of measurement methods and procedures to be	As there is only one type fuel (coal) used in the cement production lines, so $COEF_{fuel,y}$ will be calculated based on the following formula

applied:	described in the baseline methodology: $$COEF_{Fuel,y} = \frac{EF_{CO_2,fuel,y}}{NCV_{fuel,y}}$$ The $COEF_{fuel,y}$ for line 1 and line 2 will be calculated separately.
QA/QC procedures to be applied:	The data will be recorded monthly
Any comment:	-

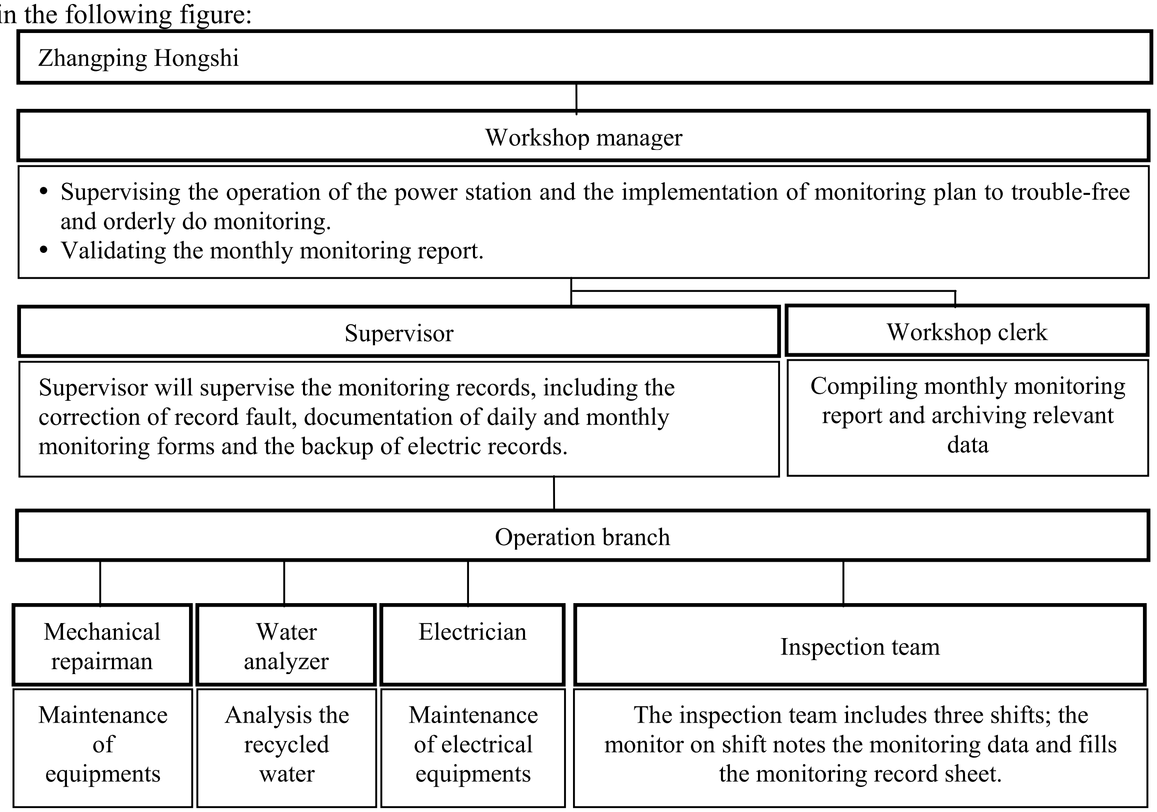
Data / Parameter:	$O_{Clinker,y}$
Data unit:	t
Description:	Annual output, expressed in tonnes, of clinker in year *y*.
Source of data to be used:	N.A
Value of data applied for the purpose of calculating expected emission reductions in section B.6.1	N.A
Description of measurement methods and procedures to be applied:	Continuously monitored by Weighbridge. The $O_{Clinker,y}$ for line 1 and line 2 will be measured separately.
QA/QC procedures to be applied:	The relevant devices will be calibrated on annual interval
Any comment:	-

Data / Parameter:	$EF_{CO2,fuel,y}$
Data unit:	tCO_2/ton
Description:	Emission factor of fuel (only coal) 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.6.1	Refer to Annex 3
Description of measurement methods and procedures to be applied:	Direct measurement and calculation.
QA/QC procedures to be applied:	As there is only one type fuel (coal) used in the cement production lines, so the carbon content of fuel ($EF_{C,fuel,y}$) will be measured and used to calculate $EF_{CO2,fuel,y}$ as below: $$EF_{CO2,fuel,y} = EF_{C,fuel,y} \times 44/12$$ The $EF_{CO2,fuel,y}$ for line 1 and line 2 will be measured separately.
Any comment:	-

B.7.2. Description of the monitoring plan:

>>
The monitoring plan is designed as required by "Methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants" AM0024 (version 02.1).

1. Monitoring management systems
The power station will set up a complete data management system, and the structure will be demonstrated in the following figure:



2. Monitoring

2.1Monitoring parameters
The main contents of the monitoring:

- $EG_{CP,y}$ Quantity of electricity supplied to cement plant from first and second WHR power station respectively;
- $O_{clinker,y}$ Annual production of clinker after project implementation for first and second cement production lines respectively ;
- $Q_{fuel,y}$ Annual fuel (only coal) consumption of clinker making process after project implementation for first and second cement production lines respectively ;
- $F_{P,y}$ Annual fuel consumption of clinker making process after project implementation for first and second cement production lines respectively;
- $NCV_{fuel,y}$ Calorific Value of fuel used in Clinker Production lines for first and second cement

production lines respectively;

- $EF_{CO2,fuel,y}$ Emission factor of fuel used in Clinker production for first and second cement production lines respectively.
- $EF_{ELEC,y}$ Emission factor of electricity displaced by the project implementation
- $EI_{P,y}$ Energy consumption per unit clinker production after project implementation for first and second cement production lines respectively.
- $COEF_{fuel,y}$ Emission Factor for fuel used in clinker production for first and second cement production lines respectively
- PE_y Project emissions for first and second cement production lines respectively
- $EG_{GEN,y}$ Power generation of East China Power Grid and Central China Power Grid in recent five years
- Power consumption rate Power consumption rate of East China Power Grid and Central China Power Grid in recent three years
- $FC_{i,y}$ Amount of fuel consumed by the power sources delivering electricity to East China Power Grid and Central China Power Grid
- $NCV_{i,y}$ It is the net calorific value (energy content) per mass or volume unit of the fuel consumed by the power sources delivering electricity to Regional Power Grid.
- $EF_{CO_2,i,y}$ Carbon emission factor of the fuel consumed by the power sources delivering electricity to Regional Power Grid.
- Installed capacity Installed capacity of East China Power Grid in recent three years
- η The commercial optimized efficiency of China thermal power generation

The 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:

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

2.2 Monitoring instrument

1) Installation of monitoring instrument

Project entity will install 6 kilowatt meters (meter M1, M2 and M3 for 1st phase WHR power station, meter M4, M5 and M6 for 2nd phase WHR power station, all meters keep running all the time) with an accuracy of class 0.5 to measure electricity generation and supply. The net electricity supply is monitored by kilowatt meters M3 and M6 installed at the tielines which connect the WHR power station to the General Transformer Station. The kilowatt meter M1 and M4 installed at the generator are used to measure gross electricity generation, and the kilowatt meter M2 and M5 installed at the transformer station of WHR power station are used to measure the self-consumed electricity. Meter M1, M2, M4, M5 are also used as backup system for the monitoring of net electricity supply. The net electricity supply can be calculated as self-consumed electricity subtracts from gross electricity generation using data from meter M1, M2, M4, M5 if the meter M3 and M6 which measure net electricity supply are out of function. Please see Fig.B.7.2.1 the simplified electrical diagram.

The quantity of fuel consumption and clinker production will be continuously measured by weighbridge with an accuracy of ±0.075%; the data of fuel calorific Value and the Emission factor of fuel will be

continuously measured according to the National Guidelines (*Proximate analysis of coal (D21 GB / T 212 – 2001)*) by electric balance with an accuracy of ±0.0001g and heat measuring equipment, which will be installed and maintained according the Operation Explanation.

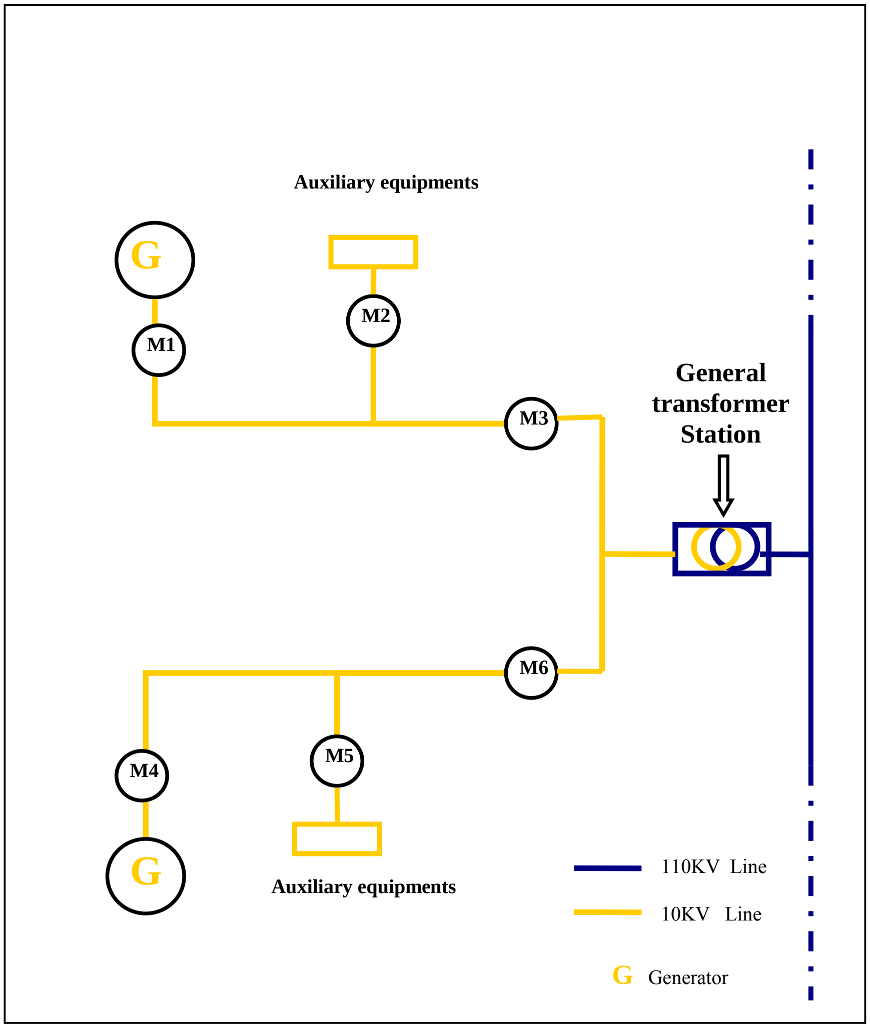


Fig.B.7.2.1 the simplified electrical diagram

2) Maintenance and calibration of electricity meters

Instruments should be calibrated at least once a year to ensure the reliability of the system and the accuracy of the readings to ensure that error must be controlled under the permitted error range of the monitoring meters. The calibration will be carried out following the national standard (JJG596-1999) by an independent entity. The relevant instruments should be calibrated, repaired and replaced if the reading error of instruments exceeds the permitted error range.

Under normal condition, the project entity is responsible for operation and maintenance of the meters in the WHR captive power stations. Once the reading error of instruments exceeds the permitted error range or the instrument is found to be malfunctioning: (1) the recordings of the meter need be repaired, calibrated or replaced should be recorded; (2) the relevant electric meters should be calibrated and reinstalled after passing the calibration.

3) Maintenance and calibration of other meters

The meters for monitoring of $NCV_{fuel,y}$, $Q_{fuel,y}$ and $O_{clinker,y}$ are in the clinker process, and the project entity and the manufactures will be in charge of the maintenance and calibration. The calibration of weighbridge will be carried out following the national standard (JJG 539-1997) and calibration of electric balance will follow the national standard (JJG98-90).

2.3 Monitoring record

The monitor of each Inspection team record the monitoring data for $EG_{CP,y}$ and calculate the power generation and power consumption according to the specification on daily basis. Monitoring data for parameters $NCV_{fuel,y}$, $Q_{fuel,y}$ and $O_{clinker,y}$ are also recorded on daily basis. And monthly monitoring report must be compiled within the first three days of the following month. The daily monitoring record sheets should be checked by the Supervisor. In the first three workdays of the following month, the monthly monitoring report will be compiled by workshop clerk based on the daily monitoring sheets and submitted to workshop manager for validation. After the validation of the workshop manager, the monthly monitoring report sheet must be submitted to metrology Department for verification. The electronic data recorded by DCS will be copied to CD periodically and filed by the workshop clerk.

3. Quality control system for monitoring data

1) The monitoring data will be daily recorded, and then filed carefully. The writing of monitoring data must be normative and can not be optionally altered. If the monitoring data assuredly need be corrected, it will be modified after being approved by the workshop manager. The person who modified the monitoring data must make a signature in the place besides the modified monitoring data. In reference column, the reasons why the monitoring data are modified and modifying data will be written, and the signature also will be made.

2) The authenticity, veracity, timeliness and standardization of the monitoring data should be checked by the workshop manager. Once something inconformity is found, it must be corrected immediately.

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

4) Spare meters (only put into operation during malfunctioning of main meters) for main kilowatt meters will be installed. Once the main meters are out of function, the monitor of Inspection team should inform Workshop Manager immediately. The malfunctioning meter will be replaced by spare meter and be sent for maintenance or calibration. The starting time and ending time (the time when malfunctioning main meters are put back into operation) of the event of meter malfunction will be precisely recorded. The data from backup system will be used to calculate the net electricity supply during the time meter M3 or M6 which measures the net electricity supply is out of function.

5) There's also a backup system for weighbridge and electric balance. Spear weighbridge and electric balance will be used while main meters are malfunctioning. The malfunctioning meters will be sent for maintenance.

4. 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 are also made to train the staff, and the staff in WHR power station should pass the periodical test carried out by the project entity.

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:	18/07/2008
Person determining the baseline study and monitoring methodology:	CHEN Ximing
Tel:	+86-21-32500303
Fax:	+86-21-32500219
Email:	cdm009@163.com
Organization:	Shanghai Chuanji Investment Management Co., Ltd. (the project developer)
Assistants:	MA Zhiwei (Shanghai Chuanji Investment Management Co., Ltd.)

Shanghai Chuanji Investment Management Co., Ltd. is not 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 November 2007[34]

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

>>
15 years.

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

>>
The project uses fixed crediting period.

C.2.1. Renewable crediting period

>>

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>
01/06/2010

C.2.2.2. Length:

>>
10 years.

[34] The start date of the project activity is the date for Equipment Purchase Contract Signed.

SECTION D. Environmental impacts

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

>>

The project activity had developed and passed full Environmental Impact Assessments (EIA) in line with the requirements of the Chinese Government and had obtained the written approval of Fujian Environment Protection Agency on 30th August 2007.

1) Impact on Air Environment

By displacing electricity from East China Power Grid, the Project activity will result in GHGs emission reductions, which will have a positive effect both locally and globally. The operation of the project will also lead to reductions in air pollutants originally discharged into the air by the cement production line.

2) Impact on Acoustical Environment

Noise is generated due to the operation of steam turbine generator and WHR boilers. To effectively reduce the noise, the cement plant has planned to install steam turbine generators in a sound insulation room, equip silencers for WHR boilers, wrap work places with damping materials and develop green belt near the plant.

3) Impact on Water Environment

Wastewater includes chemical wastewater and sanitary wastewater. The chemical wastewater will be neutralized and recycled. The sanitary wastewater will be used for watering the green belt. Thus, the project activity has no obvious impact on the water environment.

4) Solid Waste Management

The solid waste from the project activity consists of a small amount of sludge from the chemical neutralized pool and domestic waste from the plant that will be collected and regularly clean by the local Environmental Sanitation Bureau. Therefore, there will be no negative impacts resulting from project activity.

5) Ecology

The WHR power station will be located in the cement plant. The land on which the project activity takes place has already been converted to industrial use for the construction of the cement works. Therefore, the project has no influence on the ecological 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 project entity has carried out proper measures for environmental protection, and the negative effect has been reduced to the lowest level. Then the environmental impacts of the project activity are considered to be acceptable.

SECTION E. Stakeholders' comments

>>

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

>>

The stakeholders of the project activity are mainly staffs and residents nearby. So the project entity collected opinions from the major shareholders including the staffs and local residents through questionnaires from August 20, 2007 to August 24, 2007. 56 questionnaires were distributed and 56 questionnaires were collected with a response rate of 100%.

The information of participants was summarized in the following table:

<table>
<tr><td colspan="12">1. Sex</td></tr>
<tr><td colspan="6">Male</td><td colspan="6">Female</td></tr>
<tr><td colspan="6">32 (66.1%)</td><td colspan="6">24 (42.9%)</td></tr>
<tr><td colspan="12">2. Maximum educational qualification</td></tr>
<tr><td colspan="4">Undergraduate and above</td><td colspan="4">High school</td><td colspan="4">Primary school and below</td></tr>
<tr><td colspan="4">11 (19.6%)</td><td colspan="4">23 (41.1%)</td><td colspan="4">22 (39.3%)</td></tr>
<tr><td colspan="12">3. Occupation</td></tr>
<tr><td colspan="3">Farmer</td><td colspan="3">Worker</td><td colspan="3">Cadre</td><td colspan="3">others</td></tr>
<tr><td colspan="3">21 (37.5%)</td><td colspan="3">25 (44.6%)</td><td colspan="3">7 (12.5%)</td><td colspan="3">3 (5.4%)</td></tr>
</table>

E.2. Summary of the comments received:

>>

The following is a summary of the key findings based on returned questionnaires.

1.49 persons (87.5%) of the respondents knew about the project activity, others (12.5%) knew little about the project activity.

2. 43 persons (76.8%) of the respondents think climate warming is obvious.

3. 41 persons (73.2%) concern noise pollution during the construction, and 35 persons (62.5%) concern water pollution for the operation of the project activity.

4. The respondents considered the construction and operation of the project activity will accelerate local economic development (accounting for 80%); raise people's living standard (accounting for 63%), increase of employment opportunities (accounting for 50%), and improve local environment (accounting for 33%).

5. Only 33 persons (58.9%) knew about CDM, but others almost have no ideas about CDM.

6. 41 persons (73.2%) thought the project activity will be benefit for mitigating the climate warming.

7. 56 persons (100%) support the construction of the project activity.

In general, the project activity is benefit to the environment and the local people, and the respondents support the construction and the operation of the project activity.

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

>>

The following measures have been or will be taken by the project entity in reply of the comments of the stakeholders.

1. The project entity was aware of the difficulty of construction of the project activity and tries to get CDM help, which will help counteract the high investment of the project activity and decrease the economic pressure of project activity operation during the crediting period.

2. The project entity will invite some senior engineers to manage the power station and provide necessary trainings to the staff workers. In this way, the risks associated with the unfamiliar technology will be mitigated.

3. As a result of the comments received, the project owner has explained to the communities that they will follow the measures listed in the EIA during construction and operation period.
4. In regards of noise pollution, silencers will be installed inside the plant and the turbines will be installed in an insulating room.
5. For concerns on water pollution, the project entity have reassured the local communities that most water will be recycled in the plant and the rest will be neutralized and used for irrigate the green belt around the plant.
6. Responses to the Project have been increasingly positive as community members have had more opportunities to understand the environmental precautions taken and the development benefits that it includes.

To sum up, the local residents are all supportive to the project and there are no adverse have been received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

1. Calculation of *OM* emission factor

Table 3-1 Annual electricity generation of East China Power Grid 2003-2007

year	Electricity generation (GWh)			Proportion of low cost and must run resources. %
	Total generation	Thermal power	Hydropower etc.	
2003[35]	429,327	382,112	47,015	11.00
2004[36]	488,010	440,411	47,598	9.75
2005[37]	574,467	505,855	68,62	11.94
2006[38]	666,820	590,541	76,279	11.43
2007[39]	755,492	673,002	82,490	10.92

35 China Electric Power Yearbook 2004 page. 709;
36 China Electric Power Yearbook 2005 page. 474;
37 China Electric Power Yearbook 2006 page. 568.
38 China Electric Power Yearbook 2007 page. 638.

39 China Electric Power Yearbook 2008 page. 748.

Table 3-2 Operation Margin of East China Power Grid in 2005

Fuel Type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission Factor	Oxidation rate	Fuel Emission Factor	Average net calorific value	CO_2 emissions (tCO_2e)
								tc/TJ	%	kgCO2/TJ	MJ/t,km3	K=F×I×J/100000(mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (volume unit)
Raw coal	10^4tons	2847.31	9888.06	4801.52	3082.9	2107.69	**22727.48**	25.8	100	87,300	20,908	414,837,511
Cleaned Coal	10^4tons						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4tons						**0**	25.8	100	87,300	8,363	0
Coke	10^4tons			0.03			**0.03**	29.2	100	95,700	28,435	816
Coke Oven Gas	10^9m^3	1.68	1.38		1.71		**4.77**	12.1	100	37,300	16,726	297,591
Other Coke Gas	10^9m^3	83.72	24.97	0.06	30		**138.75**	12.1	100	37,300	5,227	2,705,169
Crude Oil	10^4tons			27.01			**27.01**	20	100	71,100	41,816	803,039
Gasoline	10^4tons						**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4tons	1.25	16	4.52		1.67	**23.44**	20.2	100	72,600	42,652	725,828
Fuel oil	10^4tons	59.39	13.22	153.22		7.45	**233.28**	21.1	100	75,500	41,816	7,364,902
LPG	10^4tons						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	0.57	0.83				**1.4**	15.7	100	48,200	46,055	31,078
Natural gas	10^9m^3	1.09	1.85	0.62			**3.56**	15.3	100	54,300	38,931	752,567
Other petroleum products	10^4tons	21	8.38	34.8			**64.18**	20	100	75,500	41,816	2,026,232
Other coking products	10^4tons						**0**	25.8	100	95,700	28,435	0
Other energy	10^4tons standard coal	12.36		15.29			**27.65**	0	100	0	0	0
Import from Yangcheng Power Plant	MWh	11282000					**Emission Factor (tCO2/MWh)**		1.06604213			12,027,087

Import from Central China Power Grid	MWh	27039000	**Emission Factor (tCO3/MWh)**	1.16148378	31,405,360
Total emissions of East China Power Grid (tCO2e)					472,977,179
Total thermal power supply of East China Power grid (MWh)					515,638,698
OM of East China Power grid (tCO2e/MWh)					**0.91726**

Table 3-3 Operation Margin of East China Power Grid in 2006

Fuel Type	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission Factor	Oxidation rate	Fuel Emission Factor	Average net calorific value	CO_2 emissions (tCO_2e)
								(tc/TJ)	(%)	(kgCO2/TJ)	(MJ/t,km3)	K=F×I×J/100000(mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (volume unit)
Raw coal	10^4tons	2744.45	10945.42	6065	3455.2	2369.63	**25579.7**	25.8	100	87,300	20,908	466,898,181
Cleaned Coal	10^4tons						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4tons		150.54		23.06		**173.6**	25.8	100	87,300	8,363	1,267,436
Coke	10^4tons			39.07			**39.07**	29.2	100	95,700	28,435	1,063,184
Coke Oven Gas	10^9m^3	1.71	3.13	0.23	0.71		**5.78**	12.1	100	37,300	16,726	360,603
Other Coke Gas	10^9m^3	84.64	106.54	3.28	25.12		**219.58**	12.1	100	37,300	5,227	4,281,088
Crude Oil	10^4tons			20.3			**20.3**	20	100	71,100	41,816	603,543
Gasoline	10^4tons						**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4tons	2.13	3.7	4.11	1.21	1.11	**12.26**	20.2	100	72,600	42,652	379,635
Fuel oil	10^4tons	44.51	3.77	71.98	0.02	4.5	**124.78**	21.1	100	75,500	41,816	3,939,439
LPG	10^4tons						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	0.29	0.4		2.95		**3.64**	15.7	100	48,200	46,055	80,803

Natural gas	$10^9 m^3$	3.2	13.5	9.18			**25.88**	15.3	100	54,300	38,931	5,470,911
Other petroleum products	10^4tons	18.82	3.57				**22.39**	20	100	75,500	41,816	706,876
Other coking products	10^4tons						**0**	25.8	100	95,700	28,435	0
Other energy	10^4tonsstandard coal	6.66	2.8	27.45	3.21		**40.12**	0	100	0	0	0
Import from Yangcheng Power Plant	MWh	11150820					**Emission Factor (tCO2/MWh)**		0.99701979			11,117,588
Import from Central China Power Grid	MWh	24029150					**Emission Factor (tCO3/MWh)**		1.12156745			26,950,312
Total emissions of East China Power Grid (tCO2e)												523,119,600
Total thermal power supply of East China Power grid (MWh)												593,583,295
OM of East China Power grid (tCO2e/MWh)												**0.88129**

Table 3-4 Operation Margin of East China Power Grid in 2007

Fuel Type	**Unit**	**Shanghai**	**Jiangsu**	**Zhejiang**	**Anhui**	**Fujian**	**Total**	**Emission Factor**	**Oxidation rate**	**Fuel Emission Factor**	**Average net calorific value**	**CO_2 emissions (tCO_2e)**
								(tc/TJ)	**(%)**	**(kgCO2/TJ)**	**(MJ/t,km3)**	**K=F×I×J/100000(mass unit)**
		A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H**	**I**	**J**	**K=F×I×J/10000 (volume unit)**
Raw coal	10^4tons	2754.04	11060.78	7350	3929.9	3097.87	**28192.59**	25.8	100	87,300	20,908	514,590,436
Cleaned Coal	10^4tons						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4tons		459.17		29.32		**488.49**	25.8	100	87,300	8,363	3,566,416
Coke	10^4tons			35.06			**35.06**	29.2	100	95,700	28,435	954,063
Coke Oven Gas	10^9m^3	0.89	9.73	0.22	1.56	0.75	**13.15**	12.1	100	37,300	16,726	820,402

Other Coke Gas	10^9m^3	98.92	70.45	3.41	36.3	1.71	**210.79**	12.1	100	37,300	5,227	4,109,712
Crude Oil	10^4tons			15.15			**15.15**	20	100	71,100	41,816	450,427
Gasoline	10^4tons						**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4tons	1.23	5.37	2.76		1.01	**10.37**	20.2	100	72,600	42,652	321,111
Fuel oil	10^4tons	40.76	1.55	29.52		2.04	**73.87**	21.1	100	75,500	41,816	2,332,156
LPG	10^4tons						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	0.2	0.63		2.55		**3.38**	15.7	100	48,200	46,055	75,031
Natural gas	10^9m^3	4.61	19.17	11.01			**34.79**	15.3	100	54,300	38,931	7,354,444
Other petroleum products	10^4tons	20.39	2.78				**23.17**	20	100	75,500	41,816	731,502
Other coking products	10^4tons						**0**	25.8	100	95,700	28,435	0
Other energy	10^4tonsstandard coal	6.89	28.88	44.93	7.52	9.43	**97.65**	0	100	0	0	0
Import from Yangcheng Power Plant	MWh	12773620					**Emission Factor (tCO2/MWh)**		0.97254367			12,422,903
Import from Central China Power Grid	MWh	31823310					**Emission Factor (tCO3/MWh)**		1.10197351			35,068,445
Total emissions of East China Power Grid (tCO2e)												582,797,047
Total thermal power supply of East China Power grid (MWh)												679,928,440
OM of East China Power grid (tCO2e/MWh)												**0.85714**

Table 3-5 Simple OM emission factor of Central China Power Grid in 2005

Fuel Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Emission Factor	Oxidation rate	Fuel Emission Factor	Average net calorific value	CO_2 emissions (tCO_2e)
									(tc/TJ)	(%)	(kgCO2/TJ)	(MJ/t,km3)	L=G×K×J/100000(mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G×K×J/10000 (volume unit)
Raw coal	10^4tons	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	**17827.75**	25.8	100	87,300	20,908	325,404,287
Cleaned Coal	10^4tons	0.02						**0.02**	25.8	100	87,300	26,344	460
Other Washed Coal	10^4tons		138.12			89.99		**228.11**	25.8	100	87,300	8,363	1,665,408
Coke	10^4tons		25.95		105			**130.95**	29.2	100	95,700	28,435	3,563,450
Coke Oven Gas	10^9m^3			1.15		0.36		**1.51**	12.1	100	37,300	16,726	94,206
Other Coke Gas	10^9m^3		10.2			3.12		**13.32**	12.1	100	37,300	5,227	259,696
Crude Oil	10^4tons		0.82	0.36				**1.18**	20	100	71,100	41,816	35,083
Gasoline	10^4tons		0.02			0.02		**0.04**	18.9	100	67,500	43,070	1,163
Diesel Oil	10^4tons	1.3	3.03	2.39	1.39	1.38		**9.49**	20.2	100	72,600	42,652	293,861
Fuel oil	10^4tons	0.64	0.29	3.15	1.68	0.89	2.22	**8.87**	21.1	100	75,500	41,816	280,035
LPG	10^4tons							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	0.71	3.41	1.76	0.78			**6.66**	15.7	100	48,200	46,055	147,842
Natural gas	$10^9 m^3$						3	**3**	15.3	100	54,300	38,931	634,186

Other petroleum products	10^4tons							**0**	20	100	75,500	41,816	0
Other coking products	10^4tons				1.5			**1.5**	25.8	100	95,700	28,435	40,818
Other energy	10^4tonsstandard coal		2.88		1.74	32.8		**37.42**	0	100	0	0	0
Total emissions of East China Power Grid (tCO2e)													332,420,496
Total thermal power supply of East China Power grid (MWh)													286,203,305
OM of East China Power grid (tCO2e/MWh)													**1.16148378**

Table 3-6 Simple OM emission of Central China Power Grid in 2006

Fuel Type	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**	**Emission Factor**	**Oxidation rate**	**Fuel Emission Factor**	**Average net calorific value**	**CO_2 emissions (tCO_2e)**
									(tc/TJ)	(%)	(kgCO2/TJ)	(MJ/t,km3)	L=G×K×J/100000(mass unit)
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	**K**	**L=G×K×J/10000 (volume unit)**
Raw coal	10^4tons	1926.02	8098.01	3179.79	2454.48	1184.3	3285.22	**20127.82**	25.8	100	87,300	20,908	367,386,738
Cleaned Coal	10^4tons					5.79		**5.79**	25.8	100	87,300	26,344	133,160
Other Washed Coal	10^4tons	4.51	104.12		8.59	79.21		**196.43**	25.8	100	87,300	8,363	1,434,116
Briquette	10^4tons						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke	10^4tons		17.23		0.32			**17.55**	29.2	100	95,700	28,435	477,576
Coke Oven Gas	10^9m^3		0.52	1.07	4.24	0.38	0.01	**6.22**	12.1	100	37,300	16,726	388,053

Other Coke Gas	10^9m^3	12.69	3.95		1.7	4.36	0.01	**22.71**	12.1	100	37,300	5,227	442,770
Crude Oil	10^4tons		0.49					**0.49**	20	100	71,100	41,816	14,568
Gasoline	10^4tons		0.01					**0.01**	18.9	100	67,500	43,070	291
Diesel Oil	10^4tons	0.91	2.23	1.41	1.78	0.96		**7.29**	20.2	100	72,600	42,652	225,737
Fuel oil	10^4tons	0.51	1.26	1.31	0.8	0.57	3.49	**7.94**	21.1	100	75,500	41,816	250,674
LPG	10^4tons							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	0.86	8.1	1	0.97			**10.93**	15.7	100	48,200	46,055	242,630
Natural gas	$10^9 m^3$			0.28		0.16	18.63	**19.07**	15.3	100	54,300	38,931	4,031,309
Other petroleum products	10^4tons							**0**	20	100	75,500	41,816	0
Other coking products	10^4tons						0.01	**0.01**	25.8	100	95,700	28,435	272
Other energy	10^4tons standard coal	17.45	37.36	31.55	18.29	29.35		**134**	0	100	0	0	0
Import from Northwest China Power Grid	MWh	3028950						**Emission Factor (tCO_2/MWh)**		0.99148467			3,003,157
Total emissions of East China Power Grid (tCO_2e)													378,031,235
Total thermal power supply of East China Power grid (MWh)													337,056,176
OM of East China Power grid (tCO_2e/MWh)													**1.12156745**

Table 3-7 Simple OM emission factor of Central China Power Grid in 2007

Fuel Type	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**	**Emission Factor**	**Oxidation rate**	**Fuel Emission Factor**	**Average net calorific value**	**CO_2 emissions (tCO_2e)**
									(tc/TJ)	(%)	(kgCO2/TJ)	(MJ/t,km3	L=G×K×J/100000(mass unit)

												)	
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D +E+F**	**H**	**I**	**J**	**K**	**L=G×K×J/10000 (volume unit)**
Raw coal	10^4tons	2200.57	9357	3479.81	2683.81	1547.7	3239	**22507.89**	25.8	100	87,300	20,908	410,829,404
Cleaned Coal	10^4tons		3.07			3.8		**6.87**	25.8	100	87,300	26,344	157,998
Other Washed Coal	10^4tons	0.04	87.16		2.06	96.42		**185.68**	25.8	100	87,300	8,363	1,355,631
Briquette	10^4tons						0.01	**0.01**	26.6	100	87,300	20,908	183
Coke	10^4tons							**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^9m^3	0.08	2.61	0.25	0.31	0.91		**4.16**	12.1	100	37,300	16,726	259,534
Other Coke Gas	10^9m^3	29.17	25.79		24.69		23.98	**103.63**	12.1	100	37,300	5,227	2,020,444
Crude Oil	10^4tons		0.43					**0.43**	20	100	71,100	41,816	12,784
Gasoline	10^4tons				0.04	0.01		**0.05**	18.9	100	67,500	43,070	1,454
Diesel Oil	10^4tons	0.98	3.21	2.51	2.83	1.93		**11.46**	20.2	100	72,600	42,652	354,863
Fuel oil	10^4tons	0.42	1.25	1.33	0.63	0.64	1.74	**6.01**	21.1	100	75,500	41,816	189,742
LPG	10^4tons							**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4tons	1.43	10.01	0.97	0.7			**13.11**	15.7	100	48,200	46,055	291,022
Natural gas	$10^9 m^3$		0.12	0.18		0.2	1.87	**2.37**	15.3	100	54,300	38,931	501,007
Other petroleum products	10^4tons							**0**	20	100	75,500	41,816	0
Other coking products	10^4tons							**0**	25.8	100	95,700	28,435	0
Other energy	10^4tons standard coal	23.43	63.65	35.95	29.46	23.21		**175.7**	0	100	0	0	0

Import from Northwest China Power Grid	MWh	3005400	**Emission Factor (tCO2/MWh)**		1.01128915			3,039,328
Total emissions of East China Power Grid (tCO2e)								419,013,395
Total thermal power supply of East China Power grid (MWh)								380,239,080
OM of East China Power grid (tCO2e/MWh)								**1.10197351**

Table 3-8 Weighted average Operation Margin emission factor

Year	$EF_{OM,simple,y}$ （tCO$_2$e/MWh）	GEN_y （MWh）	CO_2 emission （tCO$_2$e）
2005	0.91726	515,638,698	472,977,179
2006	0.88129	593,583,295	523,119,600
2007	0.85714	679,928,440	582,797,047
		1,578,893,826	**1,789,150,432**
$EF_{grid,OM,y}$			0.8825

2. Calculation of *BM* emission factor

Table 3-9 $EF_{Coal,Ad}$, $EF_{Coal,Adv}$ and $EF_{Oil\ Adv}$

	parameter	Efficient	Carbon Emission factor（tCO2/TJ）	Oxidation	Emission factor tCO$_2$/MWh
		A	B	C	D=3.6/A/1000×B×C
Coal-fired power plant	$EF_{Coal,Adv}$	38.10%	87.3	1	0.8249
Gas-fired power plant	EF_{GasAdv}	49.99%	75.5	1	0.5437
Oil-fired power plant	$EF_{Oil\ Adv}$	49.99%	54.3	1	0.3910

Table 3-10 Calculation of λ_{Coal}, λ_{Oil} and λ_{Gas}

Fuel type	Unit	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total G=A+…+F	$NCV_{i,y}$ H	$EF_{CO2,i,j,y}$ I	Oxidation J	Emissions K=G×H×I×J/100,000
Raw Coal	10^4t	2,754.04	11,060.80	7,350	3,929.90	3,097.85	28,192.59	20,908	87,300	1	514,590,436
Clean Coal	10^4t	0	0	0	0	0	0.00	26,344	87,300	1	0
Other Washed Coal	10^4t	0	459.17	0	29.32	0	488.49	8,363	87,300	1	3,566,416
Briquette	10^4t	0	0	0	0	0	0.00	20,908	87,300	1	0
Coke	10^4t	0	0	35.06	0	0	35.06	28,435	95,700	1	954,063
other Coke Product	10^4t	0	0	0	0	0	0.00	28,435	95,700	1	0
Sub-total							0.00				519,110,916
Crude Oil	10^4t	0	0	15.15	0	0	15.15	41,816	71,100	1	450,427
Gasoline	10^4t	0	0	0	0	0	0	43,070	67,500	1	0
Diesel	10^4t	1.23	5.37	2.76	0	1.01	10.37	42,652	72,600	1	321,111
Fuel Oil	10^4t	40.76	1.55	29.52	0	2.04	73.87	41,816	75,500	1	2,332,156
Other Petroleum Products	10^4t	20.39	2.78	0	0	0	23.17	41,816	75,500	1	731,502
Sub-total							0				3,835,196
Natrual gas	10^7m^3	46.1	191.7	110.1	0	0	347.9	38,931	54,300	1	7,354,444
Coke Oven Gas	10^7m^3	8.9	97.3	2.2	15.6	7.5	131.5	16,726	37,300	1	820,402
Other Coke Gas	10^7m^3	989.2	704.5	34.1	363	17.1	2107.9	5,227	37,300	1	4,109,712
LPG	10^4t	0	0	0	0	0	0	50,179	61,600	1	0
Refinery Gas	10^4t	0.2	0.63	0	2.55	0	3.38	46,055	48,200	1	75,031
Sub-total											**12,359,588**
Total											**535,305,699**

Data source: China Energy Statistical Yearbook 2008

As per the above date and the related formulation in the PDD: λ_{Coal} =96.97% , λ_{Oil} =0.72% , λ_{Gas} =2.31%.

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.8129tCO_2/MWh.

Table 3-11 Installed capacity of East China Power Grid in 2007

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Abhui	Fujian	Total
Thermal power	MW	14,150	53,340	39,490	17,760	13,910	138,650
Hydropower	MW	0	140	8,520	1,510	9,800	19,970
Nuclear power	MW	0	2,000	3,070	0	0	5,070
Wind power and others	MW	268.8	517.8	40	0	269	1,096
Total	MW	14,419	55,998	51,120	19,270	23,979	164785.6

Source: China Electric Power Yearbook 2008

Table 3-12 Installed capacity of East China Power Grid in 2006

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Abhui	Fujian	Total
Thermal power	MW	14,526.0	51,776.0	35,391.0	14,134.0	13,001.0	128,828.0
Hydropower	MW	0.0	136.0	8,369.0	1,001.0	8,957.0	18,463.0
Nuclear power	MW	0.0	0.0	3,066.0	0.0	0.0	3,066.0
Wind power and others	MW	253.0	162.0	43.0	0.0	89.0	547.0
Total	MW	14,550.0	51,927.0	46,863.0	15,135.0	22,047.0	150,904.0

Source: China Electric Power Yearbook 2007

Table 3-13 Installed capacity of East China Power Grid in 2005

Installed capacity	Unit	Shanghai	Jiangsu	Zhejiang	Abhui	Fujian	Total
Thermal power	MW	13,113.5	42,506.4	27,688.1	11,423.2	9,345.4	104,076.6
Hydropower	MW	0	142.6	6,952.1	749.8	8,224.9	16,069.4
Nuclear power	MW	0	0	3066	0	0	3066
Wind power and 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	123,613.3

Source: China Electric Power Yearbook 2006

Table 3-14 Increased installed capacity in East China Power Grid from 2004 to 2006

	2005	2006	2007	Difference between 2005 and 2007	Percentage of installed capacity (%)
	A	B	C	D=C-A	
Thermal power (MW)	104,076.60	128,828	138,650	34,573.4	83.97%
Hydropower (MW)	16,069.40	18,463	19,970	3,900.6	9.47%
Nuclear power (MW)	3,066.00	3,066	5,070	2,004.0	4.87%

Wind power and others（MW）	401.30	547	1,096	694.3	1.69%
Total（MW）	123613.3	150904	164785.6	41172.3	100.00%
Fraction of newly increased thermal Plants (%)	75.01%	91.58%	100.00%		

Table 3-15 the Build Margin (*BM*) emission factor

Emission factor of thermal power（tCO_2e/MWh）	Increased percentages of thermal power %	*BM* emission factor（tCO_2e/MWh）
0.8129	83.97	0.6826

3. Calculation of *CM* emission factor

Table 3-16 Calculation of CM emission factor

OM（tCO_2e/MWh）	*BM*（tCO_2e/MWh）	*CM*（tCO_2e/MWh）
A	B	C=A×0.5+B×0.5
0.8825	0.6826	0.78255

4. Calculation of PE_y

Table 3-17 **Calculation of** EI_B and $EI_{P,y}$ for the first line (EI_B is from April 2008 to March 2009, $EI_{P,y}$ is from April 2009 to March 2010)

Parameters	Energy consumption before the operation of the project activity					Energy consumption after the operation of the project activity				
	$O_{Clinker,B}$	$Q_{fuel,B}$	$NCV_{fuel,B}$	F_B	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$F_{P,y}$	$EI_{P,y}$
	A	B	C	D=B×C	E=D/A	F	G	H	I=G×H	J=I/F
Unit	t	t	GJ/t	TJ	GJ/t	t	t	GJ/t	TJ	GJ/t
Source	Project Entity	Project Entity	Project Entity	Calculation	Calculation	Project Entity	Project Entity	Project Entity	Calculation	Calculation
Value	1467676	240299	22.53	5414	3.69	2533785	389470	22.97	8945	3.53

Ex-ante estimate of project emission

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	3.69	3.53	22.97	100	48.49	1.78	0.077	2,533,785	-31380
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 3-18 **Calculation of** EI_B and $EI_{P,y}$ for the second line (as there are only four months data for F_B **and** $Q_{fuel,B}$, so the industrial norm has been used as EI_B, and the $EI_{P,y}$ is from October 2009 to September 2010).

Parameters	Energy consumption before the operation of the project activity	Energy consumption after the operation of the project activity				
	EI_B	$O_{Clinker,y}$	$Q_{fuel,y}$	$NCV_{fuel,y}$	$F_{P,y}$	$EI_{P,y}$
	/	F	G	H	I=G×H	J=I/F
Unit	GJ/t	t	t	GJ/t	TJ	GJ/t
Source	Industrial Norm	Project Entity	Project Entity	Project Entity	Calculation	Calculation
Value	3.51	1,618,991	251,657	22.54	5673	3.50

Ex-ante estimate of project emission

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	3.51	3.50	22.54	100	71.54	0.12	0.01	1,618,991	-1329
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

>>
No further information.