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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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The title of the project activity: The Blended Cement project utilizing the additives to decrease the clinker content in Shanxi Guashan Cement
The current version number of the document: Version 2.2
The date of the document was completed: 10/02/2009

A.2. Description of the project activity:

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Project Summary

Shanxi Guashan Cement is one of the major cement manufacturers in Shanxi Province, producing 360 kt/year (2007) [1] using natural resources in the Province and has emitted massive volume of CO2 from clinker use in its manufacturing process. In this CDM project, production volume is planned as 600 kt/yr. Production scale depends on capacity of clinker production facilities. In this project, cement production volume can be increased from 2009 onward as clinker content will be reduced. Meanwhile, Luliang Guangsha Tezhong Jiancai Youxian Gongsi (Hereafter, "Luliang Guangsha Material"), admixture manufacturer in Shanxi Province, has engaged in R&D of admixture with which clinker content of cement products can be decreased since 1990s. As result, the company successfully developed the admixture (Hereafter, "GHPC-S"[2]) with higher content of blast furnace slag or fly ash while satisfying strength standards for blend cements.

This project aims to decrease clinker content of Shanxi Guashan's P.S cement with only blast furnace slag blended from the current level of 64% to 35% by blending GHPC-S at adequate rate, which consequently contributes to reduce CO2 emissions at their cement production stage.

The technology (GHPC-S, blending technique of GHPC-S, etc) to be employed in this project has been verified by the third party[3], in addition to an in-house production test where strength of the product satisfied the relevant standards. It should be noted that this technology is commercially adopted for the first time not only in Jiaocheng County but also in Shanxi Province, due to its technical know-how and cost, which shows that this technology is highly innovative in China.

Shanxi Province is a natural reservoir in China with abundant coal and iron ore on the one hand, while most of industrial wastes such as blast furnace slag and fly ash generated by consuming these natural reservoirs have never been recycled but simply disposed, which is recognized as a social issue in the region. The furnace slag used in this project activity is such industrial wastes so that this project will also contribute to sustainable development in the region.

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[1] Based on the data managed by Shanxi Building Material Industry Administration Office
[2] Official name is "GHPC Zhu Mo Zeng Qiang Ji."
[3] Based on the certificate by the Ad Hoc Committee on Cement Additives, Civil Architectural Society of Shanxi Province

Background

Shanxi Province, mid-east of China, is a great reservoir of natural resources such as coal, iron ore and lime stone, and produces resources and energies which have contributed to China's economic growth. The Province produces 500 Mt/year of coal, while its coke production accounts for approx. 40% of national production volume.[4] On the other hand, however, it generates enormous amount of industrial wastes as results, including blast furnace slag and fly ash. 11.3 Mt/year of metallurgical slag (including blast furnace slag) is generated from steel plants and 18 Mt/year of fly ash from coal-fired power plants: utilization/recycling rates in Jiaocheng County remain at 40% for metallurgical slag and at 51.4% for fly ash[5].

Shanxi Guashan Cement is one of the major cement manufacturers in Shanxi Province, producing 360 kt/year (2007) [6] using natural resources in the Province. At the same time, it has emitted massive volume of CO2 in production stage of clinker which is used for cement production. In this CDM project, production volume is planned as 600kt/yr. Production scale depends on capacity of clinker production facilities. In this project, cement production volume can be increased from 2009 onward as clinker content will be reduced.

On the other hand, Luliang Guangsha Material is characterized by their major product of concrete admixture (multifunction specialty pozzolan) which allows containing large amount of blast-furnace slag or fly ash.

In Chinese customs, cement and water etc. were mixed in construction field for concrete production, which could lead to produce lower quality concrete. Luliang Guangsha Material launched a development of multifunctional specialty pozzolan, a concrete admixture which allows to contain massive blast-furnace slag and fly ash in 1993, and successfully developed the concrete admixture in late 1990s. This admixture greatly improved concrete strength when using with lower strength cement. It has received a high reputation for the spread to the market in addition to the strength improvement, and then won the 3rd prize of Shanxi Province science and technology advancement, etc. Luliang Guangsha Material continued R&D of this admixture after receiving this prize and won some other prizes in Shanxi Province.

In addition, this company had implemented the meticulous R&D about the cement admixture with cooperation of Tsinghua University and Tianjing University since 2001, considering possible use in CDM project. The R&D team released some research papers and then succeeded to suppress the clinker mixing rate by using industrial waste. As a result, Luliang Guangsha Material has succeeded to suppress the clinker mixing rate, by using industrial waste (such as blast furnace slag and fly ash), and then to control CO2 emission. Luliang Guangsha Material has also conducted joint researches with Dr. Shinichi Numata, professor of Nishi-Nippon Institute of Technology, and Dr. Asuo Yonekura, professor of Hiroshima Institute of Technology, both Japan, and released some research papers. As the result of these researches, the cement admixture developed, GHPC-S, can decrease the clinker content to 35% from current 64% level.

In general, blended cement with lower clinker content which is decreased to 35% does not have enough compressive strength in 3 days. However, the newly developed GHPC-S increases the strength to the

[4] Based on the interviews conducted to government officials of Jiaocheng County.
[5] Shanxi circular economy development plan [No.51, 2006] by Shanxi Province People's Government
[6] Based on the data managed by Shanxi Building Material Industry Administration Office

level that can be in use which complies with the relevant standard. Regarding conformity of the blended cement manufactured in this project activity to the GB Standards, it was proved by the Ad Hoc Committee on Cement Additives, Civil Architectural Society of Shanxi Province. [7] Thus, the technology to be employed in this project is verified by the third party and technically established. Meanwhile, this technology is not widespread due to the various barriers (to be described) but commercially adopted for the first time in Shanxi Province, which shows that this technology is highly innovative in China.

Method of CO2 Reduction
CO2 emissions in cement manufacturing are caused mainly in clinker manufacturing. This project aims to reduce clinker content in the cement production of Shanxi Guashan Cement from the current level of 64% to 35% by using GHPC-S to be provided by Luliang Guangsha Material. In this project, blended cement will be manufactured using blast furnace slag which is not used for recycling in the Province, and this product is called as P.S cement. No fly ash is used in this project.

Regarding conformity of the blended cement manufactured in this project to the GB standards, the Inspection Center for Building Material Quality under the Shanxi Building Material Industry Administration Office[8] has established a system to prove conformity to the GB Standards, including on-site inspection to the cement plants and analytical tests to be conducted upon request. Thus, the technology to be employed in this project activity is verified by the third party.

Environmental Impact and Sustainable Development
This project aims to establish a production system for blended cement which contains large amount of blast furnace slag by using Luliang Guangsha Material's admixture, GHPC-S, lowering clinker content from the current level to 35%, and consequently reduce CO2 emissions from clinker production. In addition, the reduction of clinker content also contributes to preserve natural resources such as limestone, plaster and fluorite.

Also, this project activity needs additional industrial waste such as blast furnace slag. There are a lot of industrial wastes within Shanxi Province, and this project uses these wastes effectively. So this project is expected for sustainable development by local governments and local residents.

This project is highly praised by officials of local governments of Jiaocheng County and Luliang City because of the following reasons:

- This project is in line with China's sustainable development policy;
- This project will contribute to mitigate environmental burden;
- Recycling is not beneficial in cost: use of high-cost admixture in blended cement leads to a price rise. However, this project can be commercially viable if conducted as a CDM project. [9]

[7] Based on the certificate by the Ad Hoc Committee on Cement Additives, Civil Architectural Society of Shanxi Province
[8] http://www.sxjcw.gov.cn/Untitled-1.html
[9] Based on comment papers by Jiaocheng County's Environment Protection Department

A.3. Project participants:

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Table 1 Project participants

Name of Party involved	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as a project participant
China (host)	Private entity: Shanxi Guashan Cement	No
Japan	Private entity: Kyushu Electric Power Co., Inc.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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The project takes place at the cement plant owned and run by Shanxi Guashan Cement. The location of the cement plant is outlined below:

Shanxi Guashan Cement:
Northwest of Tan Village, Jiaochen County, Shanxi Province, P.R.China

A.4.1.1. Host Party(ies):

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P.R.China

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

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Shanxi Province

A.4.1.3. City/Town/Community etc.:

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Tan Village, Jiaocheng County, Luliang

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

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The blend cement manufacturing plant of the project activity at latitude 37° 28’ - 37° 54’ north and longitude 111° 24’ - 112° 17’ east is located at Northwest of Tan Village, Jiaocheng County, Shanxi Province. In addition to the project site, the suppliers of blast-furnace slag locate in Shanxi Province. Taiyuan, provincial capital in Shanxi Province, is 550 km west of Beijing.

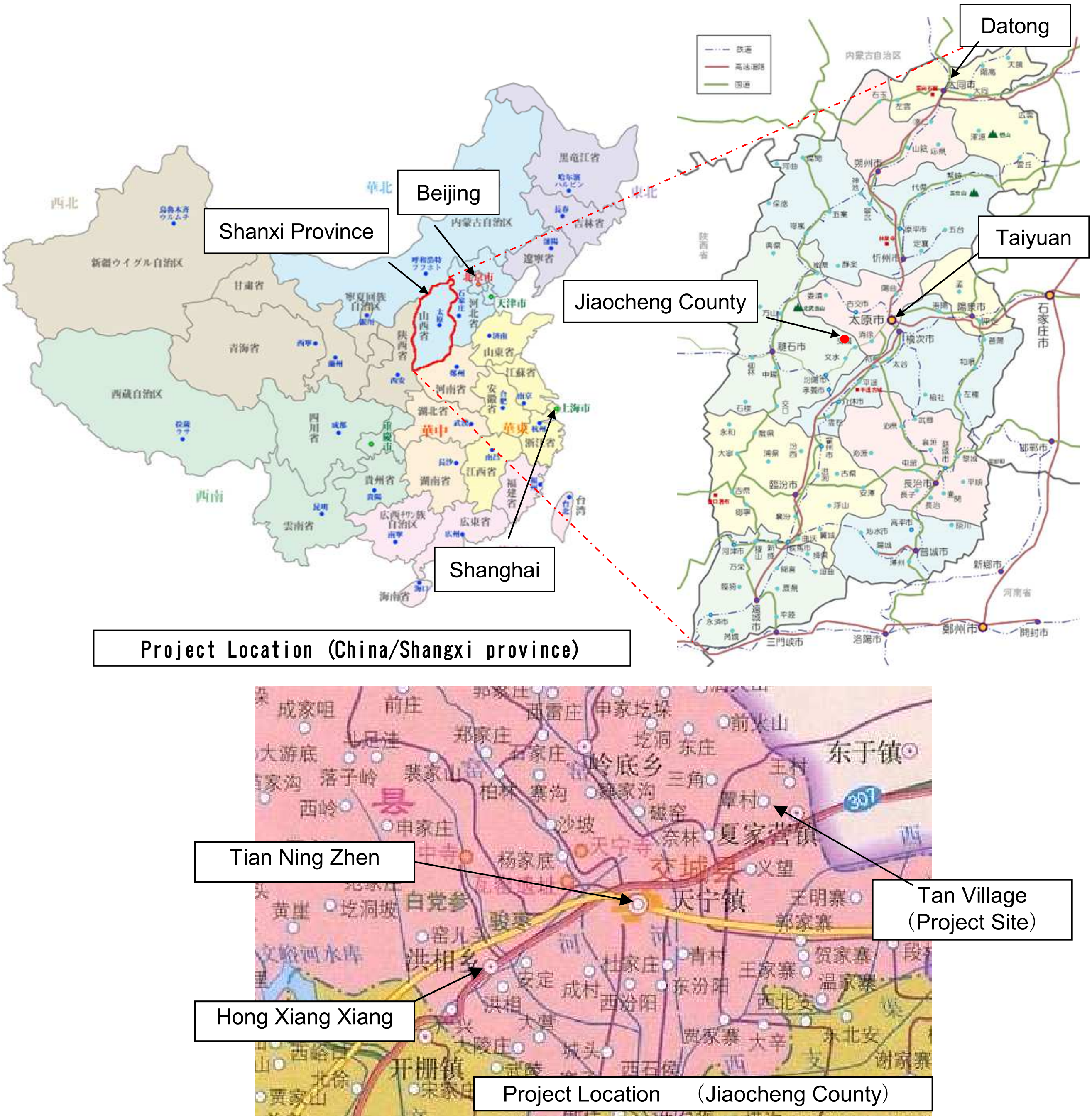

Figure 1 Project location

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

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The project activity is a cement sector specific project activity. The project activity is categorized in Category 4: Manufacturing Industries.

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

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Blended cement, containing large amount of blast furnace slag and fly ash, generally entails problems on early strength and durability, which has to be solved because otherwise the product cannot be accepted in the market. Therefore, the most important technology to be employed in this project is for cement admixture GHPC-S to give blended cement of better quality than other types of products. The cement type to be manufactured in this project is slag cement with blast furnace slag only to be added. There are two types of blast furnace slag: air-cooled slag and water-granulated slag. In this project 100 % water-granulated slag will be used. This project activity aims to use blast furnace slag, a major industrial waste in the Province. It is not expected to cause enormous damage to the environment in this project.

In Chinese custom, cement and water etc. were mixed in construction field for concrete production, which could lead to produce lower quality concrete. Luliang Guangsha Material launched a development of multifunctional specialty pozzolan, a concrete admixture which allows containing massive blast-furnace slag and fly ash about 14 years ago, and successfully developed the concrete admixture in 1990s. This admixture greatly improved concrete strength when using with lower strength cement. It has received a high reputation for the spread to the market in addition to the strength improvement, and then won the 3rd prize of Shanxi Province science and technology advancement, etc. Luliang Guangsha Material continued R&D of this admixture after receiving this prize and won some other prizes in Shanxi Province.

In order to optimize the clinker content per tonne of cement with taking environmental safety into consideration, Luliang Guangsha Material has conducted meticulous R&D with cooperation of Tsinghua University and Tianjing University. The R&D team released some research papers[10,11] and then succeeded to suppress the clinker mixing rate by using industrial waste. Luliang Guangsha Material has also conducted joint researches with Dr. Shinichi Numata, professor of Nishi-Nippon Institute of Technology, and Dr. Asuo Yonekura, professor of Hiroshima Institute of Technology, both Japan, and released some research papers.[12,13,14] As the result of these researches, the cement admixture developed, GHPC-S, can decrease clinker content to 35% from current 64% level. Regarding conformity of the blended cement manufactured in this project activity to the GB Standards, the Ad Hoc Committee on Cement Additives, Civil Architectural Society of Shanxi Province proves it.[15] Thus, the technology to be employed in this project is verified by the third party and technically established. Meanwhile, this technology is not widespread due to the various barriers (to be described) but commercially adopted for the first time in Shanxi Province, which shows that this technology is highly innovative in China.

As for the blended cement, the strength is generally insufficient. However, the quality of the blended

[10] Wang Jian and Yan Guang-qing, "Application of GHPC Mineral Admixtures to Concrete", JOURNAL OF BUILDING MATERIALS, August 2005

[11] Feng Ji-qian, etc., "Good Quality Concrete over 100 years of durability", CHINA CONCRETE AND CEMENT PRODUCTS, August 1998

[12] Shinichi Numata, Shoji Kubo, etc, "DURABILITY OF LOW HEAT PORTLAND CEMENT AND SLAG BLENDS", Science and Concrete Technology Vol.51, December 1997

[13] Shinichi Numata, Asuo Yonekura, etc, "Mechanical and Chemical Characteristics of Mortar using blast furnace fume", Science and Concrete Technology Vol.55, February 2002

[14] Shinichi Numata, "Sulfate Resistance of Composite Cements made by Blending Various Types of Portland Cement with Gronund Granulated Blast Furnace Slag and other Cementitiosu Admixtures", Memoirs of Nishinippon Institute of Technology. Science and technology Vol.25, July 1995

[15] Based on the certificate by the Ad Hoc Committee on Cement Additives, Civil Architectual Society of Shanxi Province

cement manufactured in this project is enough strong to satisfy national standards: under the project, launched in 2003 with cooperation of Luliang Guangsha Material and Shanxi Guashan Cement, some test results to prove conformity to the national standards have been obtained in the test production stage which started in June 2006. A coarse grinder (multilocular shear-type coarse grinder) is planned to be installed before the current ball-mill stage to improve particle size from 25mm to 10mm for this project activity. The blended cement made in this project activity with GHPC-S has sufficient strength, though there are various barriers such as technology and market acceptability.

Luliang Guangsha Material has the technical know-how to make GHPC-S, enabling cement manufacturers to blend both additives such as blast furnace slag more than the current average level in Shanxi Province, although there are some technical difficulties. The company has already tested numerously the impact on the quality in order to combine final impacts on strength properties and appropriate blended mixture for end users.

By reducing CO2 emissions in cement manufacturing, the project activity contributes to improve global and local environment. Air pollution control together with the ISO 14001 assures that the project is environmentally safe.

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

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In this CDM project, the fixed crediting period of 10 years has been chosen. Estimated amount of emission reductions over the crediting period are as follows:

Table 2 Estimated amount of emission reductions over the chosen crediting period

Years	**Annual estimation of emission reductions in tonnes of CO2e**
2009	66,482
2010	94,076
2011	88,316
2012	82,440
2013	76,448
2014	70,335
2015	64,100
2016	57,740
2017	51,253
2018	44,637
2019	12,629
Total estimated reductions (tonnes of CO2e)	708,455
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	70,845

In addition, as the crediting period will be from 01/05/2009 or after the date of registration (whichever is later) to 30/04/2019.

A.4.5. Public funding of the project activity:

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No public funding or official development assistant (ODA) has been used on this project activity.[16]

[16] Based on the explanation paper on progress status of ODA, prepared by Development & Reform Commission of Jiaocheng County

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 approved methodology applied by this project is referenced as ACM0005 (Version 04), "Consolidated Baseline Methodology for increasing the Blend in Cement Production" and "Consolidated Monitoring Methodology for increasing the Blend in Cement Production".

According to the requirements of ACM0005 / Version 04, "Tool for the demonstration and assessment of additionality (Version 04)" and "Tool to calculate the emission factor for an electricity system" agreed by CDM Executive Board is used during the baseline identification process and the baseline and project emission calculation process in the project activity.

For more information please refer to the UNFCCC CDM-Executive Board website under the following link: 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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This methodology is applicable to projects that increase the share of additives (i.e. reduce the share of clinker) in the production of cement types beyond current practices in the country. Additives are defined as materials blended with clinker to produce blended cement types and include fly ash, gypsum, slag, etc. The methodology is applicable under the following conditions:

- There is no shortage of additives related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for the additional amount of additives used in the project activity. If the surplus availability of additives is not substantiated the project emissions reductions (ERs) will be discounted as outlined below.
- This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement.
- Adequate data are available on cement types in the market.

The demonstration below justifies the choice of ACM0005 / Version 04 for this project activity. China is a huge country, and it is difficult to understand the situation of the entire country about cement industry and the additives used in the project activity in full detail. Moreover, as described later, the cement demand in Shanxi Province is very large, and enough for considering it as one country. It is the current status that there is little importing/exporting cement from/to the other provinces or the other countries. Therefore, the demonstration below justifies the applicability condition in Shanxi Province.

- There is no shortage of additives related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for the additional amount of additives used in the project activity. If the surplus availability of additives is not substantiated the project emissions reductions (ERs) will be discounted as outlined below.

Natural resources such as coal, iron ore, and lime stones exist abundantly in Shanxi Province, and it has been continued to produce the resources and energy that supports economic growth in China. On the other hand, however, a large amount of industrial wastes such as blast-furnace slag from the steel plants and fly ash from the coal-fired power plants has been generated, and substantial part of such wastes are left piled or dumped.

Four steel plants plan to dispose blast-furnace slag to this project activity, which are approx. 600, 400, 500 and 800 kt/year, respectively. The blast-furnace slag needed by this project activity is 348 kt/year at most, based on the production plan. As shown in the following table, supply rates of each wastes to dispose are planned between 7.5% and 25.0%, so sufficient amount of the blending materials can be obtained by recycling such industrial wastes. Fly ash will not be used in this project activity.

The fulfillment status for this condition will be grasped after the project launches as well by establishing an appropriate system.

Table 3 Demand/Supply balance of Blast-furnace Slag relevant to this project activity (2007)

Material	Company	Dispose [kt/year]	Supply [kt/year]	Supply Rate	Remnant [kt/year]	Transport Distance [km]
Blast-furnace Slag	A	600	150	25.0%	450	5.1
	B	400	100	25.0%	300	5.2
	C	500	70	14.0%	430	10
	D	800	60	7.5%	740	20

Source: Shanxi Guashan Cement

- This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement.

This project activity fits for the requirement. The cement produced in this project activity is sold in the domestic market[17], which is almost all in Shanxi Province.

The fulfillment status for this condition will be checked annually based on evidences, after the project launched as well.

[17] Based on the document which bans to export the product, issued by Development & Reform Commission of Jiaocheng County

Table 4 Production, sales and import of blended cement in Shanxi Province by cement type (2007)

Cement Type		Production [kt/yr]	Sales [kt/yr]			Import [kt/yr]	
			Shanxi Province	Other Provinces	International Export	Other Provinces	International Import
Blended Cement	P.S	10,000	8,000	2,000	0	2,000	0
	P.C	5,000	5,000	0	0	0	0
	P.P	0	0	0	0	0	0
	P.F	0	0	0	0	0	0
	P.M	0	0	0	0	0	0
Portland Cement		15,000	15,000	0	0	0	0
Total		30,000	28,000	2,000	0	2,000	0

Source: Shanxi Building Material Industry Administration Office

- Adequate data are available on cement types in the market.

This project activity fits for the requirement. The data is available from Shanxi Building Material Industry Administration Office.

The fulfillment status for this condition will be certainly grasped after the project launched as well by establishing an appropriate system for data collection from Shanxi Building Material Industry Administration Office.

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

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The project boundary includes only CO2 emissions from the cement production plants (fuel use in the kilns and calcination) and the power generation in the grid.

The table below describes which emission sources and gases are included in the project boundary for the purpose of calculating project emissions and baseline emissions.

Transport related emissions for delivery of additional additives are included in the project activity emissions as leakage.

Table 5 Sources and gases included in the project boundary

	Source	Gas	Included ?	Justification / Explanation
Baseline	Kiln fuel use	CO_2	YES	Direct emissions from firing the kiln and processing
		CH_4	NO	CH_4 emissions from combustion processes are considered negligible and excluded because these emissions by the cement industry are negligible (see WBCSD / WRI Cement protocol)
		N_2O	NO	see CH_4
	Calcination	CO_2	YES	Direct emissions due to calcination of limestone
		CH_4	NO	NO CH_4 emission
		N_2O	NO	NO N_2O emission
	Electricity from the grid	CO_2	YES	Indirect emissions from fossil fuels combustion of power plants from the grid due to electricity used for: drying, crushing and grinding raw materials used for clinker production and additives, driving the kiln and kiln fans, grinding and mixing of cement.
		CH_4	NO	CH_4 emissions are considered negligible.
		N_2O	NO	N_2O emissions are considered negligible.
	Electricity from on-site power generation	CO_2	NO	NO CO_2 emission
		CH_4	NO	NO CH_4 emission
		N_2O	NO	NO N_2O emission
Project activity	Kiln fuel use	CO_2	YES	Direct emissions from firing the kiln and processing
		CH_4	NO	CH_4 emissions from combustion processes are considered negligible and excluded because these emissions by the cement industry are negligible (see WBCSD / WRI Cement protocol)
		N_2O	NO	see CH_4
	Calcination	CO_2	YES	Direct emissions due to calcination of limestone
		CH_4	NO	NO CH_4 emission
		N_2O	NO	NO N_2O emission
	Electricity from the grid	CO_2	YES	Indirect emissions from fossil fuels combustion of power plants from the grid due to electricity used for: drying, crushing and grinding raw materials used for clinker production and additives, driving the kiln and

	Source	Gas	Included ?	Justification / Explanation
				kiln fans, coarse grinder, grinding and mixing of cement.
		CH4	NO	CH4 emissions are considered negligible.
		N2O	NO	N2O emissions are considered negligible.
	Electricity from on-site power generation	CO2	NO	NO CO2 emission
		CH4	NO	NO CH4 emission
		N2O	NO	NO N2O emission
Leakage	Fuel use for transport	CO2	YES	Direct emissions due to transportation of blast-furnace slag and admixture GHPC-S
		CH4	NO	CH4 emissions are considered negligible.
		N2O	NO	N2O emissions are considered negligible.
	Electricity from the grid	CO2	YES	Indirect emissions from fossil fuels combustion of power plants from the grid due to electricity used for mixing of raw materials (blast furnace fume) to produce admixture GHPC-S
		CH4	NO	CH4 emissions are considered negligible.
		N2O	NO	N2O emissions are considered negligible.

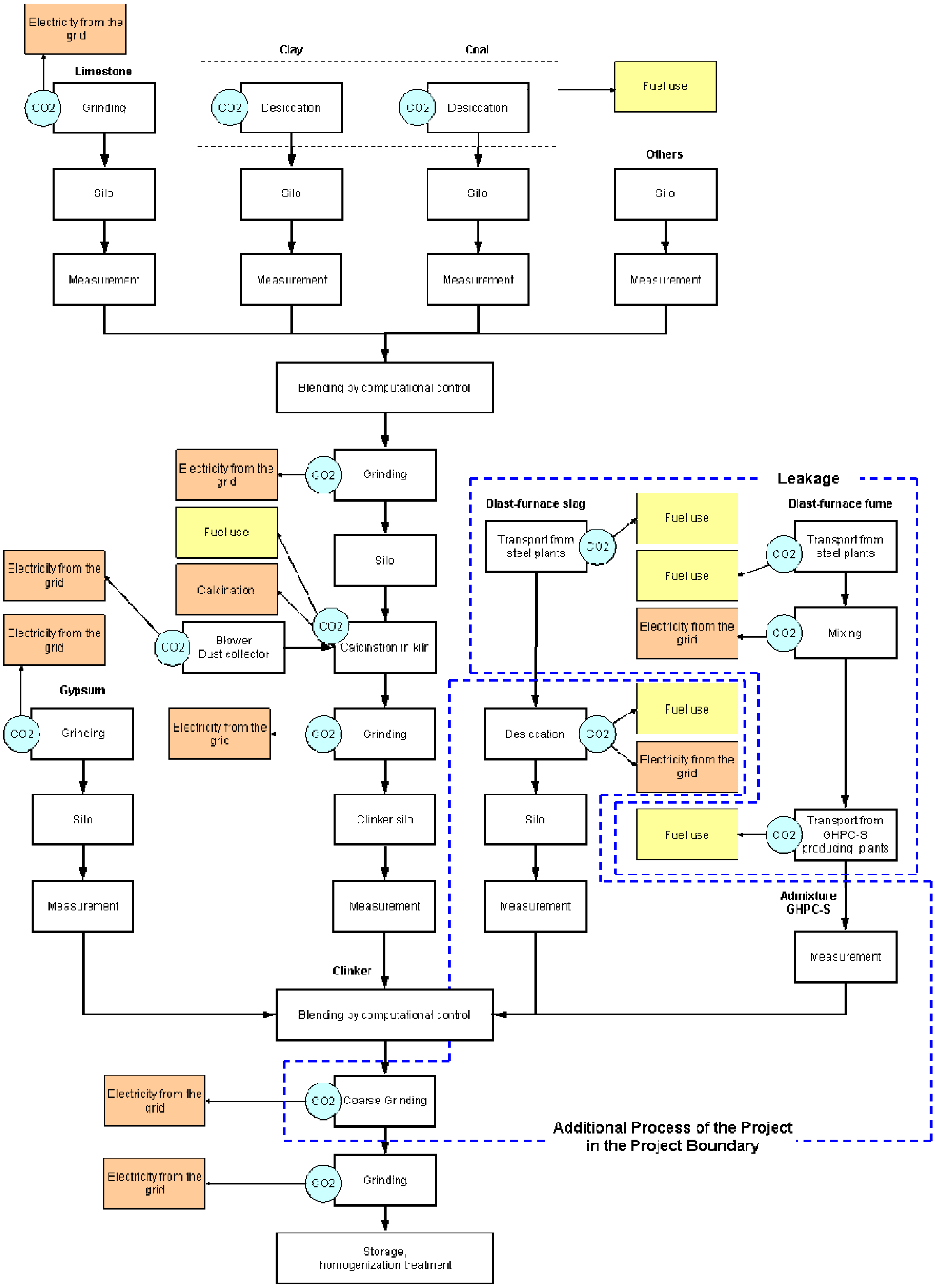

Figure 2 Project outline

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

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Identification of the baseline scenario

In China, cement characteristics are subject to the National Standards. The standards specify the contents of materials, quality level required (strength or durability), inspection methods and rules, and so on. For portland blast furnace-slag cement, portland pozzolana cement and portland fly-ash cement, the standards applied are GB 1344-1999 ("Portland Blast Furnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") and GB 12958-1999 ("Composite Portland Cement") in the National Standards (GB means mandatory standards).[18]

Table 6 Material composition by cement type

<table>
<tr><th>Cement type</th><th>Blast furnace slag</th><th>Fly ash</th><th>Volcanic Ash</th><th>Limestone</th><th>Kiln dust</th></tr>
<tr><td>P.S (Slag cement)</td><td>20 – 70 %</td><td colspan="4">< 8 %</td></tr>
<tr><td>P.P (Volcanic ash cement)</td><td></td><td></td><td>20 – 50 %</td><td></td><td></td></tr>
<tr><td>P.F (Fly ash cement)</td><td></td><td>20 – 40 %</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">P.C (Composite portland cement)</td><td colspan="4" rowspan="2">15 – 50 %</td><td></td></tr>
<tr><td>< 8 %</td></tr>
<tr><td>P.M (Other cement)</td><td colspan="5">No restrictions</td></tr>
</table>

Source: GB 1344-1999 ("Portland Blast Furnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") and GB 12958-1999 ("Composite Portland Cement") in the National Standards
For P.M., based on interviews from the Shanxi Building Material Industry Administration Office.

Including for continuation of the current blend level, theoretically possible baseline scenarios are:

(i) Implementation of the proposed project activity, but not as a CDM project;
(ii) A switch to production of another type of blended cement (P.C cement, P.F cement, P.P cement and P.M cement);
(iii) A continuation of the blend level to produce P.S cement.

On (i) above, because the project activity is unlikely to be financially attractive without being CDM project and there are various barriers to implement as described in B.5, it is impossible to regard it as the baseline scenario.

On (ii) above, P.C cement is the most probable type of cement that Shanxi Guashan Cement may produce in the near future, except for P.S cement. However, Shanxi Guashan Cement has no will to produce P.C cement instead of P.S cement because of the following reasons: first, P.C cement is used to produce mortar that has limited demand than concrete, produced by using P.S cement; second, P.C cement has much darker color than P.S cement and tends to be less preferred by many buyers; third, it takes higher cost to produce P.C cement than P.S cement, because it is necessary to divide fly ash according to particle sizes, which is contained much more in P.C cement than P.S cement.

[18] GB1344-1999 and GB12958-1999 are to be consolidated as GB175-2007 ("Common Portland Cement") from 1st of June, 2008. The draft of GB175-2007 has been publicized, which is basically the same as the existing standards.

P.F cement contains much fly ash so that Shanxi Guashan Cement has no will to produce it because of the same reasons as for P.C cement. P.F cement is not produced in Shanxi Province, which is defined as the "Region" applied for the project, as mentioned later.

P.P cement is also not produced in Shanxi Province, because there is no volcanic ash which must be blended for this type of cement in Shanxi Province.

P.M cement has no restriction for blending additives, but it usually cannot meet the standards, and even if it passes, such cement is less preferred by many buyers.

So the most probable baseline scenario is (iii): the continuation of the blend level to produce P.S cement.

The realistic and credible alternatives can consequently be restricted to the following two scenarios: the existing practice of cement production and the proposed project activity of adding additives, slag or fly ash.

Description of the baseline scenario

The first element in the calculation of baseline emissions is the benchmark share of clinker. In line with the applied methodology this is calculated as the lowest value among the following:

(i) The average (weighted by production) mass percentage of clinker for the 5 highest blend cement brands for the relevant cement type in the region. If the region comprises less than 5 blend cement brands, the national market should be used as the default market; or

(ii) The production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of the blended cement type in the region. If 20% falls on part capacity of a plant, that plant is included in the calculation; or

(iii) The mass percentage of clinker in the relevant cement type produced in the proposed project activity plant before the implementation of the CDM project activity, if applicable (For Greenfield project activity this option may be excluded)

The first step is to define the relevant region for each project. As outlined in the methodology:

Definition of region

The "Region" for the benchmark calculation needs to be clearly determined and justified by project participants. The default is the national market but project participants can define a geographic region as the area where each of the following conditions are met: (i) at least 75% of project activity plant's cement production is sold (percentage of domestic sales only); (ii) includes at least 5 other plants with the required published data; and (iii) the production in the region is at least four times the project activity plant's output. Only domestically sold output is considered and any export of cement produced by the project activity plant are excluded in the estimation of emission reductions.

Shanxi Province is chosen as the "Region" upon the conditions (i), (ii) and (iii) above being met for the year 2007.

Table 7 Fulfilment status for the three conditions to define the "Region" (for 2007)

Project Site	Region	Condition (i)	Condition (ii)	Condition (iii)
Shanxi Guashan Cement	Shanxi Province	100% of cement production is planned to be sold	In the published data there are 17 other plants (see Table 8)	The production in the region is more than 16 times Shanxi Guashan Cement plant's planned maximum output, and the former is to be increased[19] (see Table 4 and Table 8)

The national market is not defined as the "Region" because China is a large country and the key elements which define the extent of additive blending can vary greatly within the country considering quality of cement products and market perceptions. Therefore the region is defined as the area that meets the above three conditions for each project activity plant.

The sales data used to establish the above region is shown below. This is combined with data from Shanxi Building Material Industry Administration Office on the production of other cement plants in the region.

Table 8 Plantwise production of blended cement (P.S cement) – 2007 ('000 tonnes)

Cement Plant	Production (sorted by P.S cement production)	Clinker Content
A	1,000	55%
B	425	58%
Shanxi Guashan Cement	360	64%
C	300	60%
D	200	60%
E	200	60%
F	180	50%
G	150	66%
H	150	55%
I	100	58%
J	90	50%
K	80	60%
L	80	55%
M	70	50%
N	60	63%
O	60	52%
P	50	60%
Q	50	50%
The other plants	< 50	60% - 70%
Total (Shanxi Province)	10,000	

Source: Shanxi Building Material Industry Administration Office

[19] Approx. 28 times in the base year (2007). Even based on a conservative hypothesis that production of the "Region" (Shanxi Province) would remain the same in future, in the project scenario it would be more than 16 times when production of Shanxi Guashan Cement (the project activity plant) is 600kt/yr: that certainly goes beyond the "4 times" criterion of Condition (iii).

Determination of benchmark
Having established the region, the next step is to determine the benchmark clinker and additive content of blended cement in the region. As outlined in the applied methodology, the benchmark for baseline emissions is defined as the lowest among the following:

(i) The average (weighted by production) mass percentage of clinker for the 5 highest blend cement brands for the relevant cement type in the region; If the region comprises of less than 5 blend cement brands, the national market should be used as the default region; or
(ii) The production weighted average mass percentage of clinker in the top 20% (in terms of share of additives) of the total production of the blended cement type in the region. If 20% falls on part capacity of a plant, that plant is included in the calculations; or
(iii) The mass percentage of clinker in the relevant cement type produced in the proposed project activity plant before the implementation of the CDM project activity, if applicable (For Greenfield project activity this option may be excluded).

To determine benchmarks above, the methodology stipulates either statistically significant random sampling or the use of reliable and up to date annual data from a reputable and verifiable source. Data on blended cement production and on clinker production and grinding at cement plants in the region, Shanxi Province, is provided by Shanxi Building Material Industry Administration Office.

The three types of benchmark are calculated as shown below:

(i) The 5 highest blend cement brands for the relevant cement type in the region are Cement Plant A, B, C and D as well as the Project activity plant, therefore:
Benchmark (i) = $((P_A * C_A) + (P_B * C_B) + (P_C * C_C) + (P_D * C_D) + (P_{PA} * C_{PA})) / (P_A + P_B + P_C + P_D + P_{PA})$
(ii) The cement plants in the top 20%[20] in terms of share of additives are Cement Plant A, B, F, H, I, J, L, M, O and Q, therefore:
Benchmark (ii) = $((P_A * C_A) + (P_B * C_B) + (P_F * C_F) + (P_H * C_H) + (P_I * C_I) + (P_J* C_J) + (P_L * C_L) + (P_M * C_M) + (P_O * C_O) + (P_Q * C_Q)) / (P_A + P_B + P_F + P_H + P_I + P_J + P_L + P_M + P_O + P_Q)$
(iii) Clinker content in the project activity plant in 2007

Where:
P_X Production of the relevant cement type in the cement plant X
C_X Clinker content of the relevant cement type in the cement plant X

Table 9 Calculation results of the benchmark

Project activity plant	**Benchmark clinker content, 2007**
Shanxi Guashan Cement	(i) 58.1 % (ii) 54.7 % (iii) 64 %

The methodology stipulates that the lowest value among the three options be selected as the benchmark

[20] Total production of cement plant with share of additives at 45% or more is 16.8% of the total production in the Region and at 42% or more is 22.05%. In this case, the data of cement plant in the latter case is used.

baseline for the base year (2007). These are illustrated below:

Table 10 Benchmark to be used in this project

Project activity plant	Selected benchmark baseline for base year
Shanxi Guashan Cement	(ii) 54.7 %

Trends increase in additive blend.
As outlined in the methodology, we have selected to specify an ex-ante annual increase in the additive blend. The reason for this is to alleviate the monitoring burden and importantly to increase the certainty of CER volumes. There is no clear trend evident in the additive blend in the above regions, nor sufficient data to estimate such a trend. Therefore we have selected the default annual 2% increase in additives.

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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Prior consideration of the CDM
Based on the following investment analysis and barrier analysis, the incentive from the CDM project was considered seriously in the decision to proceed with the project activity. Finally, standing on the favorable result of the meeting held on 4th of September, 2007 in Jiaocheng County House with having 16 participants including local governments, Shanxi Guashan Cement has decided formally to execute CDM project in the board meeting held on 10th of September, 2007.[21] Based on that decision of the board meeting, Shanxi Guashan Cement and Luliang Guangsha Material signed the contract on the long-term purchase of admixture GHPC-S, which is indispensable for the project activity, on 20th November, 2007. Therefore it is evident that the project was intended to be undertaken as a CDM project from the very beginning, before the date of validation. Furthermore, continuing and real actions were taken to secure CDM status for the project in parallel with its implementation, including entering into contract of Emission Reduction Purchase Agreement (ERPA) between Shanxi Guashan Cement and Kyushu Electric Power on 10th December, 2008.

A timeline of the main events relating to the project's implementation is shown below.

Table 11 Progress of actions by the project participants

Date	Venue	Participant	Description	Supporting documents
Feb 28 – Mar 2, 2007	Taiyuan City, etc., Shanxi Province, China	Shanxi Government, Kyushu Electric Power and Luliang Guangsha	Kyushu Electric Power participated in the local China-Japan CDM seminar, organized by Shanxi Province, and noticed Luliang Guangsha's low-clinker technology.	The program and the participants list
Jun 1, 2007	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Guashan Cement	Shanxi Guashan Cement prepared a report on current status regarding cement production in its own plants and on technological feasibility to produce blended cement using admixture based on	Report of the internal investigation on CDM project

[21] Decision of the Board Meeting of Shanxi Guashan Cement held on 10th September, 2007.

Date	Venue	Participant	Description	Supporting documents
			experiments.	
Jun, 2007	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Zhengyuan Engineering Consulting Co. , Ltd	Shanxi Zhengyuan Engineering Consulting submitted the feasibility study report of the project (initial version) to Shanxi Guashan Cement. Based on it, Shanxi Guashan Cement investigated seriously whether to launch preparation works for CDM project.	Feasibility Study Report of the project (Initial Version)
Jul 20, 2007	Kyushu Electric Power Co., Fukuoka City, Japan	Kyushu Electric Power and Mizuho Information & Research Institute (MHIR)	Kyushu Electric Power and Mizuho Information & Research Institute (MHIR) completed consulting service agreement with regard to the blending cement project under the CDM.	The Consulting Agreement
Sep 4, 2007	Jiaocheng County House, Jiaocheng County, Shanxi Prov., China	Shanxi Government, Kyushu Electric Power, Luliang Guangsha, Shanxi Guashan Cement and MHIR	Kyushu Electric Power, Luliang Guangsha, Shanxi Guashan Cement and MHIR participated in explanatory meeting on CDM and the blend cement project, organized by the local government (Luliang City, Jiaocheng County), and gave explanations to the local governments and others about this project.	The program, the participants list and the video pictures in the explanatory meeting
Sep 10, 2007	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Board Members, Shanxi Guashan Cement	Board of Directors of Shanxi Guashan Cement decided to launch preparation works for production of cement with lower clinker content as a CDM project.	Decision of the Board Meeting
Nov 20, 2007	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Guashan Cement and Luliang Guangsha	Shanxi Guashan Cement and Luliang Guangsha signed the Purchase Agreement for admixture GHPC-S. (The starting date of the project activity)	The Purchase Agreement for GHPC-S
Dec 1, 2007	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Guashan Cement	Shanxi Guashan Cement signed the contract on the purchase of the Coarse Grinder.	The Purchase Agreement for the Coarse Grinder
Dec 27, 2007	UNFCCC, Japan Quality Assurance Organization	Japan Quality Assurance Organization	Public comment started for the disclosed PDD of the CDM project on the web site of Japan Quality Assurance Organization as a process of validation.	The web site of Japan Quality Assurance Organization[22]
Jan, 2008	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Zhengyuan Engineering Consulting Co. , Ltd	Shanxi Zhengyuan Engineering Consulting submitted the final feasibility study report of the project to Shanxi Guashan Cement, which is detailed version of the initial version (June, 2007) and both results are	Feasibility Study Report of the project (Detailed Version)

[22] http://cdm.unfccc.int/Projects/Validation/DB/X81W6C9TE5M0F48JPUU8VHQJ4Z9NYF/view.html, http://www.jqa.jp/service_list/environment/service/cdm/detail_of_project_blended_cement.html

Date	Venue	Participant	Description	Supporting documents
			substantially the same except for the initial investment. Shanxi Government made an approval for this report.	
Jan/Feb, 2008	Shanxi Guashan Cement, Jiaocheng County, Shanxi Prov., China	Shanxi Guashan Cement and four companies (as shown in Table 3)	Shanxi Guashan Cement and four steel companies signed the Purchase Agreements for slag.	The Purchase Agreements for slag
Jun 19, 2008	Kyushu Electric Power Co., Fukuoka City, Japan	Kyushu Electric Power Co. and Shanxi Guashan Cement	Kyushu Electric Power Co. and Shanxi Guashan Cement signed the Modalities of Communication (MoC).	Modalities of Communication (MoC)
Dec 10, 2008	Kyushu Electric Power Co., Fukuoka City, Japan	Kyushu Electric Power Co. and Shanxi Guashan Cement	Kyushu Electric Power Co. and Shanxi Guashan Cement signed the Emissions Reduction Purchase Agreement (ERPA).	Emissions Reduction Purchase Agreement (ERPA)

(Notes)
Project Participant: Kyushu Electric Power Co.
Project Participant: Shanxi Guashan Cement Co. (abbreviated as “Shanxi Guashan Cement”)
Provider of low-clinker technology: Luliang Guangsha Tezhong Jiancai Youxian Gongsi (abbreviated as “Luliang Guangsha”)
Validator: Japan Quality Assurance Organization

As outlined in the methodology, we used the Tool for the demonstration and assessment of additionality (version 04) developed by the CDM Executive Board (EB).

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

We defined realistic and credible alternatives to the project activity that can be (part of) the baseline scenario through the following sub-steps:

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

We identified realistic and credible alternatives available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity. As outlined in the methodology and confirmed in section B.4., the available alternatives are restricted to:

- The proposed project activity undertaken without being registered as a CDM project activity;
- The continuation of the current situation (no project activity or other alternatives undertaken)

Sub-step 1b. Consistency with mandatory laws and regulations:

There is no national/provincial regulation to decrease clinker content, including planning stage of laws or regulations. [23]

Production of P.S cement in China is subject to GB 1344-1999 ("Portland Blastfurnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") [24]in the National Standards, under which percentages of raw materials or qualities (the compressive strength or durability) must be complied:

Table 12 Material composition of P.S cement

Cement type	Blast furnace slag	Fly ash	Volcanic Ash	Limestone	Kiln dust
P.S (Slag cement)	20 – 70 %	< 8 %			

Source: GB 1344-1999 ("Portland Blast Furnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") in the National Standards

Table 13 Qualities required for P.S cement

Strength Classification	The compressive strength		The flexural properties	
	3 days	28 days	3 days	28 days
32.5	10.0	32.5	2.5	5.5

Note: "32.5" is the strength grade for P.S cement. The cement manufactured in this project has to meet this grade.
Source: GB 1344-1999 ("Portland Blast Furnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") in the National Standards

Both of the above alternatives will meet these requirements. In general, P.S cement with lower clinker content which is decreased to 35% only has 3 - 5 of the compressive strength in 3 days, which does not comply with the standard. However, if applying GHPC-S, it increases the strength to 12.0 that can be in use as the P.S cement.

GB 1344-1999 ("Portland Blast Furnace-slag Cement, Portland Pozzolana Cement and Portland Fly-ash Cement") in the National Standards is mandatory (GB means mandatory standards).

From the above discussion, we conclude that both alternatives are in compliance with the applicable laws and regulations.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

The CDM project activity generates financial benefits other than CDM related income, so the simple cost analysis (Option I.) cannot be applied.

There is no benchmark which represents standard returns in the market considering the specific risk of the project type. Therefore, the option which is to be applied in Sub-step 2 is not the benchmark analysis (Option III.), but the investment comparison analysis (Option II.).

[23] Based on the interviews conducted to government officials of Jiaocheng Country.
[24] GB1344-1999 is to be modified as GB175-2008 (Common Portland Cement) from 1st of June, 2008. Its draft has been publicized which is basically the same as the existing standard.

Sub-step 2b. – Option II. Apply investment comparison analysis

In contrast with the baseline scenario which has no investment for facilities and apparatus, the project scenario contains a plan to install a coarse grinder before the existing mill[25]. The grinder is considered not as main apparatus but supplement apparatus, therefore, it is more valid to make analysis using NPV than IRR.

The main financial parameters used in the financial analysis are as follows:

Table 14 Main Parameters Used for Financial Calculations

Materials for Cement Production	Unit Price (yuan/t)	Use in the Baseline Scenario (t/t-cement)	Use in the Project Scenario (t/t-cement)
Clinker	113.63	0.55	0.35
Slag[26]	27	0.40	0.58
Plaster	50	0.05	0.06
GHPC-S (Admixture)[27]	3,000	0	0.01
Electricity[28]	0.5 (yuan/kWh)	59.14 (kWh/t-cement)	59.14 (kWh/t-cement)

Source: Feasibility Study Report of the Project (Detailed Version), Shanxi Guashan Cement, 2008

Table 15 Cost Table Used for Financial Calculations (yuan/t-cement)

	Baseline Scenario	Project Scenario
Cement Production		
Clinker	**62.2**	**39.8**
Slag	**10.9**	**15.7**
Plaster	**2.5**	**3.0**
GHPC-S (Admixture)	**0**	**30.0**
Electricity	29.6	29.6
Other (Direct)	7.6	7.6
Other (Indirect)[29]	35.3	35.3
Packaging	20.6	20.6
Financial	4.6	4.6
Managing	12.8	12.8
Marketing	**9.1**	**10.1**
Taxes	27.0	27.0
Total	**222.1**	**236.0**

[25] It plans to install a coarse grinder (multilocular shear-type coarse grinder) before the existing ball-mill process to improve particle size from 25mm to 10mm. 1.836 million yuan was invested for this facility in total.

[26] Based on the Purchase Agreement for slag between Shanxi Guashan Cement and the four companies (as shown in Table 3)

[27] Based on the Purchase Agreement for GHPC-S between Shanxi Guashan Cement and Luliang Guangsha Material

[28] Electrical power to be used for grinding process is considered as the same in principle even if materials are different. The electricity for coarse grinder which is additionally installed can be offset with a grinder in the subsequent process.

[29] Including costs for maintenance, switchgear room, on-site transportation, other use of electricity, depreciation.

	Baseline Scenario	**Project Scenario**
Sales	**235.0**	**235.0**
Investment	**0**	**1.836 million (yuan)**
CER revenue	**0**	**80 (yuan/t-CO2)**

Source: Feasibility Study Report of the Project (Detailed Version), Shanxi Guashan Cement, 2008

Although in the project scenario the cost for producing cement clinker decreases, the additional cost to purchase slag and GHPC-S sets it off and increases the total production cost by 13.9 yuan/t-cement.

Not only the production cost, but the marketing cost is also assumed to be increased to 10.1 yuan/t-cement, which is more expensive than the baseline scenario by 1.0 yuan/t-cement, mainly because of the sales promotion and explanation to the buyers of cement.

The financial analysis results are shown below. As shown in the table, without carbon credits the project's NPV is -5.86 million yuan, which is lower than the baseline scenario, 52.78 million yuan, and generates no profit. With the revenue by selling CERs, the project's NPV increases to 34.39 million yuan, which generates profit.

Table 16 The Financial Analysis Results (NPV) (Unit: Million Yuan)

Baseline Scenario	52.78
Project Scenario (without CER revenue)	-5.86
Project Scenario (with CER revenue)	34.39

Notes: NPV uses 6% discount rate that is general in China.

Sensitivity tests assuming the values in parentheses would change are as follows:

- Additional marketing cost (default value: +1 yuan/t-cement)
- Cement price (default value: 235.0 yuan/t-cement)
- Slag price (default value: 27 yuan/t-slag)
- Discount rate (default value: 6%)

The NPV in the project scenario without CER selling revenue are always less than those in the baseline scenario. Moreover, for the values with high probability, project scenario without CER revenue brings negative NPV.

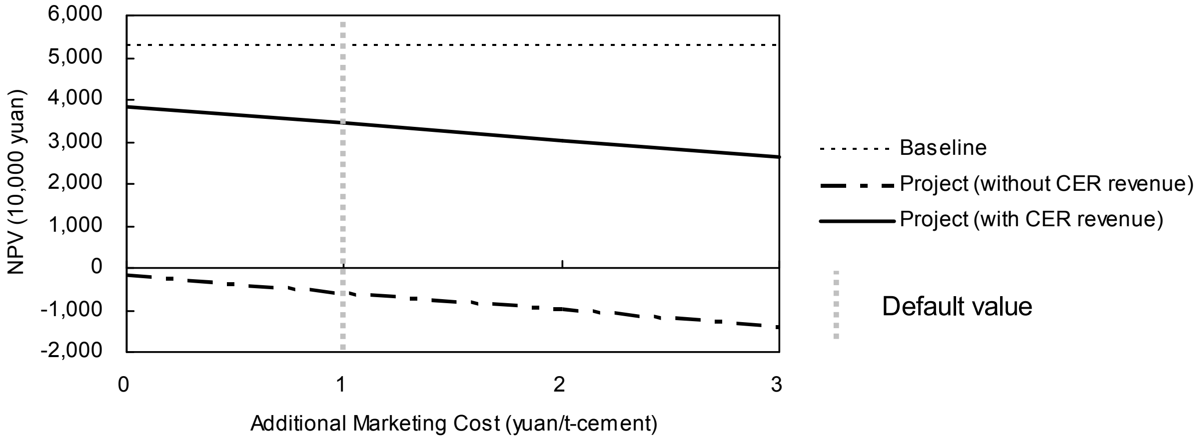

Figure 3 Changes in NPV values according to additional marketing cost

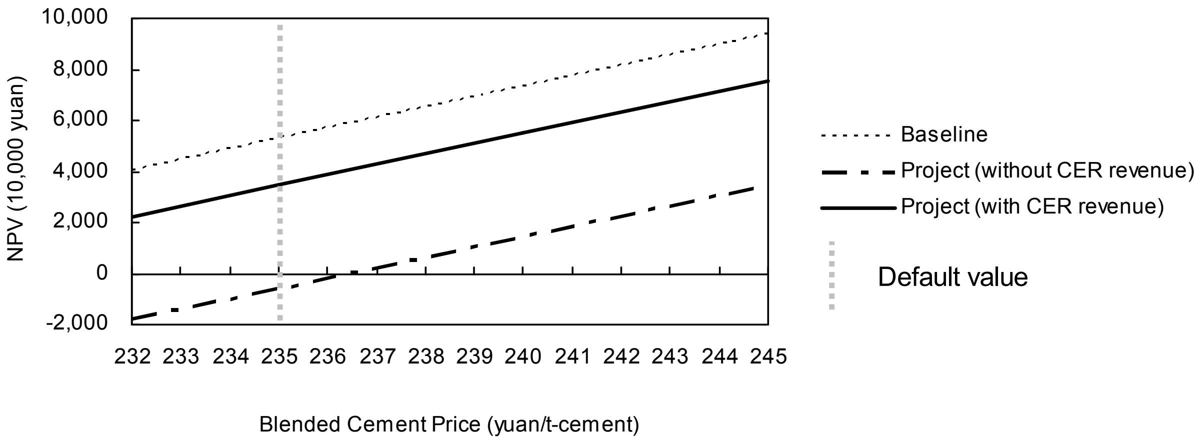

Figure 4 Changes in NPV values according to cement price

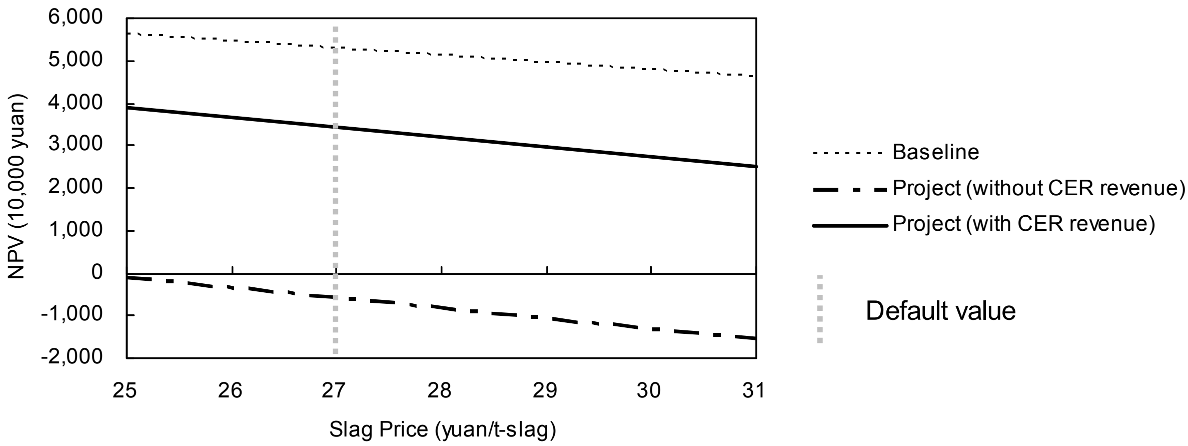

Figure 5 Changes in NPV value according to slag price

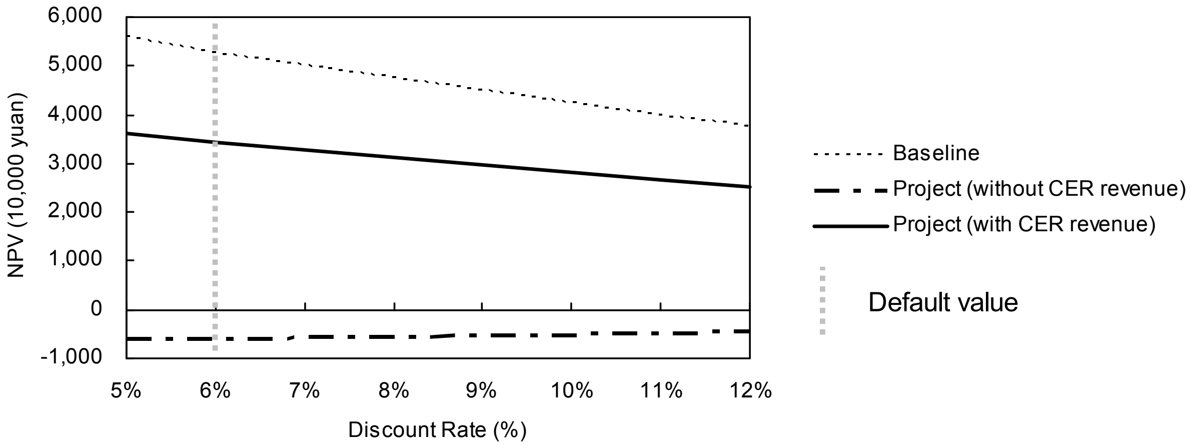

Figure 6 Changes in NPV values according to discount rate

Step 3. Barrier analysis

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

The increase of the additives in the project activity will raise the blend level higher than that of common practice in Shanxi Province.

There are a number of important barriers preventing achievement of the target rate. These barriers can be characterized as:

1. Technological barriers

The blended cement technology has already been established as an admixture for concrete production and the product has been exported to Japan. It is efficient for erosion protection and used as a ready-mixed concrete material. In the case of cement production, physicochemical principle is the same as applied to concrete production. However, it is not easy to lower clinker content rate in cement manufacturing process, unlike concrete production where admixture is blended into cement produced with a certain quality. It is difficult to increase the percentage of additives to the level anticipated in the project activity whilst maintaining the quality of the cement.

Since started R&D work in 1993 with the objective of utilizing large amount of slag from steel companies and fly ash from coal power plants, Luliang Guangsha Material has the technical know-how to make the admixture, enabling cement manufacturers to blend both additives more than the current average level in Shanxi Province.

However, there are technical barriers for Shanxi Guashan Cement, project participant, to reach the level anticipated in the project activity, except for just only using the admixture, GHPC-S. Indeed, it is still very difficult to keep the strength and durability of this type of blended cement. In order to overcome

above technological difficulties, an appropriate arrangement and operation of the facilities will be indispensable.

As for an appropriate arrangement of facilities, in the process of blending GHPC-S, the valid blending ratio is only 0.01 t/t-cement, which means it is extremely difficult to mix evenly because a little volume error in blending GHPC-S causes large deviation in contents of products.

And also in the process of blending with slag, there are as well technical issues to maintain appropriate particle size distribution of cement. Because appropriateness of particle size distribution is different between clinker and slag, in the project activity it is necessary to divide milled materials and cement according to particle sizes and to blend them in a proper way, after maintaining or reconstructing the balls inside the mills. In this context, this project also plans to install a coarse grinder to adjust particle sizes of materials before the existing mill.[30]

As for an appropriate operation of facilities, in order to overcome above technological difficulties, it is also necessary to educate employees and to strengthen a management for analyses and inspections. Especially, conducting rigorous monitoring based on its monitoring plan and managing the data obtained and documents should be focused on in the staff education. (See the Figure on monitoring system). As a part of such education, two staffs in charge of Shanxi Guashan Cement participated in a three-day seminar on CDM which was organized by NDRC, a China's DNA.[31]

Overcoming such technological barriers as above, Luliang Guangsha Material provides Shanxi Guashan Cement with GHPC-S, the admixture which can be used for this project, while Shanxi Guashan Cement, with this admixture, conducts appropriate improvement and operation of their facilities. This is well-matured, advanced technology in China and even at the international level.

2. Barriers due to prevailing practice

The project is a "first of its kind" project not only in Shanxi Province but also in China according to Shanxi Building Material Industry Administration Office and administration officials of Jiaocheng County and Luliang City.

3. Market acceptability barriers

It is crucial that the increase in additives neither reduces the quality nor results in a customer's perception that the cement is of a lower quality, in the precondition to satisfy national standards for cement quality of such as strength.

Although in Shanxi Province many cement manufacturers have been producing blended cement utilizing additives by up to 50% as a substitute for clinker, there is still a general perception that the quality of such blended cements is inferior to that of usual blended cement, especially that additives reduce cement early strength and durability. So therefore customers feel such cement is undesirable in the market and they do not tend to purchase such type of cement.

[30] It plans to install a coarse grinder (multilocular shear-type coarse grinder) before the existing ball-mill process to improve particle size from 25mm to 10mm. 1.836 million yuan was invested for this facility in total.
[31] According to the program provided in the seminar in which the staffs of Shanxi Guashan Cement participated.

Therefore, the a-priori assumption that blended cement with high additive content is of an inferior quality from customers represent major barriers that needs to be removed for implementation of the project activity. At the same time, substantial educational effort must be undertaken to ensure customers' awareness that the quality remains despite the increase of additives, as well as to make additional marketing effort to establish a certain share of higher blend cement in the market. Specifically, first, it is necessary to make and distribute free-of-charge brochures to customers explaining that blended cement with high-additive content can keep qualities such as early strength or durability, while to improve the website to provide more detailed marketing/customer information (http://gshcement.com/index.htm). Second, Shanxi Guashan Cement needs to understand requirements by potential cement buyers and some measures to meet the requirements should be taken. Third, in order to set cement buyers at ease, Shanxi Guashan Cement must promise buyers for after-sales services and prepare their own organization for giving such services. Fourth, Shanxi Guashan Cement is demanded by cement buyers to have technical guidance on making concrete by using the cement, e.g. ratio of cement and water.

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

The alternative to the project activity is the continuation of current practice. This would face much less intensive barriers than outlined above.

Step 4. Common practice analysis
Sub-step 4a. Analyze other activities similar to the proposed project activity

There have not been any other activities implemented previously or current underway that are similar to the project activity. As described in Sub-step 3a, the baseline level from which the project activity will increase the additives in the blended cement exceeds common practice in Shanxi Province. Although in Shanxi Province many cement manufacturers have been producing blended cement utilizing slag or fly ash by up to 50% as a substitute for clinker (in 2007, 18 highest blend cement brands have the clinker contents between 34% to 50% as described in B.4), there is still a general perception that the quality of blended cements utilizing additives more than 50% as a substitute for clinker is inferior to that of usual blended cement, and therefore that blended cement with a higher fly ash or slag blend is less preferred.

Moreover, the project is a "first of its kind" project in Shanxi Province. There has not been any cement manufacturer to try similar project. There are barriers for this technology to get widespread use: cost of the admixture to be used has become more expensive; technologically speaking, it is not as simple as mixing admixture. And that is why this project is worth to be implemented as CDM.

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

Similar activities are neither widely observed nor commonly carried out, and similar activities cannot be identified.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Step 1: Baseline emissions

According to ACM0005 / Version 04, the annual baseline emissions per tonne of blended cement are determined as the following equation:

$BE_{BC,y} = [BE_{clinker} * B_{Blend,y}] + BE_{ele\_ADD\_BC}$ (1)

Where:

$BE_{BC,y}$	Baseline CO_2 emissions per tonne of blended cement type (BC) (tCO_2/tonne of BC)
$BE_{clinker}$	CO_2 emissions per tonne of clinker in the baseline in the project activity plant (tCO_2/tonne of clinker) and defined below
$B_{Blend,y}$	Baseline benchmark of share of clinker per tonne of BC updated for year y (tonne of clinker/tonne of BC)
$BE_{ele\_ADD\_BC}$	Baseline electricity emissions for BC grinding and preparation of additives (tCO_2/tonne of BC)

CO_2 per tonne of clinker in the project activity plant in the baseline is calculated as follows:

$BE_{clinker} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK}$ (1.1)

Where:

$BE_{clinker}$	Baseline emissions of CO_2 per tonne of clinker in the project activity plant (t CO_2/tonne of clinker)
BE_{calcin}	Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (t CO_2/tonne of clinker)
BE_{fossil_fuel}	Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (t CO_2/tonne of clinker)
$BE_{ele\_grid\_CLNK}$	Baseline grid electricity emissions for clinker production per tonne of clinker (t CO_2/tonne of clinker)

There is no self generated electricity in the proposed project.

Emissions from the calcinations of limestone are calculated as follows:

$BE_{calcin} = [0.785*(OutCaO_{BSL} - InCaO_{BSL}) + 1.092*(OutMgO_{BSL} - InMgO_{BSL})] / [CLNK_{BSL} * 1000]$ (1.1.1)

$OutCaO_{BSL} = CaO_{cont\_CLNK\_BSL} * CLNK_{BSL} * 1000$ (1.1.1.1)

$InCaO_{BSL} = CaO_{cont\_RM\_BSL} * RM_{BSL} * 1000$ (1.1.1.2)

$OutMgO_{BSL} = MgO_{cont\_CLNK\_BSL} * CLNK_{BSL} * 1000$ (1.1.1.3)

$InMgO_{BSL} = MgO_{cont\_RM\_BSL} * RM_{BSL} * 1000$ (1.1.1.4)

Where:

BE_{calcin}	Emissions from the calcinations of limestone (tCO_2/tonne of clinker)

0.785	Stoichiometric emission factor for CaO (tCO_2/t CaO)
$OutCaO_{BSL}$	CaO content (%) of the clinker * clinker produced (tonne)
$InCaO_{BSL}$	CaO content (%) of the raw material * raw material quantity (tonne)
1.092	Stoichiometric emission factor for MgO (tCO_2/t MgO)
$OutMgO_{BSL}$	MgO content (%) of the clinker * clinker produced (tonne)
$InMgO_{BSL}$	MgO content (%) of the raw material * raw material quantity (tonne)
$CaO_{cont\_CLNK\_BSL}$	CaO content of the clinker (%)
$CaO_{cont\_RM\_BSL}$	CaO content of the raw material (%)
$MgO_{cont\_CLNK\_BSL}$	MgO content of the clinker (%)
$MgO_{cont\_RM\_BSL}$	MgO content of the raw material (%)
$CLNK_{BSL}$	Annual production of clinker in the base year (kilo tonne of clinker)
RM_{BSL}	Annual consumption of the raw material in the base year (kilo tonne)

Emissions per tonne of clinker due to combustion of fossil fuels are calculated as follows:

$$BE_{fossil\_fuel} = [\ \Sigma FF_{i\_BSL} * EFF_i] / [CLNK_{BSL} * 1000] \quad (1.1.2)$$

Where:

FF_{i_BSL}	Fossil fuel of type i consumed for clinker production in the baseline (tones of fuel i)
EFF_i	Emission factor for fossil fuel i (t CO_2/tonne of fuel)

Baseline consumption of grid electricity for clinker production is calculated as follows:

$$BE_{ele\_grid\_CLNK} = [\ BELE_{grid\_CLNK} * EF_{grid\_BSL}] / CLNK_{BSL} * 1000 \quad (1.1.3)$$

Where:

$BELE_{grid\_CLNK}$	Baseline grid electricity for clinker production (MWh)
EF_{grid_BSL}	Baseline grid emission factor (t CO_2/MWh)

Emissions due to electricity consumption for BC grinding and preparation of additives are calculated as follows:

$$BE_{ele\_ADD\_BC} = BE_{ele\_grid\_BC} + BE_{ele\_grid\_ADD} \quad (1.2)$$

Where:

$BE_{ele\_grid\_BC}$	Baseline grid electricity emissions for BC grinding (tCO_2/tonne of BC)
$BE_{ele\_grid\_ADD}$	Baseline grid electricity emissions for additive preparation (tCO_2/tonne of BC)

Baseline grid electricity emissions for BC grinding are calculated as follows:

$$BE_{ele\_grid\_BC} = [\ BELE_{grid\_BC} * EF_{grid\_BSL}] / [BC_{BSL} * 1000] \quad (1.2.1)$$

Where:

$BELE_{grid\_BC}$ Baseline grid electricity for grinding BC (MWh)
EF_{grid_BSL} Baseline grid emission factor (t CO2/MWh)
BC_{BSL} Annual production of BC in the base year (kilo tonne of BC)

Baseline grid electricity emissions for additive preparation are calculated as follows:

$$BE_{ele\_grid\_ADD} = [\ BELE_{grid\_ADD} * EF_{grid\_BSL}] / [BC_{BSL} * 1000] \quad (1.2.2)$$

Where:
$BELE_{grid\_ADD}$ Baseline grid electricity for grinding additives (MWh)
EF_{grid_BSL} Baseline grid emission factor (t CO_2/MWh)

Step 2: Project Activity Emissions

$PE_{BC,y}$ are estimated as below. In the project activity plant emissions are determined per unit of clinker or per unit of BC accounting for

(i) Emissions from calcinations of limestone;
(ii) Emissions from combustion of fossil fuel and electricity for clinker production and processing of raw material;
(iii) Emissions from electricity used for additives preparation and grinding of cement.

In determining the emissions reduction there are 3 possibilities:

(i) emissions per tonne of clinker during the crediting period are less than baseline emissions per tonne of clinker ($PE_{Clinker,y} < BE_{Clinker}$); or
(ii) baseline and year y emissions per tonne of clinker are equal ($PE_{Clinker,y} = BE_{Clinker}$); or
(iii) emissions per tonne of clinker in year y are greater than the baseline emissions per tonne of clinker ($PE_{Clinker,y} > BE_{Clinker}$).

As this methodology is restricted to increase in percentage of blend only and not to efficiency improvements or fuel switching, in case (i), the baseline value is substituted by the project activity value. That is, if emissions per tonne of clinker are lower during the crediting period, then the lower value is taken for the baseline. The choice of the lower value aims at avoiding potential perverse incentives for project participants to increase the emissions intensity of clinker production as a result of the activity (e.g. by switching from less carbon-intensive energy sources to more carbon-intensive energy sources).

In case (iii) the emissions per tonne of clinker are higher during the crediting period than the baseline. This could be due to declining efficiency or a fuel switch or some other reason. In this case, there is a possibility that project activity emissions exceed the baseline emissions for some years in the crediting period. In this case, the project does not get new credits for emissions reduction till the net balance for the project is positive. In the case that overall negative emission reductions arise in a year, ERs are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. (For example: if negative emission reductions of 30 tCO_2e occur in the year t and positive

emission reductions of 100 tCO_2e occur in the year t+1, 0 CERs are issued for year t and only 70 CERs are issued for the year t+1.)

In this project, according to "ex-ante calculation of emission reductions"(for details, please see B.6.3), emissions per tonne of clinker during the crediting period are less than baseline emissions per tonne of clinker. That is, the emission reductions of this project will meet with the condition of (i).

$$PE_{BC,y} = [PE_{clinker,y} * P_{Blend,y}] + PE_{ele\_ADD\_BC,y} \quad (2)$$

Where:

$PE_{BC,y}$	CO_2 emissions per tonne of BC in the project activity plant in year y(tCO_2/tonne of BC)
$PE_{clinker,y}$	CO_2 emissions per tonne of clinker in the project activity plant in year y (t CO_2/tonne of clinker)
$P_{Blend,y}$	Share of clinker per tonne of BC in year y (tonne of clinker/tonne of BC)
$PE_{ele\_ADD\_BC,y}$	Electricity emissions for BC grinding and preparation of additives in year y (tCO_2/tonne of BC)

CO_2 emissions per tonne of clinker in the project activity plant in year y are calculated as follows:

$$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y} \quad (2.1)$$

Where:

$PE_{calcin,y}$	Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y (tCO_2/tonne of clinker)
$PE_{fossil\_fuel,y}$	Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y (tCO_2/tonne of clinker)
$PE_{ele\_grid\_CLNK,y}$	Grid electricity emissions for clinker production per tonne of clinker in year y (tCO_2/tonne of clinker)

Emissions from the calcinations of limestone are calculated as follows:

$$PE_{calcin,y} = 0.785*(OutCaO_y - InCaO_y) + 1.092*(OutMgO_y - InMgO_y) / [CLNK_y * 1000] \quad (2.1.1)$$

$$OutCaO_y = CaO_{cont\_CLNK\_y} * CLNK_y * 1000 \quad (2.1.1.1)$$
$$InCaO_y = CaO_{cont\_RM\_y} * RM_y * 1000 \quad (2.1.1.2)$$
$$OutMgO_y = MgO_{cont\_CLNK\_y} * CLNK_y * 1000 \quad (2.1.1.3)$$
$$InMgO_y = MgO_{cont\_RM\_y} * RM_y * 1000 \quad (2.1.1.4)$$

Where:

0.785	Stoichiometric emission factor for CaO (tCO2/t CaO)
$OutCaO_y$	CaO content (%) of the clinker * clinker produced (tonne)
$InCaO_y$	CaO content (%) of the raw material * raw material quantity (tonne)
1.092	Stoichiometric emission factor for MgO (tCO2/t MgO)

$OutMgO_y$	MgO content (%) of the clinker * clinker produced (tonne)
$InMgO_y$	MgO content (%) of the raw material * raw material quantity (tonne)
$CaO_{cont\_CLNK\_y}$	CaO content of the clinker (%)
$CaO_{cont\_RM\_y}$	CaO content of the raw material (%)
$MgO_{cont\_CLNK\_y}$	MgO content of the clinker (%)
$MgO_{cont\_RM\_y}$	MgO content of the raw material (%)
$CLNK_y$	Annual production of clinker in year y (kilo tonne of klinker)
RM_y	Annual consumption of the raw material in year y (kilo tonne)

Emissions per tonne of clinker due to combustion of fossil fuels for clinker production are calculated as follows:

$$PE_{fossil\_fuel,\ y} = [\ \Sigma FF_{i,y} * EFF_i]\ /CLNK_y * 1000 \qquad (2.1.2)$$

Where:

$FF_{i,y}$	Fossil fuel of type i consumed for clinker production in year y (tonne of fuel i)
EFF_i	Emission factor for fossil fuel i (tCO_2/tonne of fuel)

Grid electricity emissions for clinker production per tonne of clinker are calculated as follows:

$$PE_{ele\_grid\_CLNK,y} = [\ PELE_{grid\_CLNK,y} * EF_{grid\_y}\ ]\ /\ [CLNK_y * 1000] \qquad (2.1.3)$$

Where:

$PELE_{grid\_CLNK,y}$	Grid electricity for clinker production in year y (MWh)
EF_{grid_y}	Grid emission factor in year y(t CO_2/MWh)

Electricity emissions for BC grinding and preparation of additives are calculated as follows:

$$PE_{ele\_ADD\_BC,y} = PE_{ele\_grid\_BC,y} + PE_{ele\_grid\_ADD,y} \qquad (2.2)$$

Where:

$PE_{ele\_grid\_BC,y}$	Grid electricity emissions for BC grinding in year y (tCO_2/tonne of BC)
$PE_{ele\_grid\_ADD,y}$	Grid electricity emissions for additive preparation in year y (tCO_2/tonne of BC)

Grid electricity emissions for BC grinding are calculated as follows:

$$PE_{ele\_grid\_BC,y} = [\ PELE_{grid\_BC,y} * EF_{grid\_BSL,y}]\ /[BC_y * 1000] \qquad (2.2.1)$$

Where:

$PELE_{grid\_BC,y}$	Baseline grid electricity for grinding BC (MWh)
$EF_{grid\_BSL,y}$	Grid emission factor in year y(t CO2/MWh)
BC_y	Annual production of BC in year y (kilo tonne of BC)

Grid electricity emissions for additive preparation are calculated as follows:

$PE_{ele\_grid\_ADD,y} = [PELE_{grid\_ADD,y} * EF_{grid\_y}] /[BC_y * 1000]$ (2.2.2)

Where:
$PELE_{grid\_ADD,y}$ Baseline grid electricity for grinding additives (MWh)

Step 3: Electricity Emission Factor

The calculation of the GHG emission reductions by the proposed project is followed by the "Tool to calculate the emission factor for an electricity system". Also the Government of China provides calculated OM, BM and CM in the "*Notification on Determining Baseline Emission Factor of China's Grid*"[32] according to the "Tool to calculate the emission factor for an electricity system".
The baseline emission factor (EF_y) is calculated ex-ante as the simple average of the operating margin emission factor ($EF_{OM,y}$) and the build margin emission factor ($EF_{BM,y}$).

Step 3-1. Identify the relevant electric power system

According to the "Tool to calculate the emission factor for an electricity system", the data published on August 9th of 2007 by the DNA of China is employed in this PDD. The North China Power Grid is identified as the electric system, from which would provide electricity in baseline scenario. The North China Power Grid covers Beijing city, Tianjin city, Hebei province, Shanxi province, Shandong province and Inner Mongolia.

Step 3-2. Select an operating margin (OM) method

The Operating Margin Emission Factor ($EF_{OM,y}$) based on one of the following four methods:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.
According to "*Notification on Determining Baseline Emission Factor of China's Grid*", the DNA of China employs the simple OM method (option a). For the simple OM the emission factor can be selected between "Ex-ante" or "Ex-post" calculation. In this PDD Ex-ante option is selected.

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

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

[32] Based on the official data released by the Chinese DNA (http://cdm.ccchina.gov.cn)

Though the DNA of China has already calculated the Operating Margin emission factor for each grid system, in this PDD these figures are recalculated with Chinese national statistical data[33] and IPCC default values at the lower limit of the uncertainty at a 95% confidence interval[34].
The calculation results are as follows:

Table 17 The simple Operating Margin emission factor for the North China Power Grid.

Year	The simple OM factor for the North China Power Grid (t-CO_2/MWh)
2003	1.013700
2004	1.061729
2005	1.092098
Average	1.059810

Step3-4. Identify the cohort of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin 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.

Because it is difficult to obtain the information of the five power plants built most recently in China, the sample group of power units *m* used to calculate the build margin is chosen (b).
In terms of vintage of data, Option 1 is chosen.

Step 3-5. Calculate the build margin emission factor

In accordance with the "Tool to calculate the emission factor for an electricity system", the BM emission factor is calculated as the generation-weighted average emission factor (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available.
Though the DNA of China has already calculated the BM emission factor for each grid system, in this PDD these figures are recalculated Chinese national statistical data[35] and with IPCC default values at the lower limit of the uncertainty at a 95% confidence interval[36].
The calculation results are the followings:

Table 18 The Build Margin emission factor for the North China Power Grid.

Year (most recent)	The BM factor for the North China Power Grid (t-CO_2/MWh)
2005	0.889498

[33] p.287, China Energy Statistical Yearbook, 2006

[34] Table 1.4 of Chapter 1 of Vol. 2 (Energy), 2006 IPCC Guidelines for National Greenhouse Gas Inventories

[35] p.287, China Energy Statistical Yearbook, 2006

[36] Table 1.4 of Chapter 1 of Vol. 2 (Energy), 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Step3-6. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \quad (3)$$

Where:

$EF_{grid,CM,y}$	Combined 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)
$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM} :

- Wind and solar power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent
- All other projects: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

In this PDD, the default values, $w_{OM} = 0.5$ and $w_{BM} = 0.5$, are used.

Step 4: Leakage

According to ACM0005 / Version 04, emissions due to transportation of additives should be accounted as leakage. Thus, transport related emissions for additives are calculated as follows:

$$L_{add\_trans} = [(TF_{cons} * D_{add\_source} * TEF) * 1/Q_{add} * 1/1000 + (ELE_{conveyor\_ADD} * EF_{grid}) * 1/ADD_y] \quad (4)$$

Where:

L_{add_trans}	Transport related emissions per tonne of additives (t CO_2/tonne of additive)
TF_{cons}	Fuel consumption for the vehicle per kilometre (kg of fuel/kilometre)
D_{add_source}	Distance between the source of additive and the project activity plant (km)
TEF	Emission factor for transport fuel (kg CO_2/kg of fuel)
Q_{add}	Quantity of additive carried in one trip per vehicle (tonne of additive)
$ELE_{conveyor\_ADD}$	Annual Electricity consumption for conveyor system for additives (MWh)
EF_{grid}	Grid electricity emission factor (tonne of CO_2/MWh)
ADD_y	Annual consumption of additives in year y. (tonne of additives)

Leakage emissions per tonne of BC due to additional additives are determined by:

$$L_y = L_{add\_trans} * [A_{blend,y} – P_{blend,y}] * BC_y - L_{admixture} * Rate * BC_y \quad (4.1)$$

Where:

L_y	Leakage emissions for transport of additives (kilo tonne of CO_2)
$A_{blend,y}$	Baseline benchmark share of additives per tonne of BC updated for year y (tonne of additives/tonne of BC)
$P_{blend,y}$	Share of additives per tonne of BC in year y (tonne of additives/tonne of BC)
BC_y	Production of BC in year y (kilo tonne of BC)
$L_{admixture}$	Leakage emissions due to addition of admixture (t CO_2/tonne of admixture)
Rate	Ratio of usage of admixture(GHPC-S) to Blend Cement (%)

Leakage emissions due to addition of admixture, GHPC-S, is calculated as follows:

$$L_{admixture} = L_{adm\_elec} + L_{adm\_trans} \quad (4.1.1)$$

Where:

L_{adm_elec}	Leakage emissions due to electricity consumption for admixture (t CO_2/tonne of admixture)
L_{adm_trans}	Transport related emissions per tonne of admixture (t CO_2/tonne of admixture)

Leakage emissions due to electricity consumption for admixture are calculated as follows:

$$L_{adm\_elec} = (ELE_{adm} * EF_{grid}) \quad (4.1.1.1)$$

Where:

ELE_{adm}	Electricity consumption for grinding of admixture (MWh/tonne of admixture)
EF_{grid}	Grid electricity emission factor (tonne of CO_2/MWh)

Transport related emissions per tonne of admixture are calculated as follows:

$$L_{adm\_trans} = (TF_{cons} * D_{adm\_source} * TEF) * 1/Q_{adm} * 1/1000 \quad (4.1.1.2)$$

Where:

TF_{cons}	Fuel consumption for the vehicle per kilometre (kg of fuel/kilometre)
D_{adm_source}	Distance between the source of admixture and the project activity plant (km)
TEF	Emission factor for transport fuel (kg CO_2/kg of fuel)
Q_{adm}	Quantity of admixture carried in one trip per vehicle (tonne of admixture)

The plant, in which the admixture (GHPC-S) is produced, is located near the project activity plant. The distance between the plant of admixture and the project activity plant is almost 5 km.

Another possible leakage due to the diversion of additives does not occur.

Step 5: Emission Reductions

The project activity mainly reduces CO2 emissions through substitution of clinker in cement by blending materials. Emissions reductions in year y are the difference in the CO2 emissions per tonne of BC in the baseline and in the project activity multiplied by the production of BC in year y.
The emissions reductions are discounted for the percentage of additives for which surplus availability is not substantiated.

$$ER_y = \{ [BE_{BC,y} - PE_{BC,y}] * BC_y + L_y \} * (1 - \alpha_y) \qquad (5)$$

where

ER_y	Emissions reductions in year y due to project activity (kilo tonne of CO2)
$BE_{BC,y}$	Baseline emissions per tonne of BC in year y (tCO2/tonne of BC)
$PE_{BC,y}$	Project emissions per tonne of BC in year y (tCO2/tonne of BC)
BC_y	BC production in year y (kilo tonne of BC)
L_y	Leakage emissions for transport of additives (kilo tonne of CO2)
α_y	Share of additional amounts of additives used as surplus in year y

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

Data / Parameter:	**$InCaO_{BSL}$**
Data unit:	tonne
Description:	Quantity of CaO in the raw material
Source of data used:	Plant record
Value applied:	2660
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	The unit in monitoring methodology is percent (%) while tonne is used in the formula (1.1.1) of the baseline methodology. This parameter shows "quantity" of CaO in raw material: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$OutCaO_{BSL}$**
Data unit:	tonne
Description:	Quantity of CaO in the clinker
Source of data used:	Plant record
Value applied:	148281
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	The unit in monitoring methodology is percent (%) while tonne is used in the formula (1.1.1) of the baseline methodology. This parameter shows "quantity" of CaO in clinker: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$InMgO_{BSL}$**
Data unit:	tonne
Description:	MgO content of the raw material
Source of data used:	Plant record
Value applied:	646
Justification of the choice of data or description of measurement methods	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size

and procedures actually applied :	and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	The unit in monitoring methodology is percent (%) while tonne is used in the formula (1.1.1) of the baseline methodology. This parameter shows “quantity” of MgO in raw material: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$OutMgO_{BSL}$**
Data unit:	tonne
Description:	MgO content of the clinker
Source of data used:	Plant record
Value applied:	8786
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	The unit in monitoring methodology is percent (%) while tonne is used in the formula (1.1.1) of the baseline methodology. This parameter shows “quantity” of MgO in clinker: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$InCaO_{cont\_RM\_BSL}$**
Data unit:	%
Description:	CaO content of the raw material
Source of data used:	Plant record
Value applied:	0.70
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	This parameter to express CaO content (%) of raw material is introduced in order to avoid confusion with $InCaO_{BSL}$.

Data / Parameter:	**$OutCaO_{cont\_CLNK\_BSL}$**
Data unit:	%
Description:	CaO content of the clinker
Source of data used:	Plant record
Value applied:	64.47
Justification of the	The value of data is calculated based on the average of actual operation data

choice of data or description of measurement methods and procedures actually applied :	during the three years (2004-2006). The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	This parameter to express CaO content (%) of clinker is introduced in order to avoid confusion with $OutCaO_{BSL}$.

Data / Parameter:	**$InMgO_{cont\_RM\_BSL}$**
Data unit:	%
Description:	MgO content of the raw material
Source of data used:	Plant record
Value applied:	0.17
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	This parameter to express MgO content (%) of raw material is introduced in order to avoid confusion with $InMgO_{BSL}$.

Data / Parameter:	**$OutMgO_{cont\_CLNK\_BSL}$**
Data unit:	%
Description:	MgO content of the clinker
Source of data used:	Plant record
Value applied:	3.82
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production.
Any comment:	This parameter to express MgO content (%) of clinker is introduced in order to avoid confusion with $OutMgO_{BSL}$.

Data / Parameter:	**$CLNK_{BSL}$**
Data unit:	Kilo tonne
Description:	Annual production of clinker in the base year
Source of data used:	Plant record
Value applied:	230
Justification of the choice of data or	The data is from an actual operation in the process of blending and is calculated as an average during the three years(2004-2006).

description of measurement methods and procedures actually applied :	The data of clinker production is written on paper by a process staff every eight hours basis and compiled annual basis. This is their usual operation of cement production.
Any comment:	None

Data / Parameter:	**RM_{BSL}**
Data unit:	Kilo tonne
Description:	Annual consumption of clinker raw material in the base year
Source of data used:	Plant record
Value applied:	380
Justification of the choice of data or description of measurement methods and procedures actually applied :	To produce 1 tonne of clinker needs 1.652 tonne of raw material. The componential breakdown is: Limestone: 1.173 tonnes, Raw coal: 0.19 tonnes, Clay:0.198 tonnes and Others: 0.091 tonnes In the base year, 230 kilo tonnes of clinker is produced, therefore, it needs 380 kilo tonnes of raw material. The value of data is calculated based on the average of actual operation data during the three years (2004-2006).
Any comment:	None

Data / Parameter:	**BC_{BSL}**
Data unit:	Kilo tonne
Description:	Annual production of BC in the base year
Source of data used:	Plant record
Value applied:	360
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from an actual operation in the process of blending and is calculated as an average during the three years (2004-2006). The data of BC production is written on paper by a process staff every eight hours basis and compiled annual basis. This is their usual operation of cement production.
Any comment:	None

Data / Parameter:	**$FF_{1\ BSL}$**
Data unit:	tonne of fuel
Description:	Fossil fuel of type 1 consumed for clinker production
Source of data used:	Plant record
Value applied:	43695
Justification of the choice of data or description of measurement methods and procedures	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). This is coal consumption as a raw material for clinker production. The type of coal is "other bituminous coal."

actually applied :	
Any comment:	Coal

Data / Parameter:	$FF_{2\ BSL}$
Data unit:	tonne of fuel
Description:	Fossil fuel of type 2 consumed for clinker production
Source of data used:	Plant record
Value applied:	2971
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). This is coal consumption as fuel of desiccation for raw materials. The type of coal is "other bituminous coal."
Any comment:	Coal

Data / Parameter:	EFF_{coal_1}
Data unit:	t CO2/tonne of fuel
Description:	Emission factor for fossil fuel
Source of data used:	IPCC/regional data
Value applied:	1.978
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is calculated based on the following data: Calorific value of raw coal: 20908 kJ/kg according to national data[37]. Emission factor of raw coal: 25.80 t-C/TJ according to IPCC[38]. Oxidation rate: 1.0 This coal is consumed as a raw material for clinker production. This parameter corresponds to the parameter, "FF1_BSL".
Any comment:	The type of coal is "other bituminous coal."

Data / Parameter:	EFF_{coal_2}
Data unit:	t CO2/tonne of fuel
Description:	Emission factor for fossil fuel
Source of data used:	IPCC/regional data
Value applied:	1.978
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is calculated based on the following data: Calorific value of raw coal: 20908 kJ/kg according to national data[39]. Emission factor of raw coal: 25.80 t-C/TJ according to IPCC[40]. Oxidation rate: 1.0 This coal is consumed as fuel of desiccation for raw materials. This parameter corresponds to the parameter, "FF2_BSL".

[37] p.287, China Energy Statistical Yearbook, 2006

[38] Chapter 1, table1.4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

[39] p.287, China Energy Statistical Yearbook, 2006

[40] Chapter 1, table1.4, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Any comment:	The type of coal is "other bituminous coal."

Data / Parameter:	**$BELE_{grid\_CLNK}$**
Data unit:	MWh
Description:	Baseline grid electricity for clinker production
Source of data used:	Plant record
Value applied:	14720
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006). Electricity is used for grinding of materials in the process of clinker production. The data is monitored by an integrating watt meter in power control room.
Any comment:	None

Data / Parameter:	**EF_{grid_BSL}**
Data unit:	tCO2/MWh
Description:	Baseline grid emission factor
Source of data used:	Chinese government and IPCC
Value applied:	0.974654
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to "Tool to calculate the emission factor for an electricity system". Electricity data is provided by DNA of China dated 9 August, 2007[41] . National average default values are used for net calorific value of fossil fuel (NCV) because values are reliable and documented in national energy statistics[42]. IPCC default values are used for CO2 emission factor of fossil fuels according to the description, "IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories", in the Tool. Calculation results are: OM: 1.05981 tCO2/MWh BM: 0.88949 tCO2/MWh CM: 0.97465 tCO2/MWh
Any comment:	In detail, see Annex 3.

Data / Parameter:	**$BELE_{grid\_BC}$**
Data unit:	MWh
Description:	Baseline grid electricity for grinding BC
Source of data used:	Plant record
Value applied:	15120
Justification of the choice of data or description of	According to consumption of 42kWh per 1 tonne of BC. Electricity is used for grinding of materials in the process of clinker production. The data is monitored by an integrating watt meter in power control room.

[41] http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=1891

[42] p.287, China Energy Statistical Yearbook, 2006

measurement methods and procedures actually applied :	The value of data is calculated based on the average of actual operation data during the three years (2004-2006).
Any comment:	None

Data / Parameter:	**$BELE_{grid\_ADD}$**
Data unit:	MWh
Description:	Baseline grid electricity for grinding additives
Source of data used:	Plant record
Value applied:	1368
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to consumption of 1.8kWh per 1 tonne of BC. Electricity is used for grinding of materials in the process of clinker production. The data is monitored by an integrating watt meter in power control room. The value of data is calculated based on the average of actual operation data during the three years (2004-2006).
Any comment:	None

Data / Parameter:	**$B_{Blend,y}$**
Data unit:	Tonne of clinker / tonne of BC
Description:	Baseline benchmark of share of clinker per tonne of BC in year y
Source of data used:	Plant record
Value applied:	0.538 – 0.437
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from an actual operation in the process of blending and is calculated as an average during the three years (2004-2006). The data of clinker production is written on paper by a process staff every eight hours basis and compiled annual basis. This is their usual operation of cement production.
Any comment:	See B.6.3

Data / Parameter:	**$A_{blend,y}$**
Data unit:	Tonne of additives / tonne of BC
Description:	Baseline benchmark share of additives per tonne of BC in year y
Source of data used:	Plant record
Value applied:	0.462 – 0.563
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from an actual operation in the process of blending and is calculated as an average during the three years (2004-2006). The data of clinker production is written on paper by a process staff every eight hours basis and compiled annual basis. This is their usual operation of cement production.
Any comment:	See B.6.3

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

>>

Baseline emissions

$$BE_{BC,y} = [BE_{clinker} * B_{Blend,y}] + BE_{ele\_ADD\_BC} \quad (1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BE_{BC_y}	t-CO2/t-BC	0.573	0.564	0.554	0.544	0.534	0.524	0.514	0.503	0.492	0.481	0.470
$BE_{clinker}$	t-CO2/t-clinker	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
B_{Blend_y}	t-clinker/t-BC	0.529	0.519	0.510	0.500	0.490	0.480	0.469	0.459	0.448	0.437	0.425
$BE_{elec\_ADD\_BC}$	t-CO2/t-BC	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045

$$BE_{clinker} = BE_{calcin} + BE_{fossil\_fuel} + BE_{ele\_grid\_CLNK} \quad (1.1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$BE_{clinker}$	t-CO2/t-clinker	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
BE_{calcin}	t-CO2/t-clinker	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536
BE_{fossil_fuel}	t-CO2/t-clinker	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401
$BE_{ele\_grid\_CLNK}$	t-CO2/t-clinker	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062

$$BE_{calcin} = [0.785*(OutCaO_{BSL} - InCaO_{BSL}) + 1.092*(OutMgO_{BSL} - InMgO_{BSL})] / [CLNK_{BSL} * 1000] \quad (1.1.1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BE_{calcin}	t-CO2/t-clinker	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536
$OutCaO_{BSL}$	tonne	148,281	148,281	148,281	148,281	148,281	148,281	148,281	148,281	148,281	148,281	148,281
$InCaO_{BSL}$	tonne	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660	2660
$OutMgO_{BSL}$	tonne	8786	8786	8786	8786	8786	8786	8786	8786	8786	8786	8786
$InMgO_{BSL}$	tonne	646	646	646	646	646	646	646	646	646	646	646
$CLNK_{BSL}$	kilo tonne	230	230	230	230	230	230	230	230	230	230	230

$$OutCaO_{BSL} = CaO_{cont\_CLNK\_BSL} * CLNK_{BSL} * 1000 \quad (1.1.1.1)$$
$$InCaO_{BSL} = CaO_{cont\_RM\_BSL} * RM_{BSL} * 1000 \quad (1.1.1.2)$$
$$OutMgO_{BSL} = MgO_{cont\_CLNK\_BSL} * CLNK_{BSL} * 1000 \quad (1.1.1.3)$$
$$InMgO_{BSL} = MgO_{cont\_RM\_BSL} * RM_{BSL} * 1000 \quad (1.1.1.4)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$CaO_{cont\_CLNK\_BSL}$	%	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47
$CaO_{cont\_RM\_BSL}$	%	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
$MgO_{cont\_CLNK\_BSL}$	%	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82
$MgO_{cont\_RM\_BSL}$	%	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
RM_{BSL}	kilo tonne	380	380	380	380	380	380	380	380	380	380	380

$$BE_{fossil\_fuel} = [\ \Sigma FF_{i\_BSL} * EFF_i] / [CLNK_{BSL} * 1000] \quad (1.1.2)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BE_{fossil_fuel}	t-CO2/t-clinker	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401
$FF_{coal\_1\_BSL}$	tonne	43,695	43,695	43,695	43,695	43,695	43,695	43,695	43,695	43,695	43,695	43,695
$EF_{coal\_2\_BSL}$	tonne	2,971	2,971	2,971	2,971	2,971	2,971	2,971	2,971	2,971	2,971	2,971
EFF_{coal_1}	t-CO2/t-fuel	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978
EFF_{coal_2}	t-CO2/t-fuel	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978

$$BE_{ele\_grid\_CLNK} = [\ BELE_{grid\_CLNK} * EF_{grid\_BSL}] / CLNK_{BSL} * 1000 \quad (1.1.3)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$BE_{ele\_grid\_CLNK}$	t-CO2/t-clinker	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
$BELE_{grid\_CLNK}$	MWh	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720	14,720
EF_{grid_BSL}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465

$$BE_{ele\_ADD\_BC} = BE_{ele\_grid\_BC} + BE_{ele\_grid\_ADD} \quad (1.2)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$BE_{ele\_ADD\_BC}$	t-CO2/t-BC	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
$BE_{ele\_grid\_BC}$	t-CO2/t-BC	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
$BE_{ele\_grid\_ADD}$	t-CO2/t-BC	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004

$$BE_{ele\_grid\_BC} = [\ BELE_{grid\_BC} * EF_{grid\_BSL}] / [BC_{BSL} * 1000] \quad (1.2.1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$BE_{ele\_grid\_BC}$	t-CO2/t-BC	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
$BELE_{grid\_BC}$	MWh	15120	15120	15120	15120	15120	15120	15120	15120	15120	15120	15120
EF_{grid_BSL}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465
BC_{BSL}	kilo tonne	360	360	360	360	360	360	360	360	360	360	360

$$BE_{ele\_grid\_ADD} = [\ BELE_{grid\_ADD} * EF_{grid\_BSL}] / [BC_{BSL} * 1000] \quad (1.2.2)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$BE_{ele\_grid\_AD}$	t-CO2/t-BC	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
$BELE_{grid\_ADD}$	MWh	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368	1,368
EF_{grid_BSL}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465
BC_{BSL}	kilo tonne	360	360	360	360	360	360	360	360	360	360	360

Project activity emissions

$$PE_{BC,y} = [PE_{clinker,y} * P_{Blend,y}] + PE_{ele\_ADD\_BC,y} \quad (2)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
PE_{BC_y}	t-CO2/t-BC	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407
$PE_{clinker\_y}$	t-CO2/t-clinker	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028
P_{Blend_y}	t-clinker/t-BC	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350
$PE_{ele\_ADD\_BC\_y}$	t-CO2/t-BC	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047

$$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\_fuel,y} + PE_{ele\_grid\_CLNK,y} \quad (2.1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{clinker\_y}$	t-CO2/t-BC	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028	1.028
PE_{calcin_y}	t-CO2/t-Clinker	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536
$PE_{fossil\_fuel\_y}$	t-CO2/t-Clinker	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430
$PE_{ele\_grid\_CLNK\_y}$	t-CO2/t-Clinker	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062

$$PE_{calcin,y} = 0.785*(OutCaO_y - InCaO_y) + 1.092*(OutMgO_y - InMgO_y) / [CLNK_y * 1000] \quad (2.1.1)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
PE_{calcin_y}	t-CO2/t-Clinker	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536	0.536
$OutCaO_y$	tonne	90,258	135,387	135,387	135,387	135,387	135,387	135,387	135,387	135,387	135,387	45,129
$InCaO_y$	tonne	1,619	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,428	2,428	809
$OutMgO_y$	tonne	5,348	8,022	8,022	8,022	8,022	8,022	8,022	8,022	8,022	8,022	2,674
$InMgO_y$	tonne	393	590	590	590	590	590	590	590	590	590	197
$CLNK_y$	kilo tonne	140	210	210	210	210	210	210	210	210	210	70

$$OutCaO_y = CaO_{cont\_CLNK\_y} * CLNK_y * 1000 \quad (2.1.1.1)$$

$InCaO_y = CaO_{cont\_RM\_y} * RM_y * 1000$ (2.1.1.2)
$OutMgO_y = MgO_{cont\_CLNK\_y} * CLNK_y * 1000$ (2.1.1.3)
$InMgO_y = MgO_{cont\_RM\_y} * RM_y * 1000$ (2.1.1.4)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$CaO_{cont\_CLNK\_y}$	%	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47	64.47
$CaO_{cont\_RM\_y}$	%	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
$MgO_{cont\_CLNK\_y}$	%	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82
$MgO_{cont\_RM\_y}$	%	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
RM_y	kilo tonne	231	347	347	347	347	347	347	347	347	347	116

$PE_{fossil\_fuel,\ y} = [\ \Sigma FF_{i,y} * EFF_i]\ /CLNK_y * 1000$ (2.1.2)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{fossil\_fuel\_y}$	t-CO2/t-Clinker	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430
$FF_{coal\_y\ 1}$	t-Fuel	26,600	39,900	39,900	39,900	39,900	39,900	39,900	39,900	39,900	39,900	13,300
$FF_{coal\_y\ 2}$	t-Fuel	3,801	5,701	5,701	5,701	5,701	5,701	5,701	5,701	5,701	5,701	1,900
EFF_{coal_1}	t-CO2/t-Fuel	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978
EFF_{coal_2}	t-CO2/t-Fuel	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978	1.978

$PE_{ele\_grid\_CLNK,y} = [\ PELE_{grid\_CLNK,y} * EF_{grid\_y}\ ]\ /\ [CLNK_y * 1000]$ (2.1.3)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{ele\_grid\_CLNK\_y}$	t-CO2/t-Clinker	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
$PELE_{grid\_CLNK\_y}$	MWh	8,960	13,440	13,440	13,440	13,440	13,440	13,440	13,440	13,440	13,440	4,480
EF_{grid_y}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465

$PE_{ele\_ADD\_BC,y} = PE_{ele\_grid\_BC,y} + PE_{ele\_grid\_ADD,y}$ (2.2)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{ele\_ADD\_BC\_y}$	t-clinker/t-BC	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
$PE_{ele\_grid\_BC\_y}$	t-CO2/t-BC	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
$PE_{ele\_grid\_ADD\_y}$	t-CO2/t-BC	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004

$PE_{ele\_grid\_BC,y} = [\ PELE_{grid\_BC,y} * EF_{grid\_BSL,y}]\ /[BC_y * 1000]$ (2.2.1)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{ele\_grid\_BC\_y}$	t-CO2/t-BC	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
$PELE_{grid\_BC\_y}$	MWh	16,800	25,200	25,200	25,200	25,200	25,200	25,200	25,200	25,200	25,200	8,400
EF_{grid_y}	t-CO2/MWh	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025	1.03025
BC_y	kilo tonne	400	600	600	600	600	600	600	600	600	600	200

$PE_{ele\_grid\_ADD,y} = [\ PELE_{grid\_ADD,y} * EF_{grid\_y}]\ /[BC_y * 1000]$ (2.2.2)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$PE_{ele\_grid\_ADD\_y}$	t-CO2/t-BC	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
$PELE_{grid\_ADD\_y}$	MWh	1520	2280	2280	2280	2280	2280	2280	2280	2280	2280	760
EF_{grid_y}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465
BC_y	kilo tonne	400	600	600	600	600	600	600	600	600	600	200

Leakage

$L_{add\_trans} = [(TF_{cons} * D_{add\_source} * TEF) * 1/Q_{add} * 1/1000 + (ELE_{conveyor\_ADD} * EF_{grid}) * 1/ADD_y]$ (4)

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
L_{add_trans}	t-CO2/t-Additives	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
TF_{cons}	kg-fuel/km	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900	0.3900
D_{add_source}	km	20	20	20	20	20	20	20	20	20	20	20
TEF	kg-CO2/kg-fuel	3.209	3.209	3.209	3.209	3.209	3.209	3.209	3.209	3.209	3.209	3.209
Q_{add}	t-Additives/trip	30	30	30	30	30	30	30	30	30	30	30
$ELE_{conveyor\_ADD}$	MWh	0	0	0	0	0	0	0	0	0	0	0
EF_{grid}	t-CO2/MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465
ADD_y	t-Additives	260	390	390	390	390	390	390	390	390	390	130

$$L_y = L_{add\_trans} * [A_{blend,y} - P_{blend,y}] * BC_y \qquad (4.1)$$

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
L_y	kilo tonne of CO2	-0.073	-0.104	-0.099	-0.094	-0.089	-0.084	-0.078	-0.073	-0.067	-0.062	-0.019
L_{add_trans}	km	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086
A_{blend_y}	t-Additives / t-BC	0.471	0.481	0.490	0.500	0.510	0.520	0.531	0.541	0.552	0.563	0.575
P_{blend_y}	t-Additives / t-BC	0.650	0.650	0.650	0.650	0.650	0.650	0.650	0.650	0.650	0.650	0.650
BC_y	kilo tonne of BC	400	600	600	600	600	600	600	600	600	600	200
$L_{admixture}$	t-CO2 / t-admixture	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029
Rate	%	1	1	1	1	1	1	1	1	1	1	1

$$L_{admixture} = L_{adm\_elec} + L_{adm\_trans} \qquad (4.1.1)$$

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$L_{admixture}$	t-CO2 / t-admixture	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285	0.00285
L_{adm_elec}	t-CO2 / t-admixture	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244
L_{adm_trans}	t-CO2 / t-admixture	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042

$$L_{adm\_elec} = (ELE_{adm} * EF_{grid}) \qquad (4.1.1.1)$$

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
L_{adm_elec}	t-CO2 / t-admixture	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244	0.00244
ELE_{adm}	MWh / t-admixture	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250	0.00250
EF_{grid}	t-CO2 / MWh	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465	0.97465

$$L_{adm\_trans} = (TF_{cons} * D_{adm\_source} * TEF) * 1/Q_{adm} * 1/1000 \qquad (4.1.1.2)$$

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
L_{adm_trans}	t-CO2 / t-admixture	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042	0.00042
TF_{cons}	kg-fuel / km	0.390	0.390	0.390	0.390	0.390	0.390	0.390	0.390	0.390	0.390	0.390
D_{adm_source}	km	10	10	10	10	10	10	10	10	10	10	10
TEF	kg-CO2 / kg-fuel	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Q_{adm}	t-admixture / trip	30	30	30	30	30	30	30	30	30	30	30

Emission reductions

$$ER_y = \{ [BE_{BC,y} - PE_{BC,y}] * BC_y + L_y \} * (1 - \alpha_y) \qquad (5)$$

	unit	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ER_y	kilo tonne of CO2	66.482	94.076	88.316	82.440	76.448	70.335	64.100	57.740	51.253	44.637	12.629
BE_{BC_y}	t-CO2/t-BC	0.573	0.564	0.554	0.544	0.534	0.524	0.514	0.503	0.492	0.481	0.470
PE_{BC_y}	t-CO2/t-BC	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407	0.407
BC_y	kilo tonne of BC	400	600	600	600	600	600	600	600	600	600	200
L_y	kilo tonne of CO2	-0.073	-0.104	-0.099	-0.094	-0.089	-0.084	-0.078	-0.073	-0.067	-0.062	-0.019
$Alfa_y$	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

In addition, as the crediting period will be from 01/05/2009 or after the date of registration (whichever is later) to 30/04/2019.

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

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Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2009	162,647	229,202	-73	66,482
2010	243,971	338,151	-104	94,076
2011	243,971	332,385	-99	88,316
2012	243,971	326,505	-94	82,440
2013	243,971	320,507	-89	76,448
2014	243,971	314,389	-84	70,335
2015	243,971	308,149	-78	64,100
2016	243,971	301,784	-73	57,740
2017	243,971	295,291	-67	51,253
2018	243,971	288,669	-62	44,637
2019	81,324	93,971	-19	12,629
Total (tonnes of CO2e)	2,439,706	3,149,003	-841	708,455

In addition, as the crediting period will be from 01/05/2009 or after the date of registration (whichever is later) to 30/04/2019.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$InCaO_y$**
Data unit:	tonne
Description:	Quantity of CaO in the raw material (CaO content of the raw material * raw material quantity)
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected	2428

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. The unit in monitoring methodology is percent (%) while tonne is used in the formula (5.1.1) of the baseline methodology. This parameter shows "quantity" of CaO in raw material: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$OutCaO_y$**
Data unit:	tonne
Description:	Quantity of CaO in the clinker (CaO content of the clinker * clinker produced)
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	135387
Description of measurement methods and procedures to be applied:	The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. The unit in monitoring methodology is percent (%) while tonne is used in the formula (5.1.1) of the baseline methodology. This parameter shows "quantity" of

	CaO in clinker: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$InMgO_y$**
Data unit:	tonne
Description:	Quantity of MgO in the raw material (MgO content of the raw material * raw material quantity)
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	590
Description of measurement methods and procedures to be applied:	The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. The unit in monitoring methodology is percent (%) while tonne is used in the formula (5.1.1) of the baseline methodology. This parameter shows “quantity” of MgO in raw material: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$OutMgO_y$**
Data unit:	tonne
Description:	Quantity of MgO in the clinker (MgO content of the clinker * clinker produced)
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8022
Description of measurement methods and procedures to be	The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and

applied:	retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. The unit in monitoring methodology is percent (%) while tonne is used in the formula (5.1.1) of the baseline methodology. This parameter shows “quantity” of MgO in clinker: therefore, based on the baseline methodology, tonne is used for this parameter.

Data / Parameter:	**$CaO_{cont\_RM\_y}$**
Data unit:	%
Description:	CaO content of the raw material
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.7
Description of measurement methods and procedures to be applied:	The inspection is carried out every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. This parameter to express CaO content (%) of raw material is introduced in order to avoid confusion with $InCaO_y$.

Data / Parameter:	**$CaO_{cont\_CLNK\_y}$**
Data unit:	%
Description:	CaO content of the clinker
Source of data to be used:	Plant records

Value of data applied for the purpose of calculating expected emission reductions in section B.5	64.47
Description of measurement methods and procedures to be applied:	The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. This parameter to express CaO content (%) of clinker is introduced in order to avoid confusion with $OutCaO_y$.

Data / Parameter:	**$MgO_{cont\_RM\_y}$**
Data unit:	%
Description:	MgO content of the raw material
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.17
Description of measurement methods and procedures to be applied:	The inspection is carried every time the raw material is brought in the plant. The inspection includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. This parameter to express MgO content (%) of raw material is introduced in order to avoid confusion with $InMgO_y$.

Data / Parameter:	$MgO_{cont\_CLNK\_y}$
Data unit:	%
Description:	MgO content of the raw material
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.82
Description of measurement methods and procedures to be applied:	The inspection is carried out every eight hours daily. It includes analyses of moisture content, calorific value, grain size and component. The result of analysis is written on paper by a plant staff and retained for three years. This is a part of their usual operation of cement production. Measurement and analysis are conducted in accordance with the methods stipulated in GB/T5484-2000 (Chemical Analysis Method of Gypsum), GB/T5762-2000 (Chemical Analysis Method of Lime Stone for Building Material) and JC/T850-1999 (Chemical Analysis Method of Irony Raw Material for Cement).
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be estimated as part of usual operation. This parameter to express MgO content (%) of clinker is introduced in order to avoid confusion with $OutMgO_y$.

Data / Parameter:	RM_y
Data unit:	Kilo tonne
Description:	Quantity of raw material is used to produce clinker
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	347
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment are replaced annually. Measurement interval: each eight hours. The project operator created a work instruction (measurement version) as an in-house procedure and conducts measurements according to this instruction. The work instruction is numbered as Document No. GSQZ2, which provides a

	detailed manual with a wide-range of coverage including methods to measure weights of raw material and clinker, as well as accuracy required, organized as Item No. from GSQZ001 to GSQZ029. Mass measurement for each data is conducted in accordance with GSQZ010. Moreover, the Control Regulation on Measurements for Cement Manufacturers, issued by China National Economy & Trade Committee, requires manufacturers to measure raw materials and fuels for cement and clinker production in accordance with GB12958-1999. In this project, measurements are also conducted in accordance with this control regulation.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes. On the other hand, calibration for measuring instruments is carried out by project operators themselves at a rate of once a year. Related documents regarding calibration method include Cement Measurement and Test Method. The above-mentioned documents, i.e. the work instruction, Control Regulation on Measurements for Cement Manufacturers and Cement Measurement and Test Method, are the critical documents with regard to measurement and blending of raw materials, the key process in cement production, and each document is in conformity with GB/T19000 and ISO9000.
Any comment:	It will be recorded as part of usual operation.

Data / Parameter:	**$CLNK_y$**
Data unit:	Kilo tonne
Description:	Annual production of clinker
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	210
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment are replaced annually. Measurement interval: every eight hours. The project operator created a work instruction (measurement version) as an in-house procedure and conducts measurements according to this instruction. The work instruction is numbered as Document No. GSQZ2, which provides a detailed manual with a wide-range of coverage including methods to measure weights of raw material and clinker, as well as accuracy required, organized as Item No. from GSQZ001 to GSQZ029. Mass measurement for each data is conducted in accordance with GSQZ010. Moreover, the Control Regulation on Measurements for Cement Manufacturers, issued by China National Economy & Trade Committee, requires manufacturers

	to measure raw materials and fuels for cement and clinker production in accordance with GB12958-1999. In this project, measurements are also conducted in accordance with this control regulation.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes. On the other hand, calibration for measuring instruments is carried out by project operators themselves at a rate of once a year. Related documents regarding calibration method include Cement Measurement and Test Method. The above-mentioned documents, i.e. the work instruction, Control Regulation on Measurements for Cement Manufacturers and Cement Measurement and Test Method, are the critical documents with regard to measurement and blending of raw materials, the key process in cement production, and each document is in conformity with GB/T19000 and ISO9000.
Any comment:	It will be recorded as part of usual operation. The volume used (or consumed) for cement production is to be monitored, because not all clinker manufactured would be used for cement production.

Data / Parameter:	**$FF_{1,y}$**
Data unit:	Tonne
Description:	Coal consumed for clinker production in year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	39900
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment are replaced annually. Measurement interval: every eight hours. The project operator created a work instruction (measurement version) as an in-house procedure and conducts measurements according to this instruction. The work instruction is numbered as Document No. GSQZ2, which provides a detailed manual with a wide-range of coverage including methods to measure weights of raw material and clinker, as well as accuracy required, organized as Item No. from GSQZ001 to GSQZ029. Mass measurement for each data is conducted in accordance with GSQZ010. Moreover, the Control Regulation on Measurements for Cement Manufacturers, issued by China National Economy & Trade Committee, requires manufacturers to measure raw materials and fuels for cement and clinker production in accordance with GB12958-1999. In this project, measurements are also conducted in accordance with this control regulation.

QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes. On the other hand, calibration for measuring instruments is carried out by project operators themselves at a rate of once a year. Related documents regarding calibration method include Cement Measurement and Test Method. The above-mentioned documents, i.e. the work instruction, Control Regulation on Measurements for Cement Manufacturers and Cement Measurement and Test Method, are the critical documents with regard to measurement and blending of raw materials, the key process in cement production, and each document is in conformity with GB/T19000 and ISO9000.
Any comment:	Only coal will be used for production of clinker.

Data / Parameter:	**$FF_{2,y}$**
Data unit:	Tonne
Description:	Coal consumed for clinker production in year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5701
Description of measurement methods and procedures to be applied:	This data is monitored by a track scale every time coal is brought in the plant. Measurement interval is daily basis. The truck scale is inspected by Department of Mass Supervision Technology of Shanxi Province at the rate of once a year. Inspection regulation is in accordance with JJG539-1997 under the China Measurement Screening Regulation.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	Only coal will be used for production of clinker.

Data / Parameter:	**$PELE_{grid\_CLNK,y}$**
Data unit:	MWh
Description:	Grid electricity for clinker production
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	13440
Description of measurement methods and procedures to be applied:	This data will be measured at an integrated watt meter. Data of electricity consumption will be transcribed every eight-hour basis according to usual plant operation.

QA/QC procedures to be applied:	The meter used to measure the electricity consumed by the project will be in accordance with the manufacturer's recommendations for accuracy and reliability. The purchase specification of electricity will be used for cross-checked to enhance the quality. Meters are calibrated once a year in accordance with GB3924-1983.
Any comment:	It will be measured and managed subject to ISO9002 and ISO14001.

Data / Parameter:	**ADD_y**
Data unit:	Tonne
Description:	Annual consumption of additives for year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	390
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment is replaced annually. Measurement interval: each eight hours. The project operator created a work instruction (measurement version) as an in-house procedure and conducts measurements according to this instruction. The work instruction is numbered as Document No. GSQZ2, which provides a detailed manual with a wide-range of coverage including methods to measure weights of raw material and clinker, as well as accuracy required, organized as Item No. from GSQZ001 to GSQZ029. Mass measurement for each data is conducted in accordance with GSQZ010. Moreover, the Control Regulation on Measurements for Cement Manufacturers, issued by China National Economy & Trade Committee, requires manufacturers to measure raw materials and fuels for cement and clinker production in accordance with GB12958-1999. In this project, measurements are also conducted in accordance with this control regulation.
QA/QC procedures to be applied:	The meter used to measure the additives consumed by the project will be in accordance with the manufacturer's recommendations for accuracy and reliability. The purchase specification of additives will be used for cross-checked to enhance the quality. In addition, as the company has ISO9002 and ISO14001 certificate, the data will be treated based on these schemes. On the other hand, calibration for measuring instruments is carried out by project operators themselves at a rate of once a year. Related documents regarding calibration method include Cement Measurement and Test Method.

	The above-mentioned documents, i.e. the work instruction, Control Regulation on Measurements for Cement Manufacturers and Cement Measurement and Test Method, are the critical documents with regard to measurement and blending of raw materials, the key process in cement production, and each document is in conformity with GB/T19000 and ISO9000.
Any comment:	It will be recorded as part of usual operation.

Data / Parameter:	**$PELE_{grid\_BC,y}$**
Data unit:	MWh
Description:	Grid electricity consumption for grinding BC in year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	25200
Description of measurement methods and procedures to be applied:	This data will be measured at an integrated watt meter. Data of electricity consumption will be printed out monthly basis and also will be transcribed daily according to normal plant operation.
QA/QC procedures to be applied:	The meter used to measure the electricity consumed by the project will be in accordance with the manufacturer's recommendations for accuracy and reliability. The purchase specification of electricity will be used for cross-checked to enhance the quality. Meters are calibrated once a year in accordance with GB3924-1983.
Any comment:	It will be measured and managed subject to ISO9002 and ISO14001. Both $PELE_{grid\_BC,y}$ and $BELE_{grid\_BC}$ represent power consumption necessary for grinding clinker row materials. Based on the actual performance, power consumption necessary for grinding raw materials per ton of cement production is 0.042MWh/t-BC. It can be expected that this power consumption coefficient remains almost the same in both baseline and project cases, so that cement production in project case is 1.67 times from baseline production, which means the value of $PELE_{grid\_BC,y}$ is also 1.67 times.

Data / Parameter:	**$PELE_{grid\_ADD,y}$**
Data unit:	MWh
Description:	Grid electricity consumption for grinding additives
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in	2280

section B.5	
Description of measurement methods and procedures to be applied:	This data will be measured at an integrated watt meter. Data of electricity consumption will be printed out monthly basis and also will be transcribed daily according to normal plant operation.
QA/QC procedures to be applied:	The meter used to measure the electricity consumed by the project will be in accordance with the manufacturer's recommendations for accuracy and reliability. The purchase specification of electricity will be used for cross-checked to enhance the quality. Meters are calibrated once a year in accordance with GB3924-1983.
Any comment:	It will be measured and managed subject to ISO9002 and ISO14001. Both $PELE_{grid\_ADD,y}$ and $BELE_{grid\_ADD}$ represent power consumption necessary for mixing and grinding blend cement with additives blended. According to traditional performance record of the plants, the relevant power consumption per ton of cement production is 0.0038MWh/t-BC, which is assumed to be the same in project case. Therefore, as with the reason above, production volume is 1.67 times, which makes 1.67 times the value of $PELE_{grid\_ADD,y}$.

Data / Parameter:	BC_y
Data unit:	Kilo tonne
Description:	Annual production of BC for year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	600
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment is replaced annually. Measurement interval: every eight hours.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be recorded as part of usual operation. In this CDM project, cement production volume is planned as 400kt/yr for 2008, the first year of the project, and for 2009 onward as 600kt/yr. From the viewpoint of capacity of facilities and appliances, the most important element in a cement plant is capacity of kiln for clinker production. Clinker production capacity in the project plant is 270kt, with which maximum cement

	production is 420kt/year under its traditional rate of clinker use (64%). However, in this CDM project, clinker usage rate is assumed as 35% and cement production can be increased to up to approx. 770kt/yr. Therefore, 600kt of annual cement production is achievable based on the plant capacity, with sufficient spare capacity.

Data / Parameter:	$P_{blend,y}$
Data unit:	Tonne of additives/tonne of blended cement (%)
Description:	Share of additives per blended cement for year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	65
Description of measurement methods and procedures to be applied:	Continuous weighing and recording system is already installed and used in usual operation. The equipment system for materials is located in cement production lines. Monitoring equipment is calibrated and checked by the company itself weekly. In addition, some important parts of this equipment is replaced annually. Measurement interval: every eight hours.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	It will be recorded as part of usual operation.

Data / Parameter:	TF_{cons}
Data unit:	kg of fuel/kilometre
Description:	Fuel consumption for the vehicle per kilometre
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.39
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low.

Data / Parameter:	D_{add_source}

Data unit:	km
Description:	Distance between the source of the additives and the project activity plant.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	20
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	The company has ISO9002 and ISO14001 certificate. The data will be treated subject to these schemes.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low, therefore, data will be cross-checked with map.

Data / Parameter:	**TEF**
Data unit:	kg of CO2/kg of fuel
Description:	Emission factor of transport fuel
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.209
Description of measurement methods and procedures to be applied:	This is IPCC default value.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low, therefore, data will be re-check by reports of IPCC periodically.
Any comment:	The type of fuel is Diesel Oil. This value will be fixed during the project period.

Data / Parameter:	Q_{add}
Data unit:	Tonne of additives/vehicle
Description:	Quantity of additives carried in one trip per vehicle.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in	30

section B.5	
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low, therefore, data will originate from vehicle manufactures.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low.

Data / Parameter:	α_y
Data unit:	Tonne of additive
Description:	Share of additional amounts of additives used as surplus in year y.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	There is no plan to use surplus of additives.
QA/QC procedures to be applied:	None
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low.

Data / Parameter:	**ELE_{adm}**
Data unit:	MWh / tonne of admixture
Description:	Electricity consumption for grinding of admixture
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0025
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low, therefore, data will originate from vehicle manufactures.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low.

Data / Parameter:	**Rate**

Data unit:	%
Description:	Ratio of usage of admixture to Blend Cement
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.0
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low.

Data / Parameter:	**D_{adm_source}**
Data unit:	km
Description:	Distance between the source of admixture and the project activity plant
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	10
Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low. Data will be cross-checked by a map.

Data / Parameter:	**Q_{adm}**
Data unit:	tonne of admixture / vehicle
Description:	Quantity of admixture carried in one trip per vehicle.
Source of data to be used:	Plant records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	30

Description of measurement methods and procedures to be applied:	The data is based on actual performance of plant operation.
QA/QC procedures to be applied:	According to ACM0005 / Version 04, uncertainty level of the data is low, therefore, data will originate from vehicle manufactures.
Any comment:	According to ACM0005 / Version 04, uncertainty level of the data is low. This data is same as "Q_{add}".

B.7.2. Description of the monitoring plan:

>>

The monitoring plan is established according to the requirement of approved monitoring methodology ACM0005 / Version 04.

In order to achieve the real, credible CERs of the project design document has calculated, it needs the managers of project participants to ensure the safe operation of the project, to satisfy the information need of the DOE for verifying project as part of verification and certification process, to establish and maintain the appropriate monitoring system.

The environmental manager will be requested to be responsible for all interrelated CDM activity.
The quality assurance and quality control for recording, maintaining and archiving data shall be approved as the part of this CDM project activity. This is on going process that ensured by the CDM mechanism in terms of need for verification emission on the annual basis.

The company has ISO9002 and ISO14001 certificate, therefore, they have already quality control, quality assurance system and environmental management system for daily usual operation. In this CDM project, these management systems will be utilized effectively.

Monitoring system

The project owner establishes its CDM project implementation team within the company to implement the project in accordance with the official rules by the United Nations and to conduct monitoring.

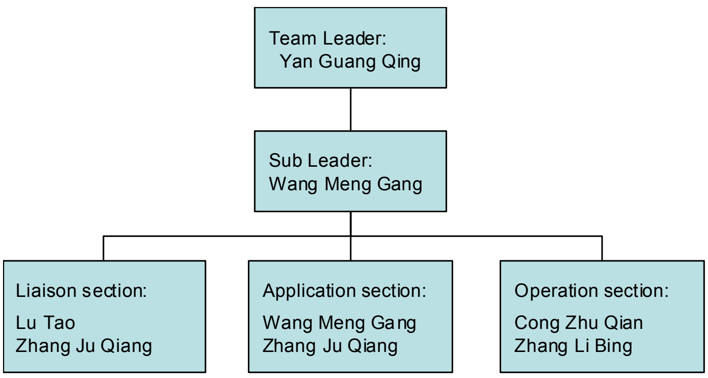

Figure 7 CDM project implementation team

Liaison section takes care of communication with Kyushu Electric Co., a project participant. Application section is in charge of confirmation of the latest information on UNFCCC, Kyoto Protocol and CDM rules; submission of monitoring reports; coordination of verification; and application to the Chinese Government. Operation section takes charge of monitoring, calculating data and preparing monitoring reports in daily operation. This section also provides education to staffs positioned in cement production line (staffs who are necessary for regular cement production) regarding the importance of monitoring not only in regular cement production from QA/QC perspective but also in implementation of CDM projects. The cement production line of the company is divided into some parts, such as Clinker part, Kiln part, etc. Each part has a responsible person who will monitor and check the data required. Each personnel will transcribe data on a specific sheet.

The items that are subject to monitoring in this CDM project are consistent with the items needed for its quality management in regular operations for clinker and cement manufacturing. The project operator has obtained ISO 9001 and ISO 14001 certificates and conducts measurement and management for each monitoring item according to the rules in their regular operation. So it will be effective to employ this measurement/management system as it is into this CDM project.
Besides each monitoring item, relevant purchasing slips etc. are also calculated in order to ensure preciseness by crosschecking.

Education on CDM
As mentioned above, items for monitoring are consistent with that conducted in the regular operation. It is important, from CDM perspective, to catch up with the latest information to make clear the purpose and the scope of responsibility of the project as well as to be able to correspond to any changes in CDM rules.
Therefore, in the CDM project implementation team, members share the latest information regarding CDM, while holding company-wide training to deepen employees' understanding and knowledge on CDM. As a part of such education, two staffs in charge of Shanxi Guashan Cement participated in a three-day seminar on CDM which was organized by NDRC, a China's DNA.
As for an appropriate operation of facilities, in order to overcome the technological difficulties, the company will educate employees and strengthen a management for analyses and inspections.

Monitoring equipment and calibration
Monitoring equipment is already installed and used in usual operation. The equipment for materials are located in cement production lines. Other equipment for electricity and content analysis are located in a electricity distribution centre and laboratory respectively.

Some monitoring equipment for cement production lines are calibrated and checked by the company itself weekly because the company is the second class qualified inspector. In addition, some important parts of main equipment is replaced annually.

The other more important equipment, ex. a track scale for carrying materials in, is required to be examined and calibrated by the first class qualified inspector.

Data management and QA/QC
The company has ISO9002 and ISO14001 certificate, therefore, they have already quality control, quality assurance system and environmental management system for daily usual operation. In this CDM project, these management systems will be utilized effectively.

Furthermore, the company will do cross-check using evidence documentation, such as purchase specification, to enhance the quality of data monitored.

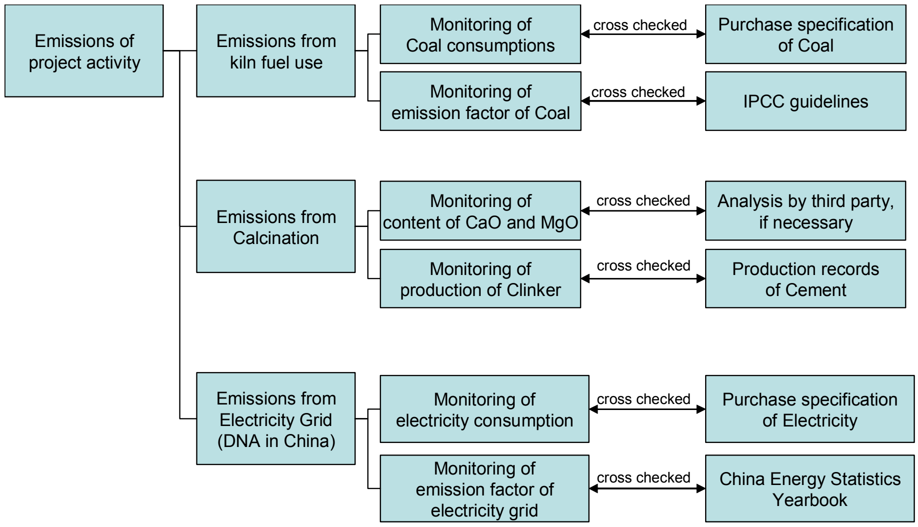

Figure 8 Data using for cross check

Fulfilment status for the conditions of methodology application
This methodology, ACM0005(Version 04), is applicable to projects that increase the share of additives (i.e. reduce the share of clinker) in the production of cement types beyond current practices in the country. Additives are defined as materials blended with clinker to produce blended cement types and include fly ash, gypsum, slag, etc. The methodology is applicable under the following conditions:

- There is no shortage of additives related to the lack of blending materials. Project participants should demonstrate that there is no alternative allocation or use for the additional amount of additives used in the project activity. If the surplus availability of additives is not substantiated the project emissions reductions (ERs) will be discounted as outlined below.
- This methodology is applicable to domestically sold output of the project activity plant and excludes export of blended cement.
- Adequate data are available on cement types in the market.

The company will check the fulfillment status for these conditions annually based on relevant evidences.

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 completion of the application of the baseline study and monitoring methodology: 14/08/2008.

Contact information of the person responsible:

Table 19 Contact information of the person responsible

Entity	Contact details	Project participants
Mizuho Information & Research Institute Co., Inc.	Mr. Akira Saito +81-3-5281-5410 akira.saitou@mizuho-ir.co.jp	No
Greenensign (Beijing) New Energy and Technology Co. Ltd.	Ms. Feng Yuxin +86(10) 58156375-821 fengyx@greenensign.com Mr. Bao Cheng +86(10)58156375-823 baoch@greenensign.com Ms. Deng Ping +86(10)58156375-816 dengp@greenensign.com	No

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:

>>
The starting date of the project activity is 20/11/2007.[43]

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

>>
Operational lifetime is estimated to be 20 years and 0 months. It was assumed in consideration of the general lifetime of the cement production line.

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

Fixed crediting period has chosen.

C.2.1. Renewable crediting period:

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

>>
Not applicable (NA)

C.2.1.2. Length of the first crediting period:

>>
Not applicable (NA)

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/05/2009 or after the date of registration (whichever is later)

C.2.2.2. Length:

>>
10 years and 0 months.

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[43] Standing on the favourable result of the meeting held on 4th of September, 2007 in Jiaocheng County House with having 16 participants including local governments, Shanxi Guashan Cement has decided formally to execute CDM project in the board meeting held on 10th of September, 2007. Based on that decision of the board meeting, Shanxi Guashan Cement and Luliang Guangsha Material signed the contract on the long-term purchase of admixture GHPC-S, which is indispensable for the project activity, on 20th November, 2007.

SECTION D. Environmental impacts

>>

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

>>

The project activity contributes to sustainable development and the benefit key impact is mainly environmental as the project activity will reduce the direct emissions on site generated by calcination per tonne of blended cement. The drop of clinker content also preserves natural resources such as limestone, plaster and fluorite.

Before Shanxi Guashan Cement constructed the new kiln, it has executed environmental impact assessment in 1998 both on the newly-built kiln and existing kiln observing EIA Law in China.[44] According to the environmental impact assessment report, SP (Suspended Particulates) and SO2 were selected as the substances that have environmental impacts, and Shanxi Guashan Cement has taken measures to mitigate those impacts to meet the national standard GB3095-1996 ("Ambient Air Quality Standard"). Now air pollution control system is efficiently in operation and the air quality is better than the standard norm, and points are covered and provided with dust collection systems.

This CDM project is covered under the EIA Law. The EIA registry submitted was approved by Environment Protection Department of Jiaocheng County on January 21st, 2008.[45]

The environment management system of Shanxi Guashan Cement is ISO 14001-certified. This means that Shanxi Guashan Cement has undertaken a systematic review of the key environmental impacts of their operations, has identified appropriate management and monitoring of those impacts and undertakes regular management review of their environmental performance and the performance of the management system.

The local governments approve the project for reducing environmental impacts (SP and SO2), waste (slag) and GHG emissions. The project has also no negative impact on the water, air, waste and noise because the same facilities are used and only the raw materials are changed, except for possible impact due to transportation described below.

Based on the "Cleaner Production Standard for Cement Industry," Environment Protection Department of Jiaocheng County investigated 12 cement plants in 2007. Shanxi Guashan Cement was the first plant to have passed the investigation. According to the department, environmental performance of Shanxi Guashan Cement is excellent in their plants, meeting emission standards and showing no problem.[46]

Increase of additives will also result in additional transportation which may involve some environmental impacts. The GHG emissions from this transportation are deducted from the amount of CERs generated by the project activity. The increase of noise and dust from this transportation does not have direct impact on the residents in the region, because there is no house alongside the transportation route.

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[44] Based on the report prepared when Shanxi Guashan Cement implemented EIA in 1998.
[45] Based on the official registry for environmental impact of this project in Shanxi Guashan Cement (to Chinese Government)
[46] Based on the interviews conducted to government officials of Jiaocheng Country.

However, the interviews to the residents were executed to make sure of no additional environmental impacts to them, and received positive responses from residents.

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

>>

Environmental impact is deemed as the level of no problem (see D.1.). In project implementation, it should pay close attention not to cause environment impacts based on the rules under each regulation. The project should be stopped as soon as any environment impacts at a problematic level are detected, conducting recovery from the environment impact while reviewing implementation system of the project.

SECTION E. Stakeholders' comments

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

>>

Stakeholders' comments have been obtained through two routes.

The one is for the players related to the local governments, which was held on 4th of September, 2007 in Jiaocheng County House with having 16 participants. [47] Kyushu Electric Power Co. delivered an explanation on the CDM project. The result of the meeting was put on TV. [48,49]

The other is for the residents who live near the project site, which was held on 4th December 2007 in a meeting room of Shanxi Guashan Cement with having 22 participants. Announcement for the meeting had been made through persons responsible in the three neighbouring villages. In the meeting, Shanxi Guashan Cement delivered the handouts about this project activity, supplied some explanations and collected a questionnaire from all participants. Later, the company also conducted the same questionnaire survey to 10 respondents including teachers, company employees and farmers, visiting office/home of the respondents. Therefore, the company collected the questionnaire from 32 persons in total. [50]

- Stakeholder's meeting at Luliang City and Jiaocheng County
  - Schedule: 4th of Sep. 2007
  - Location: Governmental office at Luliang City
  - Participants: Governmental staffs of Luliang City and Jiaocheng County, Shanxi Guashan Cement, Luliang Guangsha Material, Kyushu Electric Power Co, Inc., and Mizuho Information & Research Institute. The persons have been invited by official invitation.
  - Methods: Kyushu Electric Power Co., Inc. has demonstrated the summary of Kyoto mechanism and this cement CDM project in Shanxi Province and then received some comments from governmental stakeholders.

[47] Based on the program and the participants list of the project explanatory meeting.
[48] http://www.lvliang.gov.cn/misc/2007-09/12/content_20430.htm
[49] Based on video pictures in the explanatory meeting.
[50] Based on questionnaire survey to local residents.

- The questionnaire survey for the residents who live in neighbouring area of the project site:
  - Schedule: From 4th of Dec. 2007 to 7th of Dec. 2007
  - Location: Tan Village and around the project site
  - Participants: 32 local residents
  - Methods: Face-to-Face interviews were executed. The understanding of this project activity was confirmed after that summary was explained, and then their opinions were gathered.

E.2. Summary of the comments received:

>>

A Stakeholder's comments we received are summarized as follows.

- Stakeholder's meeting at Luliang City and Jiaocheng County

The governmental staffs have given a welcome to this CDM project. The government has already taken some energy efficiency and CO2 reduction project, so this CDM project is very attractive from the viewpoint of improvement of the environmental performance such as industrial waste in Shanxi Province.

The government expects that this project will become a model project, which improves environmental performance in Shanxi Province.

Each staff's comment is as follows.

- Mr. Guo Zheng (Luliang Energy Saving Leading Group Vice Director, City Government Vice Secretary General)

  The Jiaochen County government has promoted the energy efficiency and GHG reduction, it has devoted to support for advantageous cooperate activities. This CDM project activity with Kyushu Electric Power Co., Inc. and Luliang Guangsha Material become the model project in Shanxi Province, so it is meaningful. The government expects that this activity will become the model project for sustainable society and economical development as first CDM project in Shanxi Province.

- Mr. Liu Pingze (Luliang Energy Saving Leading Group Vice Director and Office Director, Economic Committee Director of the city)

  Energy efficiency and CO2 reduction are important issue faced by the local government. Jiaochen County has promoted these themes as the model city of sustainable society in Shanxi. The government expects that this activity with Kyushu Electric Power Co., Inc. and Luliang Guangsha Material will pass through the severe CDM EB process and approve as CDM project.

- Mr. Ren Jianfeng (Chief Engineer, Luliang Environmental Protection Agency)

  It is very attractive from the viewpoint of the environmental protection only as no mere CDM. The Luliang Environmental Protection Agency expects that this activity promote to utilize industrial waste such as blast furnace slag and fly ash and support project participants.

- Mr. Liu Wenhai (Vice Secretary, Jiaocheng County Committee)

The Jiaochen County government has promoted the energy efficiency and CO2 emission reduction projects for a long time as model city for sustainable society in Shanxi Province. The government expect that this project will pass through the CDM process and success CO2 reduction.

- The questionnaire survey for the residents who live in neighbouring area of the project site:

The opinions we received from local residents are mainly summarized as follows. We have no negative response from local residents. They expect that this project activity will improve local air pollution and strengthen sustainable development.[51]

- It is hoped to be implemented the project activity as soon as possible because this reduces air pollution and then guarantees human health.
- The government should strongly support it and companies positively promote it.
- It is necessary to decrease environmental pollution and then strengthen the sustainable development.
- The project should be supported because the industrial wastes are used efficiently and this reduce environmental burden.
- This project activity is profitable for local villagers, and we support it strongly.

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

>>

No additional action was required because any issues were not raised.

[51] Based on the questionnaire survey conducted to local residents.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shanxi Guashan Cement
Street/P.O.Box:	Northwest of Tan Village
Building:	Shanxi Guashan Cement Plant
City:	Jiaocheng County
State/Region:	Shanxi Province
Postcode/ZIP:	030500
Country:	P.R.China
Telephone:	86-0358-3566651
FAX:	86-0358-3566014
E-Mail:	shanxiguashan@163.com
URL:	http://www.gshcement.com/
Represented by:	Lu Enyuan
Title:	General Manager & Chairman of the Board
Salutation:	Mr.
Last name:	Lu
Middle name:	En
First name:	Yuan
Department:	-
Mobile:	86-13903585462
Direct FAX:	86-0358-3566014
Direct tel:	86-0358-3566651
Personal e-mail:	shanxiguashan@163.com

Organization:	Kyushu Electric Power Co., Inc.
Street/P.O.Box:	1-82, Watanabe-dori 2-Chome
Building:	-
City:	Chuo-ku
State/Region:	Fukuoka
Postcode/ZIP:	810-8720
Country:	Japan
Telephone:	81-92-761-3031
FAX:	81-92-761-4237
E-Mail:	Masanori_kouzuma@kyuden.co.jp
URL:	http://www.kyuden.co.jp
Represented by:	Masanori Kozuma
Title:	Assistant Manager, Architectual Planning Group
Salutation:	Mr.
Last name:	Kozuma
Middle name:	-
First name:	Masanori
Department:	Civil Engineering Department

Mobile:	-
Direct FAX:	81-92-761-4237
Direct tel:	81-92-761-3031
Personal e-mail:	Masanori_kouzuma@kyuden.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding or official development assistant (ODA) has been used on this project activity. [52]

[52] Based on the explanation paper on progress status of ODA, prepared by Development & Reform Commission of Jiaocheng County

Annex 3

BASELINE INFORMATION

Baseline emission factor for electricity

Step 1. Calculation of the Operating Margin Emission Factor

Table A 1 Calculation of CO2 emissions of North China Power Grid in 2003.

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
									(kgCO2/TJ)	(%)	（MJ/t,km3）	(t-CO2e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/1000
Raw coal	10000 ton	714.73	1052.74	5482.64	4528.51	3949.32	6808.00	22535.94	89500	100	20908	**421,707,383.00**
Cleaned coal	10000 ton						9.41	9.41	89500	100	26344	**221,867.85**
Other washed coal	10000 ton	6.31		67.28	208.21		450.90	732.70	89500	100	8363	**5,484,175.24**
Coke	10000 ton					2.80		2.80	87300	100	28435	**69,506.51**
Coke oven gas	108 m3	0.24	1.71		0.90	0.21	0.02	3.08	37300	100	16726	**192,154.98**
Other coal gas	108 m3	16.92		10.63		10.32	1.56	39.43	37300	100	5227	**768,755.28**
Crude oil	10000 ton						29.68	29.68	71100	100	41816	**882,421.30**
Gasoline	10000 ton						0.01	0.01	67500	100	43070	**290.72**
Diesel	10000 ton	0.29	1.35	4.00		2.91	5.40	13.95	72600	100	42652	**431,966.66**
Fuel oil	10000 ton	13.95	0.02	1.11		0.65	10.07	25.80	75500	100	41816	**814,533.86**
LPG	10000 ton							0.00	61600	100	50179	**0.00**
Refinery gas	10000 ton			0.27			0.83	1.10	48200	100	46055	**24,418.36**
Natural gas	108 m3		0.50				1.08	1.58	54300	100	38931	**334,004.62**
Other petloreum product	10000 ton							0.00	69300	100	38369	**0.00**
Other energy	10000 ton	9.83					39.21	49.04	0	100	0	**0.00**
											Total	**430,931,478.39**

Source: China Energy Statistical Year Book (2004) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 2 Calculation of CO2 emissions of Northeast Power Grid in 2003.

Fuel Type	Unit	Liaoning	Jilin	Heilong jiang	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
						(kgCO2/TJ)	(%)	（MJ/t,km3）	(t-CO2e)
		A	B	C	G=A+B+C	H	I	J	K=G*H*I*J/1000
Raw coal	10000 ton	3556.51	2006.66	2763.62	8326.79	89500	100	20908	155,816,390.16
Cleaned coal	10000 ton	70.83		3.00	73.83	89500	100	26344	1,740,754.88
Other washed coal	10000 ton	617.04	15.90	53.41	686.35	89500	100	8363	5,137,250.82
Coke	10000 ton				0.00	87300	100	28435	0.00
Coke oven gas	10^8 m^3	1.66			1.66	37300	100	16726	103,564.05
Other coal gas	10^8 m^3	5.31			5.31	37300	100	5227	103,527.53
Crude oil	10000 ton	3.39			3.39	71100	100	41816	100,788.69
Gasoline	10000 ton					67500	100	43070	0.00
Diesel	10000 ton	0.32	0.34		0.66	72600	100	42652	20,437.13
Fuel oil	10000 ton	14.87	0.70	4.32	19.89	75500	100	41816	627,948.78
LPG	10000 ton	1.55			1.55	61600	100	50179	47,910.91
Refinery gas	10000 ton	4.03		0.46	4.49	48200	100	46055	99,671.31
Natural gas	10^8 m^3		0.04	4.47	4.51	54300	100	38931	953,392.94
Other petloreum product	10000 ton				0.00	69300	100	38369	0.00
Other energy	10000 ton	29.38			29.38	0	100	0	0.00
								Total	164,751,637.20

Source: China Energy Statistical Year Book (2004) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 3 Power generation of Northeast Power Grid in 2003.

Region	Generation (MWh)	Self usage rate (%)	Supply (MWh)
Liaoning	79751000	7.17	**74032853.3**
Jilin	29739000	7.32	**27562105.2**
Heilong jiang	48493000	8.48	**44380793.6**
Total			**145975752.1**

Source: China Electric Power Year Book (2004)

Table A 4 Power generation of North China Power Grid in 2003.

Region	Generation (MWh)	Self usage rate (%)	Supply (MWh)
Beijing	18608000	7.52	**17208678.4**
Tianjin	32191000	6.79	**30005231.1**
Hebei	108261000	6.50	**101224035.0**
Shanxi	93962000	7.69	**86736322.2**
Inner Mongolia	65106000	7.66	**60118880.4**
Shandong	139547000	6.79	**130071758.7**
Total			**425364905.8**

Source: China Electric Power Year Book (2004)

The CO2 emission of North China Power Grid in 2003: 430,931,478.39 t-CO2
The power supply of thermal plants in North China Power Grid in 2003: 425,364,905.8 MWh
The import electricity from Northeast Power Grid to North China Power Grid in 2003: 4,244,380 MWh

The CO2 emission of Northeast Power Grid in 2003: 164,751,637.20 t-CO2
Therefore, the emission factor of Operating Margin of North China Power Grid in 2003 is 1.013700 t-CO2/MWh.

Table A 5 Calculation of CO2 emissions of North China Power Grid in 2004.

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
									(kgCO2/TJ)	（%）	（MJ/t,km3）	(t-CO2e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/1000
Raw coal	10000 ton	823.09	1410.00	6299.80	5213.20	4932.20	8550.00	27228.29	89500	100	20908	**509,513,733.15**
Cleaned coal	10000 ton						40.00	40.00	89500	100	26344	**943,115.20**
Other washed coal	10000 ton	6.48		101.04	354.17		284.22	745.91	89500	100	8363	**5,583,050.57**
Coke	10000 ton					0.22		0.22	87300	100	28435	**5,461.23**
Coke oven gas	10^8 m^3	0.55		0.54	5.32	0.40	8.73	15.54	37300	100	16726	**969,509.21**
Other coal gas	10^8 m^3	17.74		24.25	8.20	16.47	1.41	68.07	37300	100	5227	**1,327,141.05**
Crude oil	10000 ton							0.00	71100	100	41816	**0.00**
Gasoline	10000 ton								67500	100	43070	**0.00**
Diesel	10000 ton	0.39	0.84	4.66				5.89	72600	100	42652	**182,385.92**
Fuel oil	10000 ton	14.66		0.16				14.82	75500	100	41816	**467,883.41**
LPG	10000 ton							0.00	61600	100	50179	**0.00**
Refinery gas	10000 ton		0.55	1.42				1.97	48200	100	46055	**43,731.06**
Natural gas	10^8 m^3		0.37		0.19			0.56	54300	100	38931	**118,381.38**
Other petloreum product	10000 ton							0.00	69300	100	38369	**0.00**
Other energy	10000 ton	9.41		34.64	109.73	4.48		158.26	0	100	0	**0.00**
											Total	**519,154,392.19**

Source: China Energy Statistical Year Book (2005) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 6 Calculation of CO2 emissions of Northeast Power Grid in 2004.

Fuel Type	Unit	Liaoning	Jilin	Heilong jiang	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
						(kgCO2/TJ)	(%)	（MJ/t,km3）	(t-CO2e)
		A	B	C	G=A+B+C	H	I	J	K=G*H*I*J*44/12/1000
Raw coal	10000 ton	4144.20	2310.90	3084.80	9539.90	89500	100	20908	178,516,905.13
Cleaned coal	10000 ton	84.75	1.09	4.88	90.72	89500	100	26344	2,138,985.27
Other washed coal	10000 ton	577.67	14.26	61.00	652.93	89500	100	8363	4,887,105.96
Coke	10000 ton				0.00	87300	100	28435	0.00
Coke oven gas	10^8 m^3	4.83	2.91		7.74	37300	100	16726	482,882.97
Other coal gas	10^8 m^3	57.33	4.19		61.52	37300	100	5227	1,199,437.60
Crude oil	10000 ton				0.00	71100	100	41816	0.00
Gasoline	10000 ton					67500	100	43070	0.00
Diesel	10000 ton	2.04	1.16	0.24	3.44	72600	100	42652	106,520.81
Fuel oil	10000 ton	12.81	1.78	2.86	17.45	75500	100	41816	550,915.35
LPG	10000 ton	2.19			2.19	61600	100	50179	67,693.48
Refinery gas	10000 ton	9.79		1.14	10.93	48200	100	46055	242,629.71
Natural gas	10^8 m^3		0.03	2.53	2.56	54300	100	38931	541,172.04
Other petloreum product	10000 ton				0.00	69300	100	38369	0.00
Other energy	10000 ton	26.97	5.07		32.04	0.0	100	0	0.00
								Total	188,734,248.33

Source: China Energy Statistical Year Book (2005) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 7 Power generation of Northeast Power Grid in 2004.

Region	Generation (MWh)	Self usage rate （%）	Supply (MWh)
Liaoning	84543000	7.21	**78447449.7**
Jilin	33242000	7.68	**30689014.4**
Heilong jiang	53482000	7.84	**49289011.2**
Total			**158425475.3**

Source: China Electric Power Year Book (2005)

Table A 8 Power generation of North China Power Grid in 2004.

Region	Generation (MWh)	Self usage rate （%）	Supply (MWh)
Beijing	18579000	7.94	17103827.4
Tianjin	33952000	6.35	31796048.0
Hebei	124970000	6.50	116846950.0
Shanxi	104926000	7.70	96846698.0
Inner Mongolia	80427000	7.17	74660384.1
Shandong	163918000	7.32	151919202.4
Total			489173109.9

Source: China Electric Power Year Book (2005)

The CO2 emission of North China Power Grid in 2004: 519,154,392.19 t-CO2
The power supply of thermal plants in North China Power Grid in 2004: 489,173,109.9 MWh
The import electricity from Northeast Power Grid to North China Power Grid in 2004: 4,514,550 MWh
The CO2 emission of Northeast Power Grid in 2004: 188,734,248.33 t-CO2
Therefore, the emission factor of Operating Margin of North China Power Grid in 2004 is 1.061729 t-CO2/MWh.

Table A 9 Calculation of CO2 emissions of North China Power Grid in 2005.

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
									（tc/TJ）	（%）	（MJ/t,km3）	(t-CO2e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/1000
Raw coal	10000 ton	897.75	1675.20	6726.50	6176.45	6277.23	10405.40	32158.53	89500	100	20908	**601,771,637.99**
Cleaned coal	10000 ton						42.18	42.18	89500	100	26344	**994,514.98**
Other washed coal	10000 ton	6.57		167.45	373.65		108.69	656.36	89500	100	8363	**4,912,779.12**
Coke	10000 ton					0.21	0.11	0.32	87300	100	28435	**7,943.60**
Coke oven gas	10^8 m^3	0.64	0.75	0.62	21.08	0.39		23.48	37300	100	16726	**1,464,869.77**
Other coal gas	10^8 m^3	16.09	7.86	38.83	9.88	18.37		91.03	37300	100	5227	**1,774,785.51**
Crude oil	10000 ton					0.73		0.73	71100	100	41816	**21,703.76**
Gasoline	10000 ton			0.01				0.01	67500	100	43070	**290.72**
Diesel	10000 ton	0.48		3.54		0.12		4.14	72600	100	42652	**128,196.56**
Fuel oil	10000 ton	12.25		0.23		0.06		12.54	75500	100	41816	**395,901.34**
LPG	10000 ton							0.00	61600	100	50179	**0.00**
Refinery gas	10000 ton			9.02				9.02	48200	100	46055	**200,230.56**
Natural gas	10^8 m^3	0.28	0.08		2.76			3.12	54300	100	38931	**659,553.43**
Other petloreum product	10000 ton							0.00	69300	100	38369	**0.00**
Other energy	10000 ton	8.58		32.35	69.31	7.27	118.90	236.41	89500	100	0	**0.00**
											Total	**612,332,407.34**

Source: China Energy Statistical Year Book (2006) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 10 Calculation of CO2 emissions of Northeast Power Grid in 2005.

Fuel Type	Unit	Liaoning	Jilin	Heilong jiang	Total	Carbon emission factor	Oxidation rate	Low caloric value	CO2 emission
						(kgCO2/TJ)	(%)	（MJ/t,km3）	(t-CO2e)
		A	B	C	G=A+B+C	H	I	J	K=G*H*I*J*44/12/1000
Raw coal	10000 ton	4305.41	2446.13	3383.21	10134.75	89500	100	20908	189,648,130.94
Cleaned coal	10000 ton				0.00	89500	100	26344	0.00
Other washed coal	10000 ton	524.74	19.26	24.16	568.16	89500	100	8363	4,252,612.26
Coke	10000 ton				0.00	87300	100	28435	0.00
Coke oven gas	10^8 m^3	1.03	3.57	0.68	5.28	37300	100	16726	329,408.53
Other coal gas	10^8 m^3	12.62	8.37		20.99	37300	100	5227	409,235.94
Crude oil	10000 ton	1.16			1.16	71100	100	41816	34,488.16
Gasoline	10000 ton				0.00	67500	100	43070	0.00
Diesel	10000 ton	1.18	1.48	0.57	3.23	72600	100	42652	100,018.09
Fuel oil	10000 ton	9.32	2.46	1.55	13.33	75500	100	41816	420,842.50
LPG	10000 ton	0.12			0.12	61600	100	50179	3,709.23
Refinery gas	10000 ton	5.48		1.32	6.80	48200	100	46055	150,949.87
Natural gas	10^8 m^3		0.84	2.24	3.08	54300	100	38931	651,097.62
Other petloreum product	10000 ton				0.00	69300	100	38369	0.00
Other energy	10000 ton	16.18			16.18	0	100	0	0.00
								Total	196,000,493.14

Source: China Energy Statistical Year Book (2006) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 11 Power generation of Northeast Power Grid in 2005.

Region	Generation (MWh)	Self usage rate （%）	Supply (MWh)
Liaoning	83697000	7.03	**77813100.9**
Jilin	35294000	6.59	**32968125.4**
Heilong jiang	58000000	7.96	**53383200.0**
Total			**164164426.3**

Source: China Electric Power Year Book (2006)

Table A 12 Power generation of North China Power Grid in 2005.

Region	Generation (MWh)	Self usage rate (%)	Supply (MWh)
Beijing	20880000	7.73	19,265,976
Tianjin	36993000	6.63	34,540,364
Hebei	134348000	6.57	125,521,336
Shanxi	128785000	7.42	119,229,153
Inner Mongolia	92345000	7.01	85,871,616
Shandong	189880000	7.14	176,322,568
Total			560,751,013

Source: China Electric Power Year Book (2006)

The CO2 emission of North China Power Grid in 2005: 612,332,407.34 t-CO2
The power supply of thermal plants in North China Power Grid in 2005: 560,751,013 MWh
The import electricity from Northeast Power Grid to North China Power Grid in 2005: 23,423,000 MWh
The CO2 emission of Northeast Power Grid in 2005: 196,000,493.14 t-CO2
Therefore, the emission factor of Operating Margin of North China Power Grid in 2005 is 1.092098 t-CO2/MWh.

As a result, Operating Margin Emission Factor of North China Power Grid is calculated in Table A 13.
Therefore, EF_{OM} = 1.05981 t-CO2/MWh.

Table A 13 Operating Margin Emission Factor of North China Power Grid.

Year	Total Emission (t-CO2)	Total Supplied Power (MWh)	Emission Factor (t-CO2/MWh)	EF_{OM} (t-CO2/MWh)
2003	435,495,079	429,609,286	1.013700	
2004	524,162,537	493,687,660	1.061729	
2005	637,975,480	584,174,013	1.092098	
Total	1,597,633,097	1,507,470,959		1.059810199

Step 2. Calculation of the Build Margin Emission Factor

Sub step 1. Calculation of percentage of each fuel
The CO2 emission percentage of coal, oil and gas fired in the total emissions of North China Power Grid is calculated.

Table A 14 Calculation of CO2 emissions of North China Power Grid in 2005.

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia	Total	Low Caloric Value	Carbon emission factor	Oxidation rate	CO2 emission
										(kgCO2/TJ)	（%）	(t-CO2e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/10000/1000
Raw coal	10000 ton	897.75	1675.20	6726.50	6176.45	10405.40	6277.23	32158.53	20908	89500	100	601,771,638
Cleaned coal	10000 ton	0.00	0.00	0.00	0.00	42.18	0.00	42.18	26344	89500	100	994,515
Other washed coal	10000 ton	6.57	0.00	167.45	373.65	108.69	0.00	656.36	8363	89500	100	4,912,779
Coke	10000 ton	0.00	0.00	0.00	0.00	0.11	0.21	0.32	28435	87300	100	7,944
Sub Total												**607,686,876**
Crude oil	10000 ton	0.00	0.00	0.00	0.00	0.00	0.73	0.73	41816	71100	100	21,704
Gasoline	10000 ton	0.00	0.00	0.01	0.00	0.00	0.00	0.01	43070	67500	100	291
Coal Tar	10000 ton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43070	71100	100	0
Diesel	10000 ton	0.48	0.00	3.54	0.00	0.00	0.12	4.14	42652	72600	100	128,197
Fuel oil	10000 ton	12.25	0.00	0.23	0.00	0.00	0.06	12.54	41816	75500	100	395,901
Other petloreum product	10000 ton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38369	69300	100	0
Sub Total												**546,092**
Natural gas	10^7 m^3	2.80	0.80	0.00	27.60	0.00	0.00	31.20	38931	54300	100	659,553
Coke oven gas	10^7 m^3	6.40	7.50	6.20	210.80	0.00	3.90	234.80	16726	37300	100	1,464,870
Other coal gas	10^7 m^3	160.90	78.60	388.30	98.80	0.00	183.70	910.30	5227	37300	100	1,774,786
LPG	10000 ton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50179	61600	100	0
Refinery gas	10000 ton	0.00	0.00	9.02	0.00	0.00	0.00	9.02	46055	48200	100	200,231
Sub Total												**4,099,439**
											Total	**612,332,407**

Source: China Energy Statistical Year Book (2006) and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

According to Table A 14, each percentage of fuel is as follows:
The percentage for coal: 99.24%
The percentage for oil: 0.09%
The percentage for gas: 0.67%

Sub step 2. Calculation of the average emission factor of thermal power plants

Table A 15 Emission factor of thermal power plants.

Plant Type	Item	Efficiency	Carbon Emission Factor (kg-CO2/TJ)		Emission Factor (t-CO2/MWh)
		A	B	C	D=3.6/A/1000*B*C
Coal Fired	$EF_{Coal,Adv}$	35.82%	89500	1	0.8995
Gas Fired	$EF_{Gas,Adv}$	47.67%	54300	1	0.4101
Oil Fired	$EF_{Oil,Adv}$	47.67%	75500	1	0.5702

Source: China Electric Power Year Book (2006)

The average emission factor of thermal power plants is:
99.24*0.8995/100 + 0.67*0.4101/100 + 0.09*0.5702/100 = 0.895927164 t-CO2/MWh.

Sub step 3. Calculation of Build Margin Emission Factor

Table A 16 Installed capacity of North China Power Grid in 2003.

Plant type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
Hydro	MW	1058.1	5.0	764.3	795.7	592.1	50.8	3266.0
Nuclear	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind and Others	MW	0.0	0.0	13.5	0.0	76.6	0.0	90.1
Toral	MW	4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	87362.7

Table A 17 Installed capacity of North China Power Grid in 2004.

Plant type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydro	MW	1055.9	5.0	783.8	787.3	567.9	50.8	3250.7
Nuclear	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind and Others	MW	0.0	0.0	13.5	0.0	111.7	12.3	137.5
Toral	MW	4514.4	6013.5	20730.0	18480.6	14321.1	32923.5	96983.1

Table A 18 Installed capacity of North China Power Grid in 2005.

Plant type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3833.5	6149.9	22333.3	22246.8	19173.3	37332.0	111068.8
Hydro	MW	1025.0	5.0	784.5	783.0	567.9	50.8	3216.2
Nuclear	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind and Others	MW	24.0	24.0	48.0	0.0	208.9	30.6	335.5
Toral	MW	4882.5	6178.9	23165.8	23029.8	19950.1	37413.4	114620.5

Table A 19 Capacity change of North China Power Grid.

	2003	2004	2005		
	A	B	C	D=C-A	
Thermal Power	84006.6	93594.9	111068.7	27062.1	99.282%
Hydro Power	3266.0	3250.7	3216.2	-49.8	-0.183%
Nuclear	0.0	0.0	0.0	0.0	0.000%
Wind and Others	90.1	137.5	335.5	245.4	0.900%
Total	87362.7	96983.1	114620.4	27257.7	100%

Therefore, EF_{BM} =0.895927164*99.282% = 0.88949 t-CO2/MWh.

Step 3. Calculation of the Combined Margin Emission Factor

The emission factor of combined margin for North China Power grid is calculated as follows:

EM_{CM} = 0.5*1.05981 + 0.5*0.88949 = 0.97465 t-CO2/MWh.

Table A 20 "Lower" effective CO2 emission factor

Energy type in China	Lower Value (kg-CO2/TJ)	Remarks
Raw coal	89500	Other Bituminous Coal
Cleaned coal	89500	Other Bituminous Coal
Other washed coal	89500	Other Bituminous Coal
Coke	87300	Coking Coal
Coke oven gas	37300	Coke Oven Gas
Other coal gas	37300	Gas Works Gas
Crude oil	71100	Crude Oil
Gasoline	67500	Motor Gasoline
Diesel	72600	Diesel Oil
Fuel oil	75500	Residual Fuel Oil
LPG	61600	Liquefied Petroleum Gas
Refinery gas	48200	Refinery Gas
Natural gas	54300	Natural Gas
Other petloreum produ	69300	Naptha
Other energy product	89500	Other Bituminous Coal
Other energy	0	-

Source: Table1.4, Chapter 1, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Annex 4

MONITORING INFORMATION

1. Introduction

The approved consolidated monitoring methodology ACM0005 / Version 04 "Consolidated Monitoring Methodology for increasing the Blend in Cement Production" is applied in this project.

The monitoring plan explains a guideline of monitoring procedures, schedule and responsibility. Information monitored should be real, measureable and retraceable.

2. Management system and Responsibility

The monitoring plan and monitoring system are established by Shanxi Guashan Cement. Mr. Lu En Yuan, general manager of Shanxi Guashan Cement, is responsible for the monitoring and reporting of this project.
The cement production line of the company is divided into some parts, such as Clinker part, Kiln part, etc. Each part has a responsible person who will monitor and check the data required. Each personnel will transcribe data on a specific sheet.

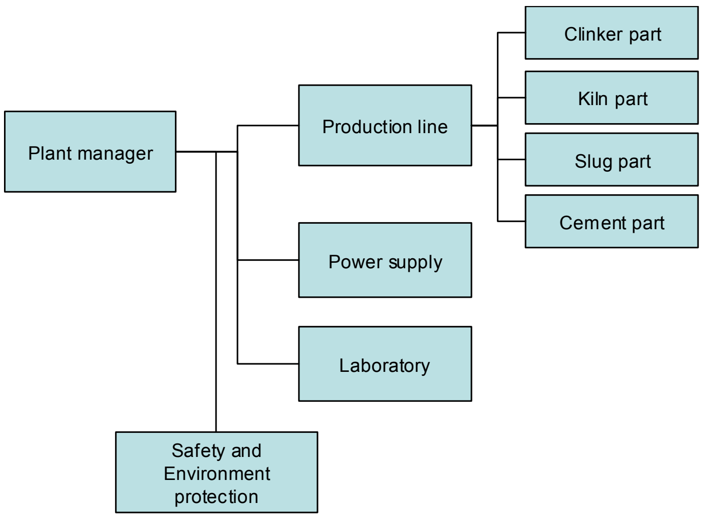

Figure A 1 Organization of cement production

3. Monitoring equipment and calibration

Monitoring equipment is already installed and used in usual operation. The equipments for materials are located in cement production lines. Other equipment for electricity and content analysis are located in a electricity distribution centre and laboratory respectively.

Some monitoring equipments for cement production lines are calibrated and checked by the company itself weekly because the company is the second class qualified inspector. In addition, some important parts of main equipment is replaced annually.

Other equipments which are also important, eg. a track scale for carrying materials in, are required to be examined and calibrated by the first class qualified inspector.

Monitoring points on cement production flow and monitoring data are shown in Figure A 2, Table A 21 and Table A 22, respectively.

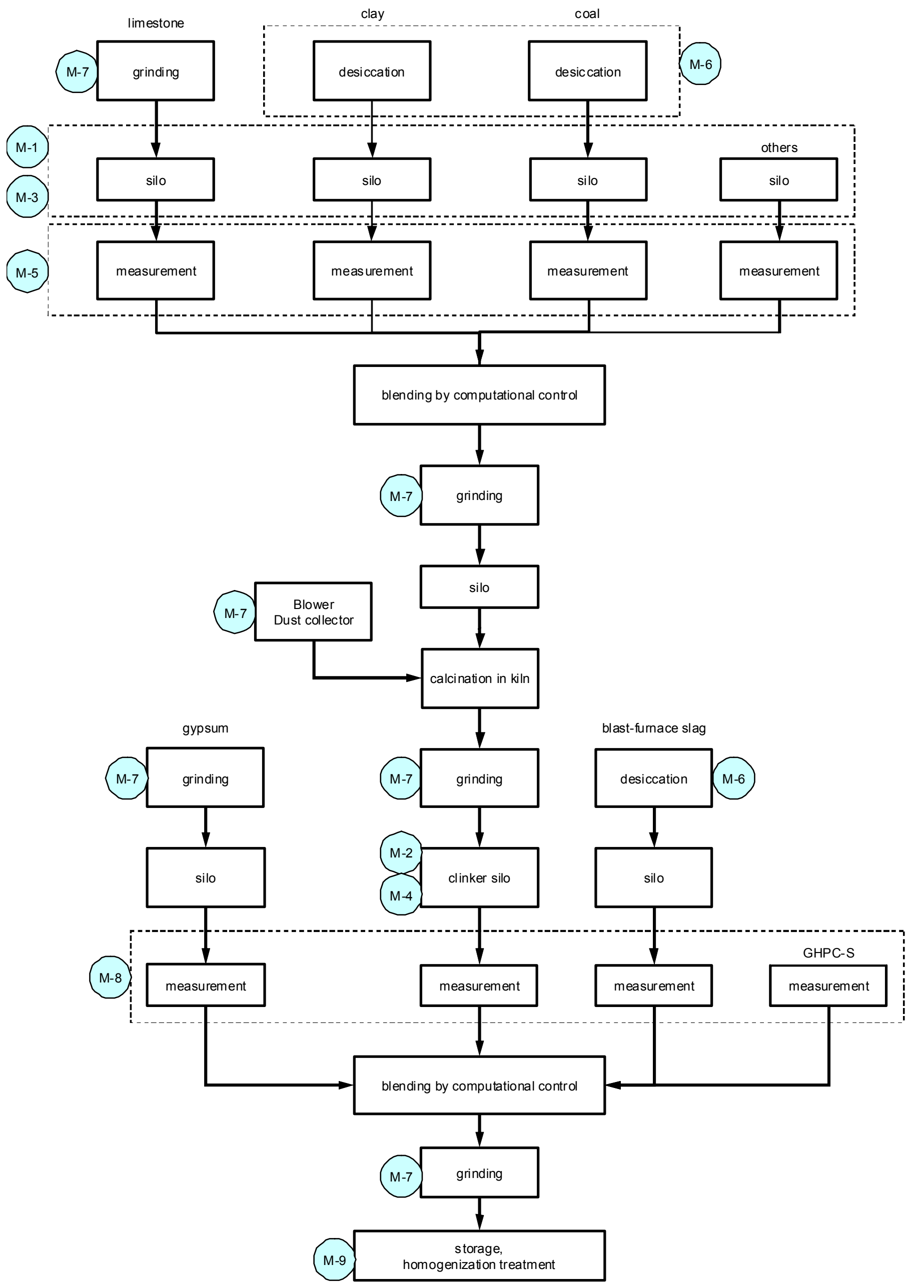

Figure A 2 Monitoring points

Table A 21 Monitoring data and methods for project activity

Point number	Data variable	Description	Monitoring Method	Monitoring location
M-1	**$CaO_{cont\_RM\_y}$ ($InCaO_y$)**	CaO content of the raw material	Method in accordance with Chemical analysis (GB/T5484-2000, GB/T5762-2000 and JC/T850-1999)	Laboratory A
M-2	**$CaO_{cont\_CLNK\_y}$ ($OutCaO_y$)**	CaO content of the clinker		Laboratory B
M-3	**$MgO_{cont\_RM\_y}$ ($InMgO_y$)**	MgO content of the raw material		Laboratory A
M-4	**$MgO_{cont\_CLNK\_y}$ ($OutMgO_y$)**	MgO content of the clinker		Laboratory B
M-5	**RM_y (Quantity of clinker raw material)**	Quantity of raw material is used to produce clinker: Limestone, Clay and others	Continuous weighing and recording system	Control room 1
	$FF_{1,y}$	Coal consumed for clinker production as raw material in year y.		
M-6	**$FF_{2,y}$**	Coal consumed for clinker production	Procurement records	Procurement division
M-7	**$PELE_{grid\_CLNK,y}$**	Grid electricity for clinker production	Integrated watt meters	Distribution switch gear room 1&2
	$PELE_{grid\_BC,y}$	Grid electricity consumption for grinding BC		
	$PELE_{grid\_ADD,y}$	Grid electricity consumption for grinding additives		
M-8	**$CLNK_y$**	Annual consumption of clinker	Continuous weighing and recording system	Control room 2
	ADD_y	Annual consumption of additives		
	BC_y	Annual production of BC		
	$P_{blend,y}$	Share of additives per blended cement		
M-9	**BC_y**	Annual production of BC for cross-check	Sales records	Sales division

Table A 22 Monitoring data and methods for leakage

Point number	Data variable	Description	Monitoring Method and Cross check
L-1	$\mathbf{TF_{cons}}$	Fuel consumption for the vehicle per kilometre	Manufacturer's catalogue, Procurement records
L-2	$\mathbf{D_{add\_source}}$	Distance between the source of the additives and the project activity plant	Confirmation on Map
L-3	**TEF**	Emission factor of transport fuel	IPCC guidelines
L-4	$\mathbf{Q_{add}}$	Quantity of additives carried in one trip per vehicle	Manufacturer's catalogue
L-5	α_y	Share of additional amounts of additives used as surplus	Procurement records, Sales records
L-6	$\mathbf{ELE_{adm}}$	Electricity consumption for grinding of admixture	Records of plant operation
L-7	**Rate**	Ratio of usage of admixture to Blend Cement	Procurement records
L-8	$\mathbf{D_{adm\_source}}$	Distance between the source of admixture and the project activity plant	Confirmation on Map
L-9	$\mathbf{Q_{adm}}$	Quantity of admixture carried in one trip per vehicle	Manufacturer's catalogue

4. Data management and QA/QC

The company has ISO9002 and ISO14001 certificate, therefore, they have already quality control, quality assurance system and environmental management system for daily usual operation. In this CDM project, these management systems will be utilized effectively.

Furthermore, the company will do cross-check using evidence documentation, such as purchase specification, to enhance the quality of data monitored.

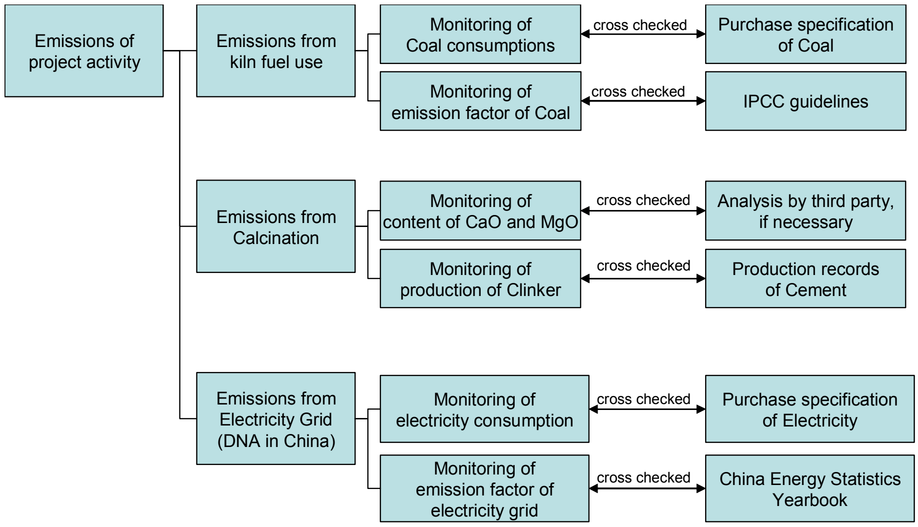

Figure A 3 Data used for monitoring and cross-check

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