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:

BBMG Cement WHR[1] for 10.5 MW power generation project in Beijing
Version: 01
Date: 21/3/2007

A.2. Description of the project activity:

The Beijing Building Material Group (BBMG) 10.5MW Cement Waste Heat Recovery Project (hereafter, the "Project Activity") is being developed by Beijing Building Material Group Co., Ltd. (hereafter referred to as BBMG or the project developer). The project activity uses waste gas and waste heat to generate electricity at two cement plants in the municipality of Beijing, China - hereafter referred to as the "Host Country".

The project is located in BBMG's two subsidiary companies:

- Beijing cement plant (Changping district, Beijing Municipality, hereafter referred to as "Beijing Cement Plant"), where 6MW of electricity will be generated from the waste heat/gas of the two clinker production lines [operation expected to start end of March 2007]; and
- Beijing Liulihe cement plant (Fangshan district, Beijing municipality, hereafter referred to as "Liulihe Cement Plant"), where 4.5MW of electricity will be generated from the waste heat/gas of one of the two clinker production lines (the other one already has an electricity generator[2] and is not included in this project) [operation expected to start end of April 2007].

This is summarised in the table below.

Table A2-1: Details of the Project Activity

Site	Line providing heat	Clinker capacity t/d	Commenced operation	Inclusion in CDM project	Current installed capacity MW	Project generation capacity MW
Beijing Cement Plant	Clinker	2,350	December 1994	Included	0	6.0
	Clinker	3,000	May 2005	Included	0	
Liulihe Cement Plant	Clinker	2,500	July 2000	Included	0	4.5
	Clinker	2,000	1995	Excluded	12.0	
Totals		7,850			12.0	10.5

Within the cement lines at the Beijing Cement Plant (clinker manufacture), waste heat is recovered from the suspension pre-heater (SP) and the Air Quenching Chamber (AQC). The clinker includes the section of a solid waste production line that provides a very small part of raw material to the clinker process, while mixed with other raw material. The waste heat is fed into two waste heat recover boilers that are used to supply a single turbine generator. No fossil fuels are used to provide additional heat in the processes.

[1] Short form for waste heat recovery.

[2] Using mostly coal as well as some waste heat

Within the cement lines at the Liulihe Cement Plant (clinker manufacture) waste heat is recovered from the SP. Recovered waste heat is fed into two waste heat recovery bloilers that feed a single turbine generator. No fossil fuels are used to provide additional heat in the processes.

The annual output of the three lines included in the project activity is approximately 1.5 million tons clinker/year. At present, the electricity demanded by these lines is met by imports from the North China Power Grid[3] (hereafter, the "NCPG"). BBMG currently purchases 382 GWh/yr of electricity from the NCPG, which is dominated by coal-fired electricity. The project activity will result in an annual net generation of approximately 72,620 MWh/yr, which will offset emissions from the NCPG of about 71,458 tCO_2e/year during the crediting period.

It is firmly believed by the project participants that the project activity will promote sustainable economic and industrial growth in the long run, conserving natural resources and contributing to a cleaner and healthier environment. Some of the sustainable development benefits associated with the project include:

- **Social Benefits**: The project activity will increase skilled labour positions (by almost 110) providing direct and indirect employment during construction and operation.
- **Economic benefits:** The project activity will, through its income generation, generate many economic benefits for the local community.
- **Environmental Well-being:** A major share of the electricity for the NCPG is generated from fossil fuels (mainly coal). In addition to reduced greenhouse gas emissions, the project will contribute to reductions in SO_2 and NO_x emissions. The project will assist in the mitigation of the negative impacts incurred by the excessive exploitation and depletion of natural resources such as coal.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Beijing BBMG Group Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group PLC.	No

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

[3] North China Power Grid covers Beijing Municipality, Tianjin Municipality, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia.

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

Beijing Municipality

A.4.1.3. City/Town/Community etc:

Beijing Cement Plant: Beixiaoying Village East, Tingzizhuang Town, Changping District
Liulihe Cement Plant: No.1, Liulihe Depot Front Street, Fangshan District

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

The project activity is to be implemented in Beijing BBMG's cement production lines in Changping District and Fangshan District as illustrated in fig. 1 and fig. 2 below. The geographical coordinates of the two project sites are shown in **Table A4-1** and **Fig A4-1** below:

Table A4-1

	Changping Lines (Beijing cement plant)	Fangshan Lines (Luhile cement plant)
longitude	E116°20′	E116°02′
latitude	N40°22′	N39°36′

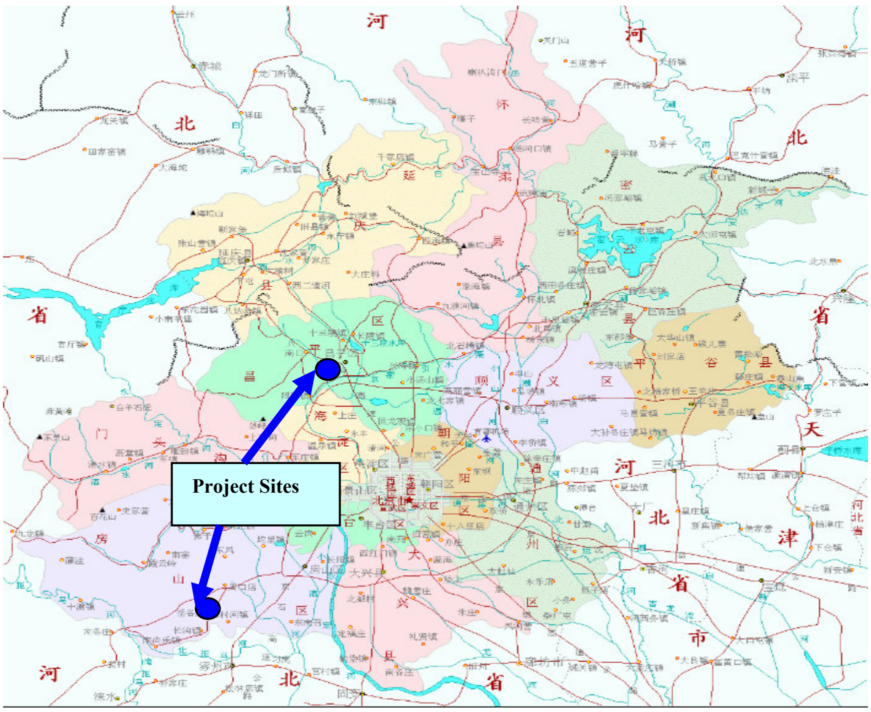

Fig A4-1：The geographical location of the project activity within Beijing Municipality

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

According to Annex A of the Kyoto Protocol, the project activity falls under UNFCCC Sectoral Scope Number 1-Energy Industries (renewable/non-renewable sources) and 4- Manufacturing Industries

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

During the process of cement production, a large amount of waste heat is emitted into the atmosphere from the kilns and pre-heaters. This project will use waste heat recovery boilers to utilise this heat and produce steam. Steam from the boilers will drive a steam turbine generator to produce electricity. The operation, control, monitoring and data logging for the plant will be made by a distributed control system (DCS) at each plant. A diagram of the processes can be seen below.

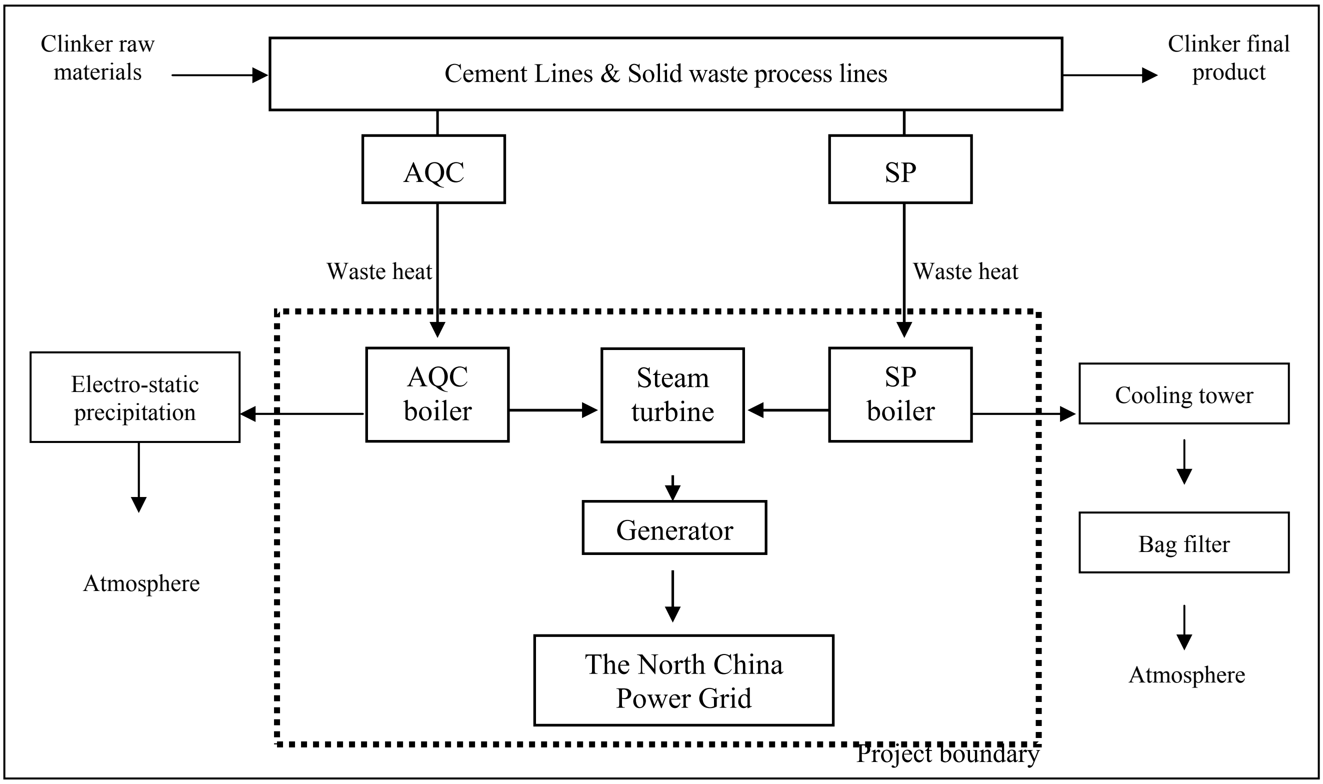

Figure A.4.3 Beijing Cement Plant – Line 1

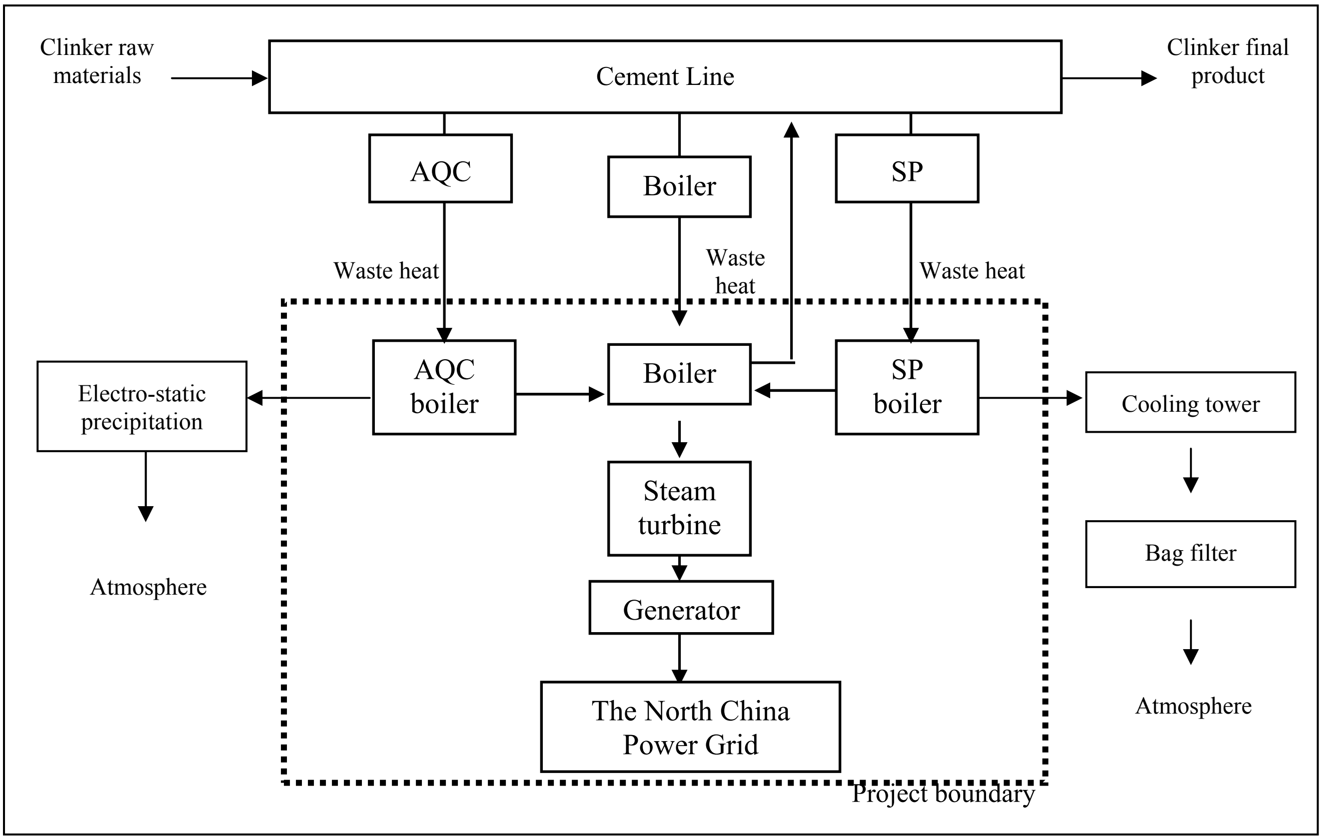

Figure A4-3 Liulihe Cement Plant – Line 2

The major components in the project activity for both sites are detailed below. The technologies used for building the captive power plant are all domestic in China.

Beijing Cement Lines:

Equipment	Technical parameter	Manufacturer
AQC Boiler	Inlet gas conditions: 90000Nm^3/h-340℃ Particulate concentration: <10g/Nm^3 Steam outlet Temperature: 120 °C Section I: Main steam conditions: 6.7t/h-1.35MPa-310℃	Hangzhou Boiler Plant

	Inlet gas conditions: 80000Nm^3/h-340℃ Particulate concentration: <10g/Nm^3 Steam outlet Temperature: 120 ^{o}C Section I: Main steam conditions: 5.9t/h-1.35MPa-310 ^{o}C	
SP boiler	Inlet gas conditions: 161000Nm^3/h-346℃ Particulate concentration: <100g/Nm^3 Exhaust gas Temperature: 220 ^{o}C Main steam conditions: 10t/h-1.35MPa-310℃(overheat)	Hangzhou Boiler Plant
	Inlet gas conditions: 240000Nm^3/h-350℃ Particulate concentration: <100g/Nm^3 Exhaust gas Temperature: 220 ^{o}C Main steam conditions: 15.7t/h-1.35MPa-310℃(overheat)	
Steam turbine	Model number: HS5005N6-1.25 Standard power: 6.0MW Standard rotational speed: 3000r/min Pressure of main gas: 1.25 MPa Temperature of main steam: 290 ^{o}C Exhaust pressure: 0.008 MPa	Hangzhou Zhongneng Steam Turbine & Power Co.,Ltd
Generator	Model number: QF1-6-2 Standard power: 6.0MW Standard rotational speed: 3000r/min Output voltage: 6300V	Hangzhou Zhongneng Steam Turbine & Power Co.,Ltd

Liulihe Cement Plant:

AQC Boiler	Inlet steam conditions: 94000Nm^3/h-400 ^{o}C Particulate concentration: <10g/Nm^3 Steam outlet Temperature: 85 ^{o}C Section I: Main steam conditions: 10.5t/h-1.35MPa-360 ^{o}C	Shanghai Industrial Boiler Co., Ltd.
SP boiler	Inlet gas conditions: 194000Nm^3/h-350℃ Particulate concentration: <100g/Nm^3 Steam outlet Temperature: 220 ^{o}C Main steam conditions: 14.2t/h-1.35MPa-310℃(overheat)	Shanghai Industrial Boiler Co., Ltd.
Steam turbine	Model number: S4.5-1.25 Standard power: 4.5MW Standard rotational speed: 3000r/min Pressure of main gas: 1.25 MPa Temperature of main steam: 340 ^{o}C Exhaust pressure: 0.006 MPa	Qingdao Jieneng Steam Turbine Co., Ltd.
Generator	Model number: QF2-4.5 Standard power: 4.5MW Standard rotational speed: 3000r/min Output voltage: 6300V	Ji'nan Power Equipment Factory

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

The estimation of the emission reductions in the first crediting period is presented in table A4-3.

Table A4-3 Estimation of the emission reductions in the first crediting period

Year	Total Annual estimation of emission reductions in tonnes of CO2e
2007 (July-December)	15,144
2008	71,458
2009	71,458
2010	71,458
2011	71,458
2012	71,458
2013	71,458
2014 (January-June)	35,729
Total estimated reductions (tonnes of CO2e)	479,621
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	68,517

A.4.5. Public funding of the project activity:

No public funding as part of project financing from parties included in Annex I of the convention is involved in the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title: "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation"
Reference: UNFCCC Approved consolidated baseline methodology ACM0004/ Version 02, 3 March 2006

ACM0004 also refers to the following documents:

- ACM0002: "Consolidated Methodology for Grid-connected Electricity Generation from Renewable Sources" – Version 06, dated 19 May 2006, is used

- "Tool for the demonstration and assessment of additionality" – Version 03, adopted at EB29, is used.

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

Methodology applicability conditions	The Proposed Project Activity
The methodology applies to project activities that generate electricity from waste gas and/or heat and/or pressure in industrial facilities.	The Project activity will generate electricity by utilizing waste heat sources exhausted from the clinker production process and additives production process (from SP and AQC).
The methodology applies to electricity generation project activities that displace electricity generation with fossil fuels in the electricity grid or displace captive generation.	The proposed project activity will generate electricity which will reduce imports from the North China Power Grid. This is dominated by coal-fired electricity and so the project displaces fossil fuels.
The methodology applies to electricity generation project activities where no fuel switch is done in the process where the waste heat or waste gas is produced after implementation of the project activity.	No fuel switch takes place in the process where the waste heat is produced.
The methodology covers both new and existing facility.	The project activity includes three existing cement lines.

Hence the said methodology ACM0004 (Version02) is applicable for the project activity.

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

As per ACM0004 (Version 02), the project boundary includes the waste heat recovery system and the NCPG (there is no captive power generation in the lines included in the project boundary). In the calculation of project emissions in ACM0004, only CO_2 emissions from fossil fuel combustion at the project plant are considered.

The GHGs included in or excluded from the project boundary are listed in the below Table B.3-1. Diagrams illustrating the project boundary are contained in section A.4.3

Table B.3-1 The sources and gases included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.

	generation	N_2O	No	Excluded for simplification. This is conservative.
Project Activity Project Activity	On-site fossil fuel consumption due to the project activity	CO_2	Yes	This source is included in case fossil fuels are used in the future. However, this is not expected.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Combustion of waste gas for electricity generation	CO_2	No	It is assumed that this gas would have been burned in the baseline scenario.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

Figure B.3-2: The sources and gases originated from the project boundary of Liulihe Cement Plant

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

The baseline scenario is determined in accordance with ACM0004 (Version 2). The list of possible alternatives is given below, and for each of them the following aspects are assessed:

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

Alternative a. The proposed project activity not undertaken as a CDM project activity
The project developer may set up waste heat recovery systems to generate electricity. This alternative is in compliance with all applicable legal and regulatory requirements.

Alternative b. Continuation of equivalent import of electricity from the North China Power Grid
This alternative corresponds to the current practice: electricity that will be generated from the waste heat recovery boilers would otherwise be bought from the NCPG (and the electricity currently generated on-site at Liuhile plant would continue to generate as usual).

Although there has been a number of regulations to encourage the recovery of waste heat in industries (e.g.: *Scheme for Energy Conservation Technology Policy of the People's Republic of China, List of Clean Production Technologies for key Industries in China, Planning of Medium and Long Term Energy Conservation in China)*, none of them is forcing the project developer to develop power generation from waste gas, nor are there any laws or regulations which rule out alternative b) from plausible scenarios.

Alternative c. Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas
For the cement production in BBMG's two cement plants, the company needs to purchase electricity totalling 382GWh/yr from the NCPG. BBMG already has a 12MW captive power plant at its Liulihe Cement Plant, based on a power generation system with 25% waste heat and 75% coal. However, the captive power plant has been running at maximum output and has no way to further increase power supply.

The project developer could generate equivalent power to the CDM project activity by constructing another new fossil fuel based captive power plant. The only fossil fuel likely to be used would be coal given the large availability of coal in China. However, this would not be an appropriate baseline, since the construction and operation of coal-fired power plants with an installed capacity less than 135MW is prohibited in the areas covered by large grids[4]. Therefore, the baseline option c may be excluded from the baseline scenario.

Alternative d. A mix of alternative (b) and (c), in which case the mix of grid and captive power should be specified.
Like alternative (d), alternative (c) would not be in compliance with the Chinese regulations,

Alternative e. Other uses of the waste gas
The waste heat has no other means to be used except for generating electricity on site. There are not sufficient thermal energy demands to consider using the waste heat for thermal energy only. Therefore, alternative e cannot be taken as the baseline scenario.

Alternative f. The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the alternatives above)
This alternative is already included in alternative b.

From the identified alternatives it can be concluded that only alternative a) and b) are credible scenarios which comply with all legal/regulatory requirements. Section B.5 will analyse which of these two scenarios is the most likely.

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):

In accordance with ACM0004, the additionality is demonstrated using the 'Tool for the demonstration and assessment of additionality' (Version 03).

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

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

Alternative baseline scenarios have been defined as follows:

a) The proposed project activity not undertaken as a CDM project activity
b) Continuation of equivalent import of electricity from North China Power Grid
c) Existing or new captive power generation on-site, using other energy sources than waste heat and/or gas
d) A mix of alternatives (b) and (c), in which case the mix of grid and captive power should be specified
e) Other uses of the waste gas
f) The continuation of the current situation, whether this is captive or grid-based power supply (if not already included in the alternatives above)

[4] *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below* Issued by State Council Office Decree no. 2002-6. http://www.minbank.net/flfg/gwy/200204/1552.html.

As per the analysis in Section B.4, alternatives (c), (d), (e) and (f) could be excluded. Therefore, only alternatives a) and b) are considered further.

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

This analysis has been performed in section B.4, and concluded that alternatives a) and b) were consistent with mandatory laws and regulations, while c) and d) were not.

Step 2. Investment analysis

Sub-step 2a: Determine appropriate analysis method

According to the Tool for the demonstration and assessment of additionality, one of three options must be applied for this step:

- simple cost analysis (where no benefits other than CDM income exist for the project)
- investment comparison analysis (where comparable alternatives to the project exist) or
- benchmark analysis.

In this case, since cost savings from avoiding continuing electricity imports could be regarded as revenue, simple cost analysis is not applicable. Investment comparison analysis is not appropriate, since the alternative to the project activity is to supply the electricity from the NCPG instead of investing in an alternative power generation project (thus the alternative requires no investment). Benchmark analysis is therefore the most appropriate approach in this case, because it can clearly show the logic behind the investment decision-making for the proposed projects.

Sub-step 2b: Option III - Apply benchmark analysis

The financial attractiveness of this project will be determined by comparing the project IRR (without carbon) with the benchmark rate applied in China's cement industry, which is estimated and published by the Host Country[5]. The benchmark is accordingly set at 12%. If the project IRR (without carbon) is less than 12%, the project is considered not be financially attractive in the absence of CDM revenues, and is therefore considered to be additional.

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

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

Table B.5-1: Main parameters used for financial calculations

Main parameters	Unit	Beijing 6MW plant	Liulihe 4.5MW plant
Installed capacity	MW	6	4.5
Annual net electricity supplied	MWh/yr	38,420	34,200
Capital cost	RMB	46,325,500	45,145,000
Operating cost	RMB/year	10,300,472	9,098,551
Electricity Tariff (no VAT)	RMB/MWh	427	427
Urban + education tax	%	10	10
Income tax	%	33	33

[5] Methodology and Parameters applying in Constructive Project Economic Analysis (2006), Page 202, China Planning Publisher, Beijing

The financial analysis results are shown in Table B.5-2. As shown in the tables, without carbon credits the two projects' IRR are respectively 7.52% (Beijing) and 7.85% (Liulihe), which are much lower than the benchmark rate of 12%. This therefore indicates that in comparison to other alternative investments, the project without carbon credits is not financially attractive to a rational investor.

Table B.5-2 Financial indicators of the project

	Beijing 6MW plant	Liulihe 4.5MW plant
Net Present Value (RMB)	-10,085,200	-442,592
IRR	7.52%	7.85%

Notes: NPV uses 12% discount rate. All calculations are done over 20years and exclude carbon revenues

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

- Total revenues (i.e. electricity tariff) increased by 10%
- Total costs (both investment and operational) decreased by 10%

The impact on the project financial results are given below.

Table B.5-3 Influence of various changes in key parameters on the project's IRR

Scenario	IRR (%) - Beijing 6MW	Liulihe 4.5MW plant
Original	7.52%	7.85%
Increase electricity price + 10%	10.24%	8.82%
Decrease in variable cost -10%	9.32%	8.09%
Decrease in capital cost -10%	8.96%	8.77%

Notes: NPV uses 12% discount rate. All calculations are done over 20years and exclude carbon revenues

As it can be seen, the project IRR remains lower than 12% of the benchmark rate in China cement industry, even in the case where the change of these parameters is in favour of the project. Therefore we can conclude that the assumption that the project (without carbon) is not financially attractive is robust to the variation of key parameters.

Step 3. Other Barriers analysis

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

Step 2 highlighted the financial difficulties faced by the projects; however, the project also face some important technical difficulties, which in turn impact the profitability and risk profile of the project:

a) The exhaust gases from the cement manufacturing process have a high dust content, and exit at relatively high temperatures. Most of the dust particles are sticky at high temperatures[6]. This

[6] *Tang J.Q., Chang Z.G.. Several problems in pure lower temperature for power generation of clinker production. Cement. Issue 4, 2005*

makes waste heat utilization very difficult as a large amount of dust collects on heat transfer surfaces and leads to complete choking of the heat exchanger[7]. This will pose a real threat to the successful implementation of the project activity and requires high upfront costs to prevent severe choking.

b) The final temperature (260~400℃) of exit gases poses technical barriers for power generation in China[8], which will also increase risks of technical failure of the project
c) There is a severe shortage of staff in China with in-depth knowledge of this technology. Training of the technical staff will be provided, but it will take no less than one year for the staff to master such techniques through training. Thus, the lack of readily available technical staff also forms a upfront barrier to the proposed project activity and also increase the risk of technical failure during operation and maintenance.

This qualitative analysis shows that the project faces some important technical barriers, which increase the risk of technical failure and under-performance of the project. These barriers do not apply to the other alternative (continuation of the current practice without any investment). The registration of the project as a CDM project activity will help alleviate these additional barriers faced by the project by providing an additional, diversified and secure source of revenue.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity
At present, there is no similar project in Beijing region and Hebei province, where there are totally 429 cement factories (including 26 with an annual capacity of more than 600,000 tonnes of cement produced[9]). The project activity is a 'first of its kind' in Beijing region and Hebei province. Therefore, there exist no other activities similar to the proposed project activity. The Beijing region together with Hebei province has been selected for comparison because it represents a very large area both in terms of population, and in terms of cement production, much larger than the cement industries of many developing countries. However, even if the whole of China were considered as the region for comparison, the project activity still does not represent common practice, as discussed in sub-step 4.b below.

Sub-step 4b. Discuss any similar options that are occurring
"The total cement output of China in 2005 reaches 1.064 billion tons, among which the output from the production lines with PC kilns accounts for 40%, while the number of such production lines built at the end of 2005 stands at 613"[10]. Among the 613 PC kiln lines, "there are only 20 which have installed or plan to install waste heat utilization boilers for power generation"[11], which represents 3% of the lines – a

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[7] Zhang B.. *A Study on utilizing waste heat from Pre-Calcining kilns for power generation and assessment on the merits of this technology. CHINA SCIENCE AND TECHNOLOGY INFORMATION.* Edition 3, 2005, page 82

[8] *Tang J.Q., Chang Z.G.. Several problems in pure lower temperature for power generation of clinker production. Cement. Issue 4, 2005*

[9] *China Cement Digital Report (2006), Digital Cement Magazine, First-Second Issue,2006,P64*

[10] *China cement statistical report, Feb, 2006, page 153. China cement statistical report is a periodical co-sponsored by China Cement Association and Digicement*

[11] *The Special Edition on Waste heat Recovery for Power Generation in Cement Industry* in the paper publication of the web-based periodical www.chinacements.com, P.34, Edition 5, 2006

figure that cannot be taken as one that indicates common practice. Furthermore, as indicated before, these WHR installations are all outside Beijing and Hebei province.

In conclusion, this section shows that the project activity undertaken without CDM revenues is not financially attractive and is prevented by several technical barriers which add uncertainty to the project performance (and revenues). These qualitative and quantitative analyses are confirmed by the fact that waste heat recovery is not common practice in the cement industry in Beijing and Hebei provinces, and even more generally in China. Therefore, the project activity can be considered additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per the Methodology ACM0004, emission reductions of the project are equal to baseline emissions minus project emissions, minus leakage.

Baseline Emissions:

Baseline emissions are calculated as follows:

$$BE_y = EG_y \times EF_y \qquad (6)$$

Where:

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

EG_y is the power displaced by the project activity, and

EF_y is the baseline emission factor in the year y.

According to Section B.4 and B.5, the baseline scenario is the "continuation of equivalent import of electricity from the NCPG". Therefore, ACM0002 (Version 06, 19 May 2006) is used to determine the emission factor of the displaced electricity EF_y. The combined margin has been calculated as described in the methodology while taking the relevant grid definitions and emission factors.

Grid boundary:

According to the latest rules on project boundary in version 6 of ACM0002 (19 May 2006), the regional grid definition should be used in large countries with layered dispatch system (e.g. state/ provincial/ regional/ national). This is the case in China and therefore all power plants connected to the North China Power Grid (NCPG) are included the project boundary.

The North China Power Grid includes Beijing City Power Grid, Tianjin City Power Grid, Hebei Province Power Grid, Shanxi Province Power Grid and Shandong Province Power Grid. The most recent available information on the fuel consumption of North China Power Grid is the Data from *China Energy Statistical Yearbook* (the most recent data applicable are from 2000-2002, 2003, 2004 and 2005) and *China Electric Power Yearbook* (the most recent data applicable are from 2000, 2001, 2002, 2003, 2004 and 2005), and the Emission Factor of the baseline scenario will be calculated accordingly.

Method to determine EF_y:

The methodology used for the calculation of baseline emissions from the use of grid electricity follows Option (a) of the Consolidated Methodology for Grid Connected Projects ACM0002 (Simple Operating

Margin). This is because low-cost must run resources constitute less than 50% of total grid generation, and detailed data to apply option (b) or (c) are not available.

The grid emission factors and calculations for the NCPG are provided by the Designated National Authority of the P.R. China [12].

The baseline emissions factor (EF_y) is a weighted average of the EF_OM_y and EF_BM_y:

$$EF_y = (\omega_{OM} * EF\_OM_y) + (\omega_{BM} * EF\_BM_y) (2)$$

Where:

EF_OM_y is the operating margin carbon emissions factor
EF_BM_y is the build margin carbon emissions factor
And the weights ω_{OM} and ω_{BM} are by default 0.5.

The Project is using ex ante emission factor calculation; therefore, a 3-year data vintage is used based on the most recent statistics available at the time of PDD submission, which are the statistics from the China Electric Power Yearbooks 2000, 2001, 2002, 2003, 2004 and 2005, as well as the China Energy Statistics Yearbook 2005, 2004, 2003 and 2000-2002. The defaults used for the calculation of calorific values for fuel types and fuel oxidisation, came from the IPCC GHG Gas Inventory Reference Manual (IPCC 2006).

The Simple Operating Margin emission factor (EF_OM_y) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used. The equation is the following:

$$EF\_OM_y (tCO_2 / MWh) = \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j.y}]} (3)$$

Where:

$F_{i,j,y}$ is the amount of fuel i (in GJ) consumed by power source j in year y;
j is the set of plants delivering electricity to the grid, not including low-cost or must-run plants and carbon financed plants;
$COEF_{i,j,y}$ is the carbon coefficient of fuel i (tCO_2/GJ);
$GEN_{j.y}$ is the electricity (MWh) delivered to the grid by source j.

Since detailed data on individual plants serving the system is not available in China, fuel consumption data for each relevant type of generating source i.e. coal, oil etc. is obtained from the China Energy Yearbook 2000 to 2005 in the Grid to give the aggregate fuel consumption. Then, from the fuel consumption from the relevant sources in the Grid and the electricity generation by these sources, the average emissions from 2002 to 2004 are obtained; these are divided by the total amount of energy generated, to give the emissions rate per MWh.

[12] DNA grid data (was: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1026.pdf)

The simple OM emissions factor of the Huabei (North China) Grid is then calculated as **1.0585 tCO_2e /MWh** (refer to Annex 3 for details)

The Build Margin emission factor (EF_BM_y)

To calculate the Build Margin (BM), the formulae should be the following according to the ACM0002:

$$EF\_BM_y\ (tCO_2 / MWh) = \frac{[\sum_{i,m} F_{i,m,y} * COEF_{i,m}]}{[\sum_m GEN_{m.y}]} \quad (4)$$

where $F_{i.m,y}$, $COEF_{i,m}$ *and* GEN_m are analogous to the *OM* calculation above.

According to the latest EB guidance, the use of capacity additions for estimating the build margin emissions factor for grid electricity and the use of weights estimated using installed capacity in place of annual electricity generation in China are accepted. So instead of using data on fuel consumption and generation of individual plants, which is not available in China, the build margin is calculated by using aggregate data by technology type to get the capacity additions to the grid. For conservativeness, the emission factor of thermal power with Best Practice Commercialized Technology (BPCT) is used to get the Build Margin to reflect the trend of decreased coal consumption in the fuel-fired power generation brought by technology advancement in the coming years.

The BM average emissions factor of «Name_of_Electricity_Grid» is therefore calculated as **0.9096 tCO_{2e} /MWh** (refer to Annex 3 for details).

Data and assumptions are from the following sources:

Table B.6.1.1-1: Baseline Emission Factor of the «Name_of_Electricity_Grid» (tCO2/MWh)

No.	Elements	Value	Data Source
A	Operating Margin Emission Factor	1.0585	China Energy Statistics Yearbook 2000-2005 and China Electric Yearbook 2003 - 2005
B	Build Margin Emission Factor	0.9096	China Energy Statistics Yearbook 2000-2005 and China Electric Yearbook 2003 - 2005
C	Combined Emission Factor (C=0.5*A+0.5*B)	**0.9840**	China Energy Statistics Yearbook 2000-2005 and China Electric Yearbook 2003 - 2005

For the Year 2004, the value of the average emission factor was **0.9840 tCO_{2e} /MWh** (0.9840 KgCO2 / KWh, see details in Annex 3).

For all raw data and detailed calculation, please refer to Annex 3.

Project emissions:

Project emissions and leakage emissions are zero as the operation of WHR to electricity project uses only waste heat and the start-up uses small amounts of electricity (which is deducted from the ER calculation by claiming ERs only for the *net* electricity generation) and no auxiliary fuels.

Leakage

There is no leakage involved in the project activity and calculation for leakage is not required by ACM0004, nor by ACM0002.

Estimation of emission reductions *(ER_y)*

As per ACM0004, the emissions reductions will be calculated as follows:

$ER_y = BE_y - PE_y - L_y$

$= EG_y \times 0.9840$ tCO_2e

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

Data / Parameter:	**Carbon Emission Factor ($CEF_{electricity,y}$)**
Data unit:	*tCO_2/MW*
Description:	CO_2 emissions intensity of the electricity displaced
Source of data used:	Official statistics from The China Electric Power Yearbook and the China Energy Statistical Yearbook 2005, 2004 and 2003
Value applied:	**0.9840**
Justification of the choice of data or description of measurement methods and procedures actually applied :	The $CEF_{electricity,y}$ is calculated according to ACM0002, based on fuel consumption and electricity generation data for plants connected to the grid, provided by official sources. The relevant grid is the Huabei grid.
Any comment:	

Data / Parameter:	*EF_{OM}*
Data unit:	tCO2/MWh
Description:	Parameter for the calculation of the Huabei Grid's CEF
Source of data used:	Calculated
Value applied:	1.0585
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM002 applied to when low cost and must run sources makes up less than 50% of the generation.
Any comment:	

Data / Parameter:	*EF_{BM}*
Data unit:	tCO2/MWh
Description:	Parameter for the calculation of the Huabei Grid's CEF
Source of data used:	Calculated
Value applied:	0.9096
Justification of the choice of data or description of	According to ACM0002

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$F_{i,y}$
Data unit:	t(m_3)
Description:	Generation by various fuel sources
Source of data used:	The China Electric Power Yearbook and the China Energy Statistical Yearbook 2005, 2004 and 2003
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from official sources
Any comment:	

Data / Parameter:	$GEN_{i,y}$
Data unit:	GWh
Description:	Supply by various fuel sources
Source of data used:	The China Electric Power Yearbook and the China Energy Statistical Yearbook 2005, 2004 and 2003
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from official sources
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor for power plant fuel
Source of data used:	IPCC
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from IPCC
Any comment:	

Data / Parameter:	NCV_i
Data unit:	MJ/t (kJ/m^3)
Description:	Net Calorific value of the fuel used to generate grid power

Source of data used:	IPCC
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from IPCC
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	The carbon dioxide content coefficient for the fuel used to generate grid power
Source of data used:	IPCC
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from IPCC
Any comment:	

Data / Parameter:	$CAP_{i,2002-2004}$
Data unit:	MW
Description:	Between 2002-2004，new additions to the generation mix of the Huabei grid
Source of data used:	The China Electric Power Yearbook and the China Energy Statistical Yearbook 2005, 2004 and 2003
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics are from official sources
Any comment:	

Data / Parameter:	$ESCC_{bat}$
Data unit:	tce/MWh
Description:	Coal consumption for the best available technology available to the Huabei Grid
Source of data used:	The statistics by State Electricity Regulatory Commission (SERC) on newly built thermal plants in 10th "Five-Year Plan" period 2000-2005, and NDRC
Value applied:	0.336
Justification of the	Data from “The statistics by State Electricity Regulatory Commission

choice of data or description of measurement methods and procedures actually applied :	(SERC) on newly built thermal plants in 10th "Five-Year Plan" period 2000-2005, and NDRC" is an accurate representation of the BAT for the Huabei grid and satisfies conservative requirements.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

According to the Methodology and calculation steps described in section B 6.1, the emission reductions can be ex-ante calculated as follows:

Step 1. Calculated baseline emission

As per the *feasibility study report of the project activity,* the expected annual net electricity displaced by the project activity will be amount to 72,620 MWh, (slightly less in the first year) and the baseline emissions will be equal to the amount of electricity displaced times the appropriate emissions factor, **EFy, as** explained in section B 6.1 above, thus,

$BE_y = EG_y \times EF_y$ = 72,620 MWh/yr × 0.9840 tCO_2/MWh = 71,458 tCO_2e/yr

Step2. Estimation of emission reductions (ERy)

Annual emission reductions are equal to baseline emissions minus project emissions minus leakage:

$ER_y = BE_y - PE_y - L_y =$ 71,458 – 0 – 0 = 71,458 tCO_2e/yr

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

Year	Estimation of Project activity Emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of Emission reductions (tonnes of CO2e)
2007 (July to December)	0	15,144	0	15,144
2008	0	71,458	0	71,458
2009	0	71,458	0	71,458
2010	0	71,458	0	71,458
2011	0	71,458	0	71,458
2012	0	71,458	0	71,458
2013	0	71,458	0	71,458
2014(January to June)	0	35,729	0	35,729
Total	0	479,621	0	479,621

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh/y
Description:	Net electricity supplied to the manufacturing facility by the project during the year
Source of data to be used:	Calculated based on gross and auxiliary electricity data provided by project developer (detailed below).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	72,170
Description of measurement methods and procedures to be applied:	Project developer will calculate the value from the metered values of gross electricity generation from the project activity ($EG_{GEN,y}$)and auxiliary electricity consumed by the electricity generating facilities ($EG_{AUX\ y}$).
QA/QC procedures to be applied:	This value is calculated from the measured data of $EG_{GEN,y}$ and $EG_{AUX\ y}$. Please refer to the QA/QC procedures applied to these values
Any comment:	

Data / Parameter:	EG_{GEN}
Data unit:	MWh
Description:	Total quantity of electricity generated by the project activity during the year y
Source of data to be used:	Measured by electricity meters at the plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	No specific value for the total quantity has been used. The value used was directly for the generation net of any auxiliary consumption; this value is 72,620MWh/yr (except in the 1st year when it is only 65,358).
Description of measurement methods and procedures to be applied:	The data is continuously monitored by a meter (owned by the grid operator). The quantity of electricity will be recorded every day and then aggregated at the end of the crediting period. Hard copy records and electronic data will be archived for the full crediting period plus two years.
QA/QC procedures to be applied:	The Manager in charge will be responsible for ensuring that monthly electricity readings are recorded. Hard copy records will be entered into an electronic file. Data entry will be checked by someone not involved in the data entry process. The Manager in charge will be responsible for ensuring that calibration of the meter is in accordance with the Electricity Industry code and regulation in China. Calibration will be carried out by the grid operator (the owner of the meter). Recorded values will be compared at year end or crediting period end with aggregated figures.
Any comment:	

Data / Parameter:	EG_{AUX}
Data unit:	MWh

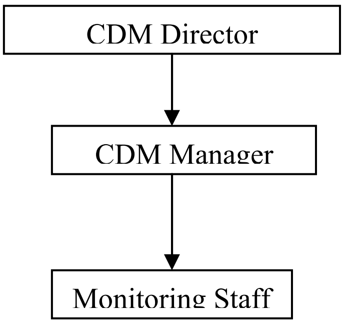
Description:	Auxiliary electricity consumed by the project activity during the year y
Source of data to be used:	Measured by meters at the plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	No specific value for the total quantity has been used. The value used was directly for the generation net of any auxiliary consumption; this value is 72,620MWh/yr (except in the 1st year when it is only 65,358).
Description of measurement methods and procedures to be applied:	The data is continuously monitored by two electricity meters (as there are two auxiliary feeds into the plant from the generated electricity). The quantity of electricity will be recorded via the DCS & manual writing every day and then aggregated at the end of the crediting period. Hard copy records and electronic data will be archived for the full crediting period plus two years.
QA/QC procedures to be applied:	The Manager in charge will be responsible for ensuring that monthly electricity readings are recorded. Hard copy records will be entered into an electronic file. Data entry will be checked by someone not involved in the data entry process. The Manager in charge will be responsible for ensuring that calibration of the meters is in accordance with the Electricity Industry code and regulation in China. Recorded values will be compared at year end or crediting period end with aggregated figures.
Any comment:	

B.7.2 Description of the monitoring plan:

The project uses the approved monitoring methodology ACM0004 "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation", Version 02, 03 March 2006. The project also refers to ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", Version 6, 19 May 2006.
All data required for verification and issuance will be kept for at least two years after the end of the crediting period or the last issuance of CERs of this project.
The following steps will be taken to ensure complete and accurate data and records are collected from the monitoring system:

1. Monitoring organisation

The project developer will establish a dedicated CDM team to take the responsibility for collecting data and records. Monitoring staff will receive training and technical support from the project consulting company. The members of the CDM workgroup are a CDM supervisor or a CDM manager from BBMG and are responsible for managing the monitoring staff and for checking the data and records.



2. Monitoring equipment

Distributed Control System (DCS) and Electricity meter installations should meet the requirements set by the general industrial standard. Before the commissioning of the meter, it should be tested and accepted by the project developer and the equipment manufacture & the grid company according to "electricity meter installation technical management code" (DL/T448-2000).

Calibration

The project developer will sign an agreement with the equipment manufacture & the grid company specifying the QA procedures for measurement and calibration to ensure accuracy of data. The periodic checks and onsite inspections should be conducted according to the relevant standards and codes set out by the national power industry. After examination and onsite inspection, an official stamp is required. The project developer and the equipment manufacture or the grid company jointly check and seal the DCS or the electricity meters. One party cannot unseal or modify the DCS or the electricity meters in the absence of the other party.

Within 10 days after the following circumstances, all the meters installed and the DCS should be tested jointly by the grid company and the equipment manufacture in the present of the project developer:

a) the error between the meter and the DCS measuring the same electricity exceeds the allowable range;
b) the meter and the DCS are repaired after failure.

3. Monitoring data

Given the emission factor is calculated ex-ante, the data to be monitored is annual electricity delivered to the NCPG from the project activity (calculated from measured gross electricity and auxiliary power use).

Electricity readings from the two meters and the DCS will be taken frequently. The data of gross electricity and auxiliary power will be transmitted to the two meters and the DCS by signal cable synchronistically. The meter readings will be manually recorded on hardcopy records in written form. The logged data from the DCS will be retained in a secure electronic archive system. The hard copy records will be retained in the site's record keeping system. The CDM Manager of the BBMG's CDM project workgroup will conduct some quality checks of the data entry to ensure consistency between the hard copy records and the electronic files.

The procedure for establishing the electricity supplied to the grid is as follows:

a) Every day the site operator records the electricity generated (gross generation), the electricity consumption of auxiliary equipment and calculates net electricity delivered to the grid. Onsite engineer checks that the net electricity delivered to the grid equals the gross electricity generated minus the auxiliary consumption.

b) the onsite engineer provides in-company readings of data signed by the staff on duty to the director of the WHR power plant.
c) on the last day of each month, the CDM manager take the data from the two meters and the DCS respectively, record the data of gross electricity and auxiliary power, then check both readings.
d) at the beginning of the next month, the grid company provides the project developer with the receipts of net electricity delivered to the grid. The project recorded data of gross electricity and auxiliary power can be cross-checked with the grid company receipts.

If the accuracy rate of the juncture meter exceeds the allowable error range or the meter is faulty, the electricity delivered to the grid should be calculated as follows:

a) First, the data from the DCS should be taken. According to the historical transmission loss rate, the electricity delivered to the grid can be calculated, unless the DCS has an faulty by any party.
b) If the DCS doesn't meet the acceptable range of accuracy or the operation fails to meet standard, the project developer and the grid company will design a reasonable and conservative calculation method. During the DOE's verification, sufficient documentation to prove this method is reasonable and conservative should be provided.
c) If the project developer and the grid company fail to reach agreement on a calculation method, according to the procedure specified in the Agreement, they will seek arbitration to determine the calculation method.

At the end of each month the monitoring data from the two meters and the DCS needs to be filed in written form. The written files need to have at least one copy for back-up. The project developer needs to keep electricity document signed by both itself and the grid company. In order to manage onsite data and records, the project developer should provide an index of the project material and monitoring results report. The technical department of the project developer should take the responsibility for filing all data and records. All the data shall be kept until two years after the end of crediting period.

All the above procedures will be applied separately in both Beijing Cement Plant and Liulihe Cement Plant.

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

The baseline study and the monitoring methodology was concluded on 1 March, 2007 by EcoSecurities Group PLc., listed in annex 1 of this document.

Person determining the baseline:
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E-mail: duncan.lee@ecosecurities.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

30 March 2007

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

25 years

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

C.2.1. Renewable crediting period

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

01 July 2007

C.2.1.2. Length of the first crediting period:

7 years, renewable twice

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The project activity has developed and passed full Environmental Impact Assessments (EIA) in line with the requirements of the Chinese Government. The following phases of the project implementation have been considered:

- Construction Phase and
- Operation and Maintenance Phase

The environmental impacts of each phase are described below, based on information contained in the EIA.

Construction Phase

The major air pollutant during the construction phase is dust. Several measures such as watering and avoiding operation in windy weather are being undertaken to reduce dust emissions. The waste water will be treated and emitted in line with relevant national standards. The solid waste will be collected, delivered to local solid waste treatment site. In general, the environmental impacts during the construction period are not considered to be significant.

Operation and Maintenance Phase

Air environment

The project activity will have no negative impacts, but instead have positive impacts on ambient air quality. Electrostatic precipitators collect the dust from the SP and AQC exhaust gas in the absence of the project activity. Once the project activity is implemented, it is expected to lead to reductions in air particulates in the flue gas as the dust would be settled in the SP boiler and AQC boiler before it is vented to the electrostatic precipitator. Furthermore the project activity is expected to reduce the CO_2, SO_2 and NO_x emissions by reducing combustion of fossil fuel in the North China Power Grid.

Thermal Pollution

The project activity will utilize the waste heat for power generation and the temperature of the waste gas emitted to atmosphere will be lower. Thereby it can reduce the effects of thermal pollution which will benefit plant staff as temperature in workshop drops.

Acoustical Environment Impact

Noise sources include construction noise and noise from the process equipment installed. Noise from turbines, fans, centrifugal pumps and electric motors are the major noise sources after the implementation of the project activity. Proper measures will be adopted to mitigate the influence of noise pollution as follows:

- Noise from the blast blowers and the induced draft fans are reduced by providing silencers in the duct. Power generation equipment will be placed in acoustic enclosures so as to limit noise pollution.
- The planting of green screening will be carried out to provide a natural noise silencer for the power station.

Impact on Water Environment

There are no poisonous or harmful substances in the water discharged from the project activity. The wastewater will be discharged to the drainage system after it has been carefully treated. The project activity has minimal impact on the water environment.

Solid Waste Management

A waste heat recovery based captive power plant would not have any significant effects as regards solid waste generation.

Ecology

There are no endangered species located in and around the plant area as the project activity would not occupy any other land out of the boundary of the cement plant.

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:

The conclusion of the EIA is that overall there are beneficial impacts to the environment given the abatement and mitigation measure employed on the project.

The references of the documents are the following:

- O*fficial reply regarding the statements of EIA of the pure waste heat recovery for 6MW power generation project at Beijing cement plant Co. Ltd.*, approved by the Beijing Environmental Protection Bureau on October 9, 2005

- O*fficial reply regarding the statements of EIA of the pure waste heat recovery for 4.5MW power generation project at Beijing Liulihe cement plant* approved also by the Beijing Environmental Protection Bureau on December 28, 2005

SECTION E. Stakeholders' comments

>>

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

In order to take the comments of local stakeholders into consideration, a survey has been carried out by the project developer in the stage of environment impacts assessment after the CDM team members of the project developer received the training of the survey regarding the local stakeholders from the project consulting company. 111 copies of questionnaires have been distributed to local community; a copy of the questionnaire is provided in annex 5 and the characteristics of the targeted stakeholders are summarized as follows:

Total	Gender		Career			
	Male	Female	Civil servant	Residents	Other	Unknown
111	82	29	6	64	41	0

E.2. Summary of the comments received:

In total, 111 questionnaires were collected, of which the major conclusions are summarized as follows:

	Positive /Yes	Negative /No	Unknown/Indifferent
Impacts on local employment and social living	111	0	0
Impacts on the living in the process of construction	111: No evident impact		
Holistic influence on the construction and implementation of the proposed project	111	0	0
Support the proposed project	111	0	0

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

The information regarding the project activity and the CDM project were notified to all of the stakeholders investigated. All of the stakeholders investigated support the proposed project greatly. Regarding to the mitigation measures suggested in EIA, the project developer has been implementing the relative measures to achieve harmonization of environmental, social and economical benefits.
At the same time, the project developer will keep stakeholders informed regularly regarding of the progress made in project construction and operation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the proposed project.

Annex 3

BASELINE INFORMATION

Carbon Emission factors of the North China Power Grid

Information used to calculate the baseline grid carbon emissions factor[13]:

CO2 emissions (tCO2e) for the NCPG (2004):

Basic data for North China Power Grid in 2004

Fuel Type	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Subtotal G=A+B+C+D+E+F	EF（t c/TJ） H	Oxidation factor (%) I	NCV（MJ/t,km3） J	CO2 emission（tCO_2e）K=G*H*I*J*44/12/10000（mass unit） K=G*H*I*J*44/12/1000 (volume unit)
Raw Coal	10000t	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	98	20908	527776527.1
Clean Coal	10000t						40	**40**	25.8	98	26344	976919.8208
Other washed coal	10000t	6.48		101.04	354.17		284.22	**745.91**	25.8	98	8363	5783167.065
Coke	10000t					0.22		**0.22**	29.5	98	28435	6631.250523
Coke Oven Gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	13	99.5	16726	1232766.915
Other Coal Gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	13	99.5	5227	1687509.064
Crude oil	10000t							**0**	20	99	41816	0

[13] All grid data from the only data source currently available, China Electric Yearbook 2005 page 473, pages 592 2003 edition, pages 708 2004 edition all properties such as calorific values, oxidation and emission factors are from the updated IPCC values of 1996. For conservativeness the oxidation factor for standard coal was taken as 98%.

Diesel	10000t	0.39	0.84	4.66				**5.89**	20.2	99	42652	184209.7825
Fuel Oil	10000t	14.66		0.16				**14.82**	21.1	99	41816	474656.87
LPG	10000t							**0**	17.2	99.5	50179	0
Refinery Gas	10000t		0.55	1.42				**1.97**	18.2	99.5	46055	60243.32197
Natural Gas	$10^8 m^3$		0.37		0.19			**0.56**	15.3	99.5	38931	121694.1015
Other petroleum products	10000t							**0**	20	99	38369	0
other coking products	10000t							**0**	25.8	98	28435	0
Other energy	10000t ce	9.41		34.64	109.73	4.48		**158.26**	0	0	0	0
											subtotal	538304325.3

《China Energy Statistics Yearbook 2005》

Electricity Generation from the thermal power plants of North China Power Grid (2004)

Province	**发电量（亿kWh)**	**Electricity generation（MWh)**	**Used by the power station（%）**	**power output（MWh)**
Beijing	185.79	18579000	7.94	17103827.4
Tianjin	339.52	33952000	6.35	31796048
Hebei	1249.7	124970000	6.5	116846950
Shanxi	1049.26	104926000	7.7	96846698
Inner Mongolia	804.27	80427000	7.17	74660384.1
Shandong	1639.18	163918000	7.32	151919202.4
total				489173109.9

《China Electric Power Yearbook 2005》

Net power import from Northeast China Power Grid in 2004 4514550 MWh

The average CO2 EF of the Northeast China Power Grid (2004)

The total CO2 emission	**195958648.6**
The total power output	**170132885.1**
The average CO2 EF	**1.151797599**

total emission tCO2	**543504173.1**
total power output [MWh	**493687659.9**
EF(tC/TJ)/2004	**1.100906944**

CO2 emissions (tCO2e) for the NCPG (2003):

Basic data for North China Power Grid in 2003

Fuel Type	**Unit**	**Beijing**	**Tianjin**	**Henan**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Subtotal**	**EF (tc/ TJ)**	**Oxidation factor (%)**	**NCV (MJ/t,k m3)**	**CO2 emission (tCO_2e) K=G*H*I*J*44/12 /10000 (mass unit)**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+ C+D+E+ F**	**H**	**I**	**J**	**K=G*H*I*J*44/12 /1000 (volume unit)**
Raw Coal	10000t	714.73	1052.74	5482.64	4528.51	3949.32	6808	**22535.94**	25.8	98	20908	436822883.4
Clean Coal	10000t						9.41	**9.41**	25.8	98	26344	229820.3878
Other washed coal	10000t	6.31		67.28	208.21		450.9	**732.7**	25.8	98	8363	5680747.688
Coke	10000t					2.8		**2.8**	29.5	98	28435	84397.73393
Coke Oven Gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	**3.08**	13	99.5	16726	244332.1814
Other Coal Gas	10^8m^3	16.92		10.63		10.32	1.56	**39.43**	13	99.5	5227	977500.8431
Crude oil	10000t						29.68	**29.68**	20	99	41816	901037.7869
Gasoline	10000t						0.01	**0.01**	18.9	99	43070	295.490349
Diesel	10000t	0.29	1.35	4		2.91	5.4	**13.95**	20.2	99	42652	436286.327
Fuel Oil	10000t	13.95	0.02	1.11		0.65	10.07	**25.8**	21.1	99	41816	826325.7251
LPG	10000t							**0**	17.2	99.5	50179	0
Refinery Gas	10000t			0.27			0.83	**1.1**	18.2	99.5	46055	33638.40313
Natural Gas	10^8m^3		0.5				1.08	**1.58**	15.3	99.5	38931	343351.2148
Other petroleum products	10000t							**0**	20	99	38369	0

other coking products	10000t							**0**	25.8	98	28435	0
Other energy	10000t ce	9.83					39.21	**49.04**	0	0	0	0
											subtotal	446580617.2

Electricity Generation from the thermal power plants of North China Power Grid (2003)

Province	发电量 (亿kWh)	Electricity generation (MWh)	Used by the power station (%)	power output (MWh)
Beijing	186.08	18608000	7.52	17208678.4
Tianjin	321.91	32191000	6.79	30005231.1
Hebei	1082.61	108261000	6.5	101224035
Shanxi	939.62	93962000	7.69	86736322.2
Inner Mongolia	651.06	65106000	7.66	60118880.4
Shandong	1395.47	139547000	6.79	130071758.7
total				425364905.8

《China Electric Power Yearbook2004》

The average CO2 EF of the Northeast China Power Grid (2003)

The total CO2 emission	**170716049.7**
The total power output	**153809752.1**
The average CO2 EF	**1.109916942**

Net power import from Northeast China Power Grid in 2003 4244380 MWh

total emission tCO2	**451291526.4**
total power output [MWh	**429609285.8**
EF(tC/TJ)/2003	**1.050469674**

CO2 emissions (tCO2e) for the NCPG (2002):

Basic data for North China Power Grid in 2002

Fuel Type	**Unit**	**Beijing** A	**Tianjin** B	**Hebei** C	**Shanxi** D	**Inner Mongolia** E	**Shandong** F	**Subtotal** G=A+B+C+D+F	**EF (tc/TJ)**	**Oxidation factor (%)** I	**NCV (MJ/t,km3)** J	**CO2 emission (tCO_2e)** K=G*H*I*J*44/12/10000 (mass unit) K=G*H*I*J*44/12/1000 (volume unit)
Raw Coal	10000t	691.84	1052.74	4988.01	4037.39	3218	5162.86	**19150.84**	25.8	98	20908	371208174.5
Clean Coal	10000t						80.71	**80.71**	25.8	98	26344	1971179.968

Other washed coal	10000t	3.43		65.2	135.56		106.32	**310.51**	25.8	98	8363	2407436.829
Coke	10000t							**0**	29.5	98	28435	0
Coke Oven Gas	10^8m^3	0.17	1.71		0.75	0.16	0.04	**2.83**	13	99.5	16726	224500.0238
Other Coal Gas	10^8m^3	15.82		7.34		10.35		**33.51**	13	99.5	5227	830739.3673
Crude oil	10000t						14.98	**14.98**	20	99	41816	454769.0717
Gasoline	10000t						0.65	**0.65**	18.9	99	43070	19206.87269
Diesel	10000t	0.26	2.35	4.12		1.6	10.02	**18.35**	20.2	99	42652	573896.3513
Fuel Oil	10000t	13.94	0.04	1.22		0.42	20.33	**35.95**	21.1	99	41816	1151411.233
LPG	10000t							**0**	17.2	99.5	50179	0
Refinery Gas	10000t			0.27				**0.27**	18.2	99.5	46055	8256.698951
Natural Gas	10^8m^3		0.55			0.02		**0.57**	15.3	99.5	38931	123867.2104
Other petroleum products	10000t							**0**	20	99	38369	0
other coking products	10000t							**0**	25.8	98	28435	0
Other energy	10000t ce					1.1	15.92	**17.02**	0	0	0	0
											subtotal	378973438.1

Electricity Generation from the thermal power plants of North China Power Grid (2002)

Province	发电量 (亿kWh)	Electricity generation (MWh)	Used by the power station (%)	power output (MWh)
Beijing	178.86	17886000	7.95	16464063
Tianjin	272.63	27263000	7.08	25332779.6
Hebei	1009.7	100970000	6.72	94184816
Shanxi	822.56	82256000	7.98	75691971.2
Inner Mongolar	513.82	51382000	7.93	47307407.4
Shandong	1241.62	124162000	6.79	115731400.2
total				374712437.4

《China Electric Power Yearbook2003》

The average CO2 EF of the Northeast China Power Grid (2002)

The total CO2 emission	**154209494.9**
The total power output	**138139812.6**
The average CO2 EF	**1.116329116**

Net power import from Northeast China Power Grid in 2002 2905200 MWh

total emission tCO2	**382216597.5**
total power output [MWh	**377617637.4**
EF(tC/TJ)/2002	**1.0121789**

OM = (Total emission tCO2 for 2002, 2003, 2004) / (Total power out put MWh 2002, 2003 2004)
=> **1.05849555**

		Unit	Value	Data source or Equation
A	Fuel comsumption, BAT	tce/MWh	0.33666	Data source: the statistics by State Electricity Regulatory Commission (SERC) on newly built thermal plants in 10th "Five-Year Plan" period 2000-2005, and NDRC see:http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215144747182.pdf
B	Net caloric value (NCV)	GJ/tce	29.27	Data source: China Energy Yearbook
C	Carbon content for coal	tC/TJ	25.8	Revised 1996 IPCC Guidelines for National Greenhouse Gas Invertories: Workbook
D	Oxidation factor	%	98	Revised 1996 IPCC Guidelines for National Greenhouse Gas Invertories: Workbook
E	Emission coefficient ($COEF_{Coal}$)	tCO_2/tce	2.714	G=B*(C/1000)*D/100*44/12
F	Emission factor	tCO_2/MWh	**0.9135**	H=A*E

Added capacity in the NCPG (2001-2004):

the installed capacity in North China Grid in 2004

type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
thermal power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
hydro power	MW	1055.9	5.0	783.8	787.3	567.9	50.8	3250.7
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	13.5	0.0	111.8	12.4	137.7
total	MW	4514.4	6013.5	20730.0	18480.6	14321.2	32923.6	96983.3

data source: China Electricity Yearbook 2005

the installed capacity in North China Grid in 2002

type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
thermal power	MW	3407.5	6245.5	16745.7	14327.8	9778.7	25102.4	75607.6
hydro power	MW	1038.5	5.0	775.9	795.3	592.1	50.8	3257.6
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	13.5	0.0	76.6	0.0	90.1
total	MW	4446.0	6250.5	17535.1	15123.1	10447.4	25153.2	78955.3

data source: China Electricity Yearbook 2003

the installed capacity in North China Grid in 2001

type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
thermal power	MW	3412.5	5632.0	16474.9	13415.8	8898.3	20957.7	68791.2
hydro power	MW	1058.1	5.0	742.6	795.9	566.2	56.2	3224.0
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	9.9	0.0	46.7	0.0	56.6
total	MW	4470.6	5637.0	17227.4	14211.7	9511.2	21013.9	72071.8

data source: China Electricity Yearbook 2002

BM calculation for North China

type	installed capacity in 2001	installed capacity in 2002	installed capacity in 2004	new added installed capacity from 2001 to 2004	Split of new capacity
	A	B	C	D=C-A	
thermal power	68791.2	75607.6	93594.9	24803.7	**99.57%**
hydro power	3224.0	3257.6	3250.7	26.7	0.11%
nuclear power	0	0	0	0.0	0.00%
wind farm and others	56.6	90.1	137.7	81.1	0.33%
total	72071.8	78955.3	96983.3	24911.5	100.00%
comparing with the capacity in 2004	74.31%	81.41%	100.00%		

		2001	New added capacity (2004-2001)	2002	2004
	Total Installed capacity (MW)	72072	24912	78955	96983
A	Thermal power Installed capacity (MW)	68791	24804	75608	93595
B	Hydro power installed capacity (MW)	4604	2477	6093	7081
C	Total change	**25.69%**		18.59%	
D	Split of new capacity		99.57%		
E	Emission factor (tCO_2/MWh)	0.9135			
F	Buid margin emission factor (F=D*E)	**0.9096**			

Baseline Emisson Factor of Central China Power Grid (tCO2/MWh)

A	Operating Margin Emission Factor	1.0585
B	Build Margin Emission Factor	0.9096
C	Combined Emission Factor (C=0.5*A+0.5*B)	**0.9840**

Annex 4

MONITORING INFORMATION

Monitoring for the BBMG WHR for 10.5MW power generation project will start with the start of operation in March, 2007. The monitoring plan details the actions necessary to record all the variables and factors required by the methodology ACM0004 "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation", Version 02, 03 March 2006, as detailed in section D of the PDD. All data will be archived electronically, and data will be kept for the full crediting period, plus two years.

Table 1. Data to be collected or used to monitor emissions reductions from the project activity.

ID Number	Data Variable	Data Unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be Monitored	Responsible Parties For Monitoring	Comments
EG_{GEN}	Total Electricity Generated	MWh/yr	m	Continuously	100%	Site Operator	Monitoring Location: The data would be measured by meters at the plant. The Manager In-charge will be responsible for regular calibration of meters
EG_{AUX}	Auxiliary Electricity	MWh/yr	m	Continuously	100%	Site Operator	Monitoring Location: The data would be measured by meters at the plant. The Manager In charge will be responsible for regular calibration of meter
EG_{Y}	Net Electricity supplied to	MWh/yr	C(EG_{GEN} - EG_{AUX})	Continuously	100%	On-site technician	Calculated from the above measured parameters.

Annex 5

STAKEHOLDER'S QUESTIONNAIRES

Table 1. Stakeholders' Questionnaire of cement waste heat recovery for 4.5MW power generation project at Beijing Liulihe Cement Plant of BBMG Corporation

Project survey: Beijing Liulihe Cement Plant is about 42.5km (direct line) from Beijing City, and has grade roads passing by it; its east longitude 116°02´, and north latitude 39°36´; and it has one cement product line of 2500t/d for building a waste heat recovery to electricity project. Its pure waste heat power plant has an installed capacity of 4.5MW, annual operating time of 8000 hours, and annual average generating capacity of 35900 MKW•h. The total construction period of the project is 10 months, and the total investment is 46.42 million RMB$
The cement waste heat recovery for 4.5MW power generation CDM project at Beijing Liulihe Cement Plant has been proposed as a CDM project by Beijing BBMG Group Co., Ltd. and EcoSecurities Group PLC (project participant). This project will be operated and developed as a CDM project. At present, the important thing for the project participants is to consult and understand the opinions of each stakeholder on the development of this CDM project. Therefore, we hereby send out this questionnaire concerning that the cement waste heat recovery for 4.5MW power generation CDM project at Beijing Liulihe Cement Plant has been proposed as a CDM project.
Questions
♦What influences will be exerted by CDM project activity on local employment and social living?
♦ If CDM project will exert any negative influence on your living in the process of construction?
♦ What positive effects will be brought by the construction and implementation of CDM project generally?
♦What negative effects will be brought by the construction and implementation of CDM project generally?
♦ What's your attitude to the construction of CDM project? Do you support the construction of CDM project?
Name: ID card No.:
Current address or work unit:
Contact Tel:

Name:	Place of signature:	Date:

Table 2. Stakeholders' Questionnaire of cement waste heat recovery for 6MW power generation project at Beijing Cement Plant of BBMG Corporation

Project survey: Beijing Cement Plant is about 32km (direct line) from Beijing City, and has grade roads passing by it; its east longitude 116°20´, and north latitude 40°22´; and it has two cement product lines of 2350t/d and 3000t/d for building a waste heat recovery to electricity project. Its pure waste heat power plant has an installed capacity of 6MW, annual operating time of 7200 hours, and annual average generating capacity of 41760 MKW•h. The total construction period of the project is 10 months, and the total investment is 47.6 million RMB$.
The cement waste heat recovery for 6MW power generation CDM project at Beijing Liulihe Cement Plant has been proposed as a CDM project by Beijing BBMG Group Co., Ltd. and EcoSecurities Group PLC (project participant). This project will be operated and developed as a CDM project. At present, the important thing for the project participants is to consult and understand the opinions of each stakeholder on the development of this CDM project. Therefore, we hereby send out this questionnaire concerning that the cement waste heat recovery for 6MW power generation CDM project at Beijing Liulihe Cement Plant has been proposed as a CDM project.
Questions
♦What influences will be exerted by CDM project activity on local employment and social living?
♦ If CDM project will exert any negative influence on your living in the process of construction?
♦ What positive effects will be brought by the construction and implementation of CDM project generally?
♦What negative effects will be brought by the construction and implementation of CDM project generally?
♦ What's your attitude to the construction of CDM project? Do you support the construction of CDM project?
Name: ID card No.:
Current address or work unit:

Contact Tel:		
Name:	Place of signature:	Date:

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