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:

Waste Heat Recovery and Utilisation for Power Generation Project of Chizhou Conch Cement Company Limited
Version 06
13/12/2007

Version history

Version 1	16/12/2006	GSP version
Version 2	07/03/2007	Updated following DOE site visit
Version 3	06/06/2007	Updated following receipt of DOE CAR & CR list
Version 4	17/08/2007	Revised according to comments from DOE
Version 5	20/11/2007	Revised according to comments from DOE
Version 6	13/12/2007	Revised according to comments from DOE

A.2. Description of the project activity:

The Project Activity is a waste heat recovery and utilization for power generation project located at Chizhou Conch Cement Company Limited at Niutoushan Town in Chizhou City of Anhui Province. Chizhou Conch Cement Company Limited is subordinate to Anhui Conch Cement Group Company Limited

The main objectives of the Project Activity are to develop the auxiliary waste heat power generation project based on two 5000t/d clinker production lines and one 8000t/d clinker production line that have been built so as to meet part of the electrical demand of Chizhou Conch Cement Company Limited. It will lead to reduce greenhouse gas emissions through the recovery and use of waste heat from the rotating kiln of the clinker production lines. At the present, this part of electricity demand is supplied by East China Power Grid (ECPG)

The Project Activity will be implemented in two phases. In the first phase, the 17MW waste heat power generation system based on two 5000t/d clinker production lines will be built, equipped with one set of turbine-generator unit and two AQC heat recovery boilers and two PH heat recovery boilers. The facilities of project activity will start to operate in November 2006. In the second phase, based on one 8000t/d clinker production line, the waste heat power generation system will be built with turbine-generator unit capacitance of about 11.6MW, equipped with one set of turbine-generator unit and one AQC heat recovery boiler and one PH heat recovery boiler. The facilities of project activity will operate in October 2007. The total installed capacity is 28.6 MW. The designed annual operation time of facilities is about 7692 hours. The annual design power generation of the two sets of turbine-generator unit above amounts to 220,000 MWh and yearly power supply to cement production lines is 204,600 MWh.

All the electricity generated by the Project Activity is used by cement plant itself to meet part of the electricity demand so as to replace electricity imported from the East China Power Grid. Thus it can generate an annual emission reduction of 185,102 tCO_2e. The schedule of the Project Activity is planned as follows:

Planned Project Schedule

Date	Work
February 2006	Started construction in phase 1
June 2006	Installed equipment in phase 1 and start to construct phase2
November 2006	Phase 1 started to operate
April 2007	Installed equipment in phase 2
October 2007	Phase 2 operating

The Project Activity supports the circular economy ideas as outlined most recently at a conference organized by the Chinese government,[1] and increases energy supply from clean energy sources and improves energy security at a time of energy shortage in the eastern provinces of China,[2] and will meet China's sustainable development needs.

The Project Activity will reduce greenhouse gas emissions (CO_2) versus the baseline scenario, which is the continued supply from the regional power grid to meet the demand for power of the cement.

Additionally the Project Activity will:

- significantly reduce harmful emissions (including SOx, NOx and floating particles), and thus improve the local environment;
- reduce fossil fuel exploitation and consumption, thus improving energy efficiency;
- lead to a reduction in the temperature of the vented hot air from about 380°C to 90°C and also reduce the volume of water that is consumed by the humidifying pump in the cooling towers and thereby save water resources in this area;
- lead to an increase in local staff employed by about 19 persons.

A.3. Project participants:

Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.

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)
Host Country: People's Republic of China (host)	Anhui Chizhou Conch Cement Company limited	No
Switzerland	Cargill International SA	No
United Kingdom of Great Britain and Northern Ireland	CAMCO International Limited	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

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[1] Source: China Daily – Front Page, September 29th 2004, where Minister Ma Kai, head of NDRC, is quoted.

[2] There have been many articles on energy shortage in China including this latest one in the China Daily outlining how the supply - demand balance is expected to be reached again by 2006 – after massive build out of predominantly coal fired power stations - http://www.chinadaily.com.cn/english/doc/2004-09/22/content_376774.htm

Note: *When the PDD is filled in support of a proposed new methodology (form CDM-NM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

The Host country is the People’s Republic of China.

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

The Project Activity is located in Anhui Province.

A.4.1.3. City/Town/Community etc:

The cement plant is located at Niutoushan Town, Tongshan County of Chizhou City of Anhui Province.

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 located at the cement plant of Chizhou Conch Cement Company Limited in Niutoushan Town, Tongshan County Chizhou City of Anhui Province. The project’s exact geographical coordinates are east longitude 117° 14’09” and north latitude is 30° 26’50”.

Figure 1 shows the location of Anhui Province.
Figure 2 shows the location of Chizhou in Anhui Province.

Figure 1. Map of Anhui Province

Figure 2. Map of Anhui Province Showing Project Location

Chizhou Conch Cement Co. Ltd.

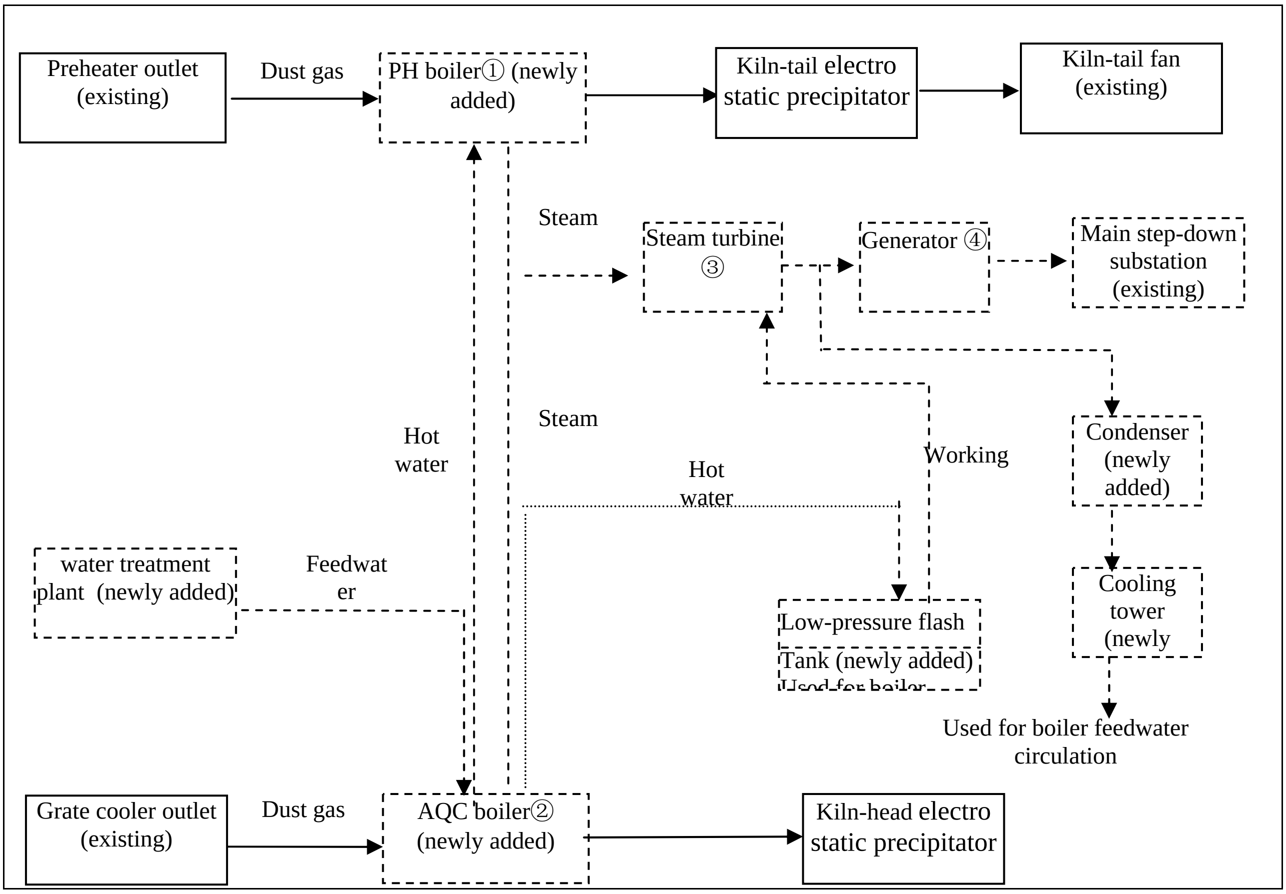
A.4.2. Category(ies) of project activity:

The project activity is relevant to sectoral scope 1 – Energy

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

The Project Activity makes use of advanced Kawasaki heat recovery technology and the power generation of clinker per ton amounts to 38.5 kWh, which comes up to the advanced international standard with the clear superiority of high efficiency of heat recovery and good effect of energy conservation. The project will not impact on the existing production process of cement. The main process of the Project Activity can be seen in Figure 3.

Figure 3 The major process of the Project Activity



On the basis of existing three clinker production lines, the project will allow the feedwater to recover the heat energy of low-temperature waste heat exhausted by cement clinker production lines through their own PH heat recovery boilers and AQC heat recovery boilers, to covert it into superheated steam, and then steam will be fed into steam turbine through the steam pipe, the heat energy will be converted into kinetic energy in steam turbine to enable turbine rotor to rotate at high speed, and then will be converted into mechanical energy to drive the generator to rotate, and electricity will then be generated. The exhaust steam of steam turbine is condensed and fed into the boiler by boosting the pressure and then re-circulated to the system. The waste gas will enter the electro static precipitator for treatment after the heat exchanger. It will then be vented into atmosphere after the dust is removed.

The model numbers and performance characteristics of the main equipment relating to the project can be seen in the table below (Table 1).

Table 1. Major Equipment Employed by the Project Activity

Name of major equipment (Phase I)	Model, specification and performance	Quantity (set)	Point on Figure 3	Manufacturer
PH boiler	Model: KAWASAKI BLW forced circulation boiler	2	1	KAWASAKI HEAVY INDUSTRIES, LTD
AQC boiler	Model: KAWASAKI BLW natural circulation boiler	2	2	Jiang Su Nantong Wanda Boiler Co. Ltd.
Steam turbine and auxiliaries	Model: mixed-pressure admission condensing Type: NZ18-0.689/0.129	1	3	Nan Jing Steam Turbine Co. Ltd.
Generator	Model: totally-enclosed self-cooling 3-phase AC synchronous generator Type: QFWL-18- 2, 6.3kV	1	4	Nan Jing Steam Turbine Co. Ltd.

Name of major equipment (Phase II)	Model, specification and performance	Quantity (set)	Point on Figure 4	Manufacturer
PH boiler	Model: KAWASAKIBLW forced circulation boiler	1	1	KAWASAKI HEAVY INDUSTRIES, LTD
AQC boiler	Model: KAWASAKIBLW natural circulation boiler	1	2	Jiang Su Nantong Wanda Boiler Co. Ltd.
Steam turbine and auxiliaries	Model: mixed-pressure admission condensing Type: NZ12-0.689/0.137	1	3	Nan Jing Steam Turbine Co. Ltd.
Generator	Model: totally-enclosed self-cooling 3-phase AC synchronous generator Type: QFW2-12-2, 6.3kV	1	4	Nan Jing Steam Turbine Co. Ltd.

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

The project uses a fixed crediting period of 10 years. The estimated emission reductions over 10 years will be 1,851,020 tonnes. The estimated emission reductions of each year are as follows:

Table 2 Estimation of emission reductions of the project

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2008 (March to December)	154,252
2009	185,102
2010	185,102
2011	185,102
2012	185,102
2013	185,102
2014	185,102
2015	185,102
2016	185,102
2017	185,102
2018 (January to February)	30, 850
Total estimated reductions (tonnes of CO_2e)	1,851,020
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	185,102

A.4.5. Public funding of the project activity:

There is no public funding of the Project Activity.

SECTION B. Application of a baseline and monitoring methodology:

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

The applied methodology:
The methodology applied to the Project is "Consolidated baseline and monitoring methodology for waste gas and/or heat and/or pressure for power generation" ACM0004 (version 2) (http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_XIXYIGMQQIJ65GY3UJCP3R90X4TG75).

The methodology "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 (version 6) (http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BW759ID58ST5YEEV6WUCN5744MN763) and

The "Tool for the demonstration and assessment of additionality (version 3)" are also applied to the Project as required by the methodology ACM0004. (http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf)

More information could be found at:
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:

The methodology ACM0004 applies to this Project Activity and the reasons are shown below:

1. This Project Activity is a waste heat power generation project of the cement plant of Chizhou Conch Cement Company Limited through the recovery and use of waste heat from the rotating kiln of the cement clinker production line.

2. Electricity generated from the Project Activity with heat recovery directly displaces power imported from the ECPG (East China Power Grid) with fossil fuels.

No fuel switch is done in the process, where the waste heat is produced, after the implementation of project activity.

3. Clinker production requires a predetermined blend of raw materials (limestone and coal) to produce a tonne of clinker, the balance of these raw materials cannot be adjusted and therefore the coal requirement per tonne of clinker produced does not change. That means the quantity of coal used to produce clinker will not increase after the implementation of the project activity.

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

The project boundary extends to the East China Power Grid (ECPG). According to the *China Regional Grid Baseline Emission Factor of 2007* that issued by the National Development and Reform Commission[3], the ECPN covers Shanghai, Jiangsu, Zhejiang, Anhui and Fujian Provinces.

Therefore the spatial extent of the project boundary is defined as ,waste heat source, heat recovery boilers (PH boiler and AQC boiler), steam turbine and waste heat generator unit and its auxiliary facilities and all power plants which connect to the ECPG.

Table 3 The emission sources and gases included in the project boundary

	Source	Gas	Included or not?	Justification /Explanation
Baseline	Grid electricity generation	CO_2	Yes	Main emission source
		CH_4	No	According to the methodology, excluded for the simplification of calculation in accordance with conservative principle.
		N_2O	No	According to the methodology, excluded for the simplification of calculation in accordance with conservative principle.
Project Activity	On-site fossil fuel consumption due to the project activity	CO_2	No	Not applicable. The project activity will not use auxiliary fuels and there are no project emission resulting from this project.
		CH_4	No	Excluded for the simplification of calculation.
		N_2O	No	Excluded for the simplification of calculation.

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

According to the methodology ACM0004, for the Project Activity the possible baseline scenario alternatives would be as follows:.

1. The proposed project activity undertaken without being registered as a CDM project activity;
2. Import of equivalent electricity from the ECPG;
3. Equivalent power supply from the existing or new captive plant on-site;
4. Other uses of the waste heat;
5. Equivalent power from captive plant and the grid；

For scenario 1, the additionality analysis in B.5. will show specifically that the project will face many barriers if the project is not undertaken as a CDM project, so option 1 cannot be the baseline scenario.

Scenario 2: Continuation of the current situation, which means continuing to import electricity from the ECPN will not face obvious barriers. It is feasible and realistic for project owner.

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[3] Source: *China Regional Grid Baseline Emission Factor of 2007* issued by the NDRC on 9th August, 2007, http://cdm.ccchina.gov.cn/web/index.asp

Scenario 3: there is no existing captive power plant on-site, the project owner could generate equivalent amount of electricity through renewable resources such as hydro, or wind etc. However there are limited renewable resources available in the location of proposed project. In Anhui province, the available hydro power resource is about 881.5MW, in which 61.97% has been developed already[4]. It should also be noted that the project site is sited in Chizhou city, which is in a plane area where it would be impossible to build a hydro power plant in or near the project site.

There is also is scarcity of wind resources in Anhui Province. According to the Wind Farm Plan of Anhui province,[5] no wind farm projects can be constructed in Chizhou City. Furthermore, there is limited land available in the project site and it would not be possible to install wind turbines that would generate the same amount of power.

It is therefore not a credible alternative to build new renewable energy power plants on site. Conch would not consider constructing a captive renewable power plant outside the project site for delivery of power onsite as this is a major deviation from their core business, business interests and management ability.

If project owner could sets up a new captive thermal power plant, which will provide the same electricity output as the proposed project, the capacity of power plant will be less than 135 MW. Then the project will be categorized as the small scale thermal plant. According to the national regulations, the thermal power plant less than 135 MW is not allowed to construct[6].And also even existing thermal power plants with a installed capacity below 50MW are enforced to show down as well[7] Therefore, it is impossible for the project owner to construct a new captive thermal power plan to meet the demand to electricity.

Hence option 3 is not a alternative baseline scenario.

Scenario 4: The cement plant at which the project activity is located is 40 km away from the Chizhou city. In the surroundings of the project site, there are no other potential demands for the waste heat, including residential and industrial heating, since there are no local demand centres.

The project is located in Anhui province, which according to the Chinese heating classification, belongs to Southern China. Therefore, there is usually no residential heating demand. There are no industrial facilities around this area and therefore no associated heating demand for the waste heat. The only possible use for the waste heat is therefore for power generation.

There are other potential technologies that could be deployed for the utilisation of waste heat for power generation. However, Conch has never considered other technologies, including domestic technology, since the power efficiency is much lower[8] and they have no experience with this equipment. Conch has some experience already of the Kawasaki technology from the Japanese donor financed project at Ningguo and therefore any further extension of the utilisation of waste heat recovery technology has only ever been in the context of utilising the Kawasaki technology.

So the option 4 is not an acceptable baseline scenario alternative

Scenario 5: Because option 3 is not feasible, so option 5 is excluded.

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[4] The current situation of available hydro power resources and potential development in China, No.10, 2001 Hydo power development

[5] The wind farm plan of Anhui province, http://info.feno.cn/2007/110304/c000057531.shtml

[6] The Notice on Strictly Prohibiting the Illegal Installation of Thermal Generators with the capacity of 135MW or below issued by the General Office of the State Council, Guo Ban Fa Ming Dian decree No. 2002-6.

[7] The notice of National Development and Reform Committee Office on closures of small scale thermal power generation units transmitted by State Council Office, issued by State Council Office in 1999 with issued No.44

[8] “China Energy Efficiency Financing Project” Report for World Bank, 31, December 2006. Tokyo Energy Efficiency Group

Therefore, without the Project Activity, the power supplied by the project must be supplied by the ECPG, so scenario 2 is considered to be the baseline scenario of the Project Activity.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

According to the methodology ACM0004, the "Tool for the demonstration and assessment of additionality" is applied to demonstrate the additionality of the project activity versus the baseline scenario.

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

Sub-step 1a. Define the alternatives to the project activity:
The methodology ACM 0004 lists the possible baseline scenario alternatives:

Scenario 1: The proposed project activity undertaken without being registered as a CDM project activity;
Scenario 2: The continuation of the current situation, namely, the continuation of waste heat emitted and the relevant power supplied by the ECPG;
Scenario 3:. Equivalent power supply from the existing or new captive plant on-site;
Scenario 4: Other uses of waste heat;
Scenario 5: A mix of scenarios 2 and 3.

For the project, option 4 is not a feasible alternative because the cement plant at which the project is located is far away from the city and the project is not possible to be used for civil uses and other industrial uses. Therefore option 4 is excluded to be the possible baseline scenario alternative.

Therefore, scenarios 1, 2, 3 and 5 are considered to be the baseline scenario alternatives of the project activity.

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

Scenario 1: The proposed project activity undertaken without being registered as a CDM project activity

The proposed project uses waste resources i.e. waste heat for generation, which is also priority field for implementation of China's strategy on recycle economy development, and is compliant with all legal and regulatory requirements and therefore scenario 1 can be considered a plausible baseline scenario.

Scenario 2: The continuation of waste heat emitted and the relevant power supplied by the ECPG;

The ECPG is one of the six regional grids of China and according to the regulations and policies of the power market in China, the ECPG has to guarantee power to meet the demand of the growing industrial and commercial sectors of the region. Meanwhile, the release of waste heat is common practice for the cement sector and it is not against the requirements of the current laws and regulations of China. Therefore, scenario 2 can also be considered a plausible baseline scenario.

Scenario 3: Equivalent power supply from the existing or new captive plant on-site

There is no existing captive power plant on-site, the project owner could generate the equivalent amount of electricity through renewable resources such as hydro, or wind etc. This complies with Chinese regulation and law. However as analysed in B.4., there are limited renewable resources available and it is impossible to build a new power plant based on these resources.

If the project owner could set up a new captive thermal power plant that would provide the same electricity output as the proposed project then the capacity of that power plant would be less than 135 MW. According to the national regulations, thermal power plants with a capacity less than 135 MW are not allowed to be constructed[9]. Moreover, existing thermal power plants with an installed capacity below 50MW are required to shut down[10] . Therefore building a new captive thermal power plant on site is not compliant with Chinese regulation. Hence option 3 is not a alternative baseline scenario.

Scenario 4: Other uses of waste heat;

The project activity is located is 40 km away from the Chizhou city. As described above, there are no other potential demands for residential or industrial heating. Therefore the waste heat could not be used except for power generation.

Scenario 5: A mix of 2 and 3

Since option 3 is not feasible, so option 5 is excluded.

In conclusion, only scenarios 1 and 2 are the feasible baseline scenario alternatives and this step is applicable because of the project undertaken as the CDM.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The Tool for the Demonstration and Assessment of Additionality recommends three analysis methods including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III) under sub-step 2b.

Option I is not applicable to this project since there will be additional economic benefits associated with the cost savings related to power procurement. Option II has not been selected, since there are no easily identified comparisons. Option III (apply benchmark analysis) has therefore been applied.

Sub-step 2b – Option III. Apply benchmark analysis

1. Selection of Appropriate Benchmark

i. The significance for selecting appropriate benchmark to investors or sponsors:

One of the appropriate benchmarks is the internal rate of return (IRR) as it considers time value of money and can maximize shareholders' return. It is defined as a cost of capital (discount rate) equates the present value of future benefits to the initial cash outlay. The IRR can be influenced by perceived technical and/or political risk and by the cost of money. IRR is a standard measure for project investment adopted by project sponsors or investment companies and is a common indicator applied in China.

The benchmark IRR should represent standard returns in the market, considering the specific risk of the project type. It should represent the minimum return required for investment in the project and as such plays a key role in investment decision-making. The benchmark is therefore used to determine whether an investment will be undertaken. An inappropriate selection of benchmark can cause investors making loss on an investment project or ruling out a profitable investment project. Therefore, it is very important for an investor to determine the correct value of a benchmark.

[9] The Notice on Strictly Prohibiting the Illegal Installation of Thermal Generators with the capacity of 135MW or below issued by the General Office of the State Council, Guo Ban Fa Ming Dian decree No. 2002-6.

[10] The notice of National Development and Reform Committee Office on closures of small scale thermal power generation units transmitted by State Council Office, issued by State Council Office in 1999 with issued No.44

ii. The benchmark IRR can be derived from different ways as described in Tool:

(a) Government bond rate (risk-free rate) plus a suitable risk premium. This is based upon the Capital Asset Pricing Model CAPM.
(b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned) based on bankers views and private equity investors/funds for comparable projects..
(c) A company internal benchmark (Weighted average capital cost of the company, simply called WACC)

2. Available benchmarks in China

In china, there are published sector benchmarks available in official data (although the coverage is not exhaustive). These can be found in "Methodology and Parameters for Financial Evaluation of Construction projects (3rd Edition)". The sector benchmarks are based on investment projects undertaken with Government funding or are in Government's area of focus (sectors where products are priced by the Government) e.g electricity, water supply, heat and gas supply, rail and airport The benchmarks are not necessarily suitable for private investors. Indeed, this Government reference sets out that private investors or other investors can determine their own benchmark based on their cost of capital and risk premium on particular investment project.(p197, Methodology and Parameters) [11]

Anhui Conch Cement Company limited (ACCCL) is a listed Company. As such, it has a higher cost of equity than State Owned Enterprises in China. This is due to the fact that it has to pay out dividends to shareholders and also pay interest on it's loans and therefore they have a higher cost of capital. Even if ACCCL were to make a loss they would still need to keep a commitment to pay out a dividend to shareholders. This means that the company must apply rigorous thresholds for the evaluation of investment projects in the group.

3. The Benchmark applied in the proposed project

(a) Requirements for use of WACC

i. The Requirements for Application of WACC by Tool

--There is only one potential project owner
--The benchmark has been used before.

ii. Requirements for use of WACC in financial theory
The company internal benchmark has been applied to this project. This is the weighted average capital cost of the company (WACC).

According to Rechard and Bill (2003)[12], the WACC is defined as the overall rate of return required in order to satisfy all stakeholders in the company. In other words, the WACC may be interpreted as an average discount rate applied by the market to the company's future operating cash flows to derive the capitalized value of this stream, i.e. the value of the whole company. It is also acceptable to use the WACC as the cut-off rate for evaluating new investments; however, some major requirements have to be satisfied before use of the WACC can be justified:

1. The project is a marginal, scalar addition to the company's existing activities, with no overspill or synergistic impact likely to disturb the current valuation relationships.
2. Project financing involves no deviation from the current capital structure of the company.

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[11] "Methodology and Parameters for Economical Appraisal for Construction Project", China Planning Publishing House (version 3)

[12] Rechard, P. and Bill, N.(2003), 'Corporate Finance (fourth edition)', Prentice Hall

3. Any new project has the same systematic risk as the company's existing operations. This may be a reasonable assumption for minor projects in existing areas and perhaps for replacement, and upgrade or retrofitting projects.
4. All cash flows are level perpetuities

However, Rechard and Bill (2003) also clarified that it is unrealistic to expect the hurdle rate for new investment to be adjusted for every minor deviation form the target gearing ratio. To all intents and purposes, it is appropriate to use WACC as the cut-off rate as long as the project is a minor one with no appreciable impact on the overall gearing ratio.

(b) Reasons for applying WACC as Benchmark in proposed project

The proposed project applied the WACC of Anhui Conch Cement Limited Company as the benchmark it meets all the requirements by the Tool and financial theory.The reasons for this are as follows:

(1). The proposed project has only one potential developer which is Chizhou Conch Cement Company Limited (CCCCL) subordinated to ACCCL. This is because:

i. The proposed project falls into the nature of upgrade and retrofit. It is built on the site of existing cement plant and share auxiliary facilities with the existing cement. Also the project relies on the existing cement production process. The fuel used in the project activity is waste heat from two 5000t/d clinker production lines and one 8000t/d clinker production line of the existing cement plant. The project can be seen as an upgrading an existing process or extension of cement production course. The proposed project is developed by the project owner who is the owner of existing cement plant. The project can be seen as an upgrading an existing process or extension of cement production course. The nature of the project activity was proofed by the approval of FSR from Anhui province DRC[13]. The proposed project owner has to be the owner of existing cement plant.

ii. There could be other potential developers for the proposed project. However, Cement production is the core business for Chizhou Conch Cement Company Limited (CCCCL), as mentioned above, the proposed project is reliant on existing cement clinker production. The power generation generated by the proposed project will be supplied to the cement production. Therefore, in other words, the power generation can also affect the cement production. In order to guarantee the quality of the cement products and output of cement and in keeping with its core business, CCCCL must be a unique developer of the proposed the project who can accommodate its core business through well managing the waste heat recovery power generation.

(2). ACCCL has applied the WACC as a benchmark for evaluation of other investment projects. This can be shown through assessing previous projects invested by the group. For example:

i. the upgrade project of 5000t/d clinker production lines clinker production lines on technology and production approach of Zongyang Conch Cement Company limited;[14]
ii. the upgrade project of the second phase 5000t/d clinker production lines in technology and production process of Digang Conch Cement Company Ltd'; [15]
iii. 'the upgrade project of 4000t/d clinker production lines clinker production lines on technology and production approach of Baimashan Cement plant of ACCCL'[16];.

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[13] The Approval of Waste Heat Recovery and Utilisation for Power Generation Project of Huaining Conch Cement Company limited

[14] Equity IRR 32.56% taken from the FSR of the 5000 t/d Clinker Cement Production Retrofit Engineering of Zongyang Conch Cement Company Limited

[15] Equity IRR 27.27% taken from the FSR of the 5000 t/d Clinker Cement Production Retrofit Engineering of Digang Conch Cement Company Limited

iv. the upgrading project of the second phase 4000t/d clinker production lines in technology and production process of Huaining Conch Cement Company Ltd'[17]

All of these projects have applied the WACC and this can be seen in the FSR of the relevant projects.

(3). The proposed project has a similar capital structure (financial gearing) with Anhui Conch Cement Company Limited (ACCCL). The proposed project gearing is 47.10% [18], whilst ACCCL has a gearing of 47% in 2005[19] .

(4). The propose project is a marginal addition to existing Anhui Conch Cement Company Limited (ACCCL) activities, and there is no notable impact on current valuation of ACCCL. The investment of the proposed project is about RMB217.836 million which makes up 2.02% of total capital employed of ACCCL; and expected net cash flow will account for 4.6% of total net cash flow of ACCCL[20]. Either capital investment or expected net cash flow will not affect the current valuation relationship of ACCCL.

(5). The proposed project is an extension of production process of existing cement plant. Even though it is a waste heat power generation project; it is based on the existing activity and utilizes waste heat generated from the existing activity. It is therefore an extension of the existing production line and not a new product development. The risk profile of the proposed project is therefore the same as existing cement plant which is related to ACCCL.

(6). The proposed project is expected to generate the same perpetual cash flow streams[21].

4. How the WACC of ACCCL Is Determined

The WACC of ACCCL includes the cost of debt and cost of equity. The cost of debt is simply decided by average interest charges of loan. The cost of equity is related to the dividend paid out to shareholders. The cost of equity can be calculated applying CAPM (Capital Asset Pricing Model) and the Dividend Growth Model (Rechard and Bill,2003)[22]. Due to the fact that the relevant data related to CAPM is not available in China, the dividend growth model is applied to determine the cost of equity of ACCCL. The formula of calculating cost of equity is as follows:

$$WAAC = K_e \times \frac{E}{E+D} + K_d \times \frac{D}{E+D}$$

Where: Ke--- cost of equity
Kd--- cost of long-term debt
E ---- Equity
D----long-term Debt

<u>Calculate Ke</u>

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[16] Equity IRR 24.65% taken from the FSR of the 4000 t/d Clinker Cement Production Retrofit Engineering of Baimashan Conch Cement Company Limited

[17] Equity IRR 39.96% taken from the FSR of the 4000 t/d Clinker Cement Production Retrofit Engineering of Huaining Conch Cement Company Limited

[18] FSR of Waste Heat Recovery Power Generation of Chizhou Cement Company Limited

[19] ACCCL Financial Statement 2005

[20] FSR of Chizhou Conch WHR and 2005 ACCCL Financial Statement

[21] WHR FSR of Chizhou Conch Cement Company Limited

[22] Rechard, P. and Bill, N.(2003), 'Corporate Finance (fourth edition)', Prentice Hall

--- Dividend model

$$Ke = \frac{d_1}{P_0} + g$$

Where: d_1----dividend to be paid in one year

g---- Average growth rate of dividend in past years

P_0---- current ex div market price of the share

As seen from above, the cost of equity is dependent how much the dividend will be paid out to shareholders and performance of a company which related to market value of the company. WAAC can be changed in terms of changes of the cost of debt and the cost of equity. As stated by Denzil and Antony [23](2001) that the WACC will change over time. The WACC is not a static concept. As the market values of securities change, so will a company's cost of capital. Not only will the weightings change, but the costs of the different sources of finance will also change as macro-economic conditions and the preferences and attitudes of investors change. Therefore, it is both advisable and necessary for companies to recalculate their cost of capital frequently in order to reflect such changes.

In practice, in order to guarantee the returns to the shareholders and also not rule out potential profitable projects, ACCCL keeps updating WAAC in terms of changes of the cost of equity. Therefore When ACCCL decides its own benchmark for new investments, they not only refer to the WACC from the outcome of calculation related to cost of equity and cost of debts, but also consider other potential qualitative factors such as economic and social factors, shareholders' attitude to risk etc. which may influence the cost of finance sources, as well as take account into the average level of IRRs in past investments and average level of IRRs for other investments in cement sector.

According to the approach displayed above and the data source from ACCCL Financial Statement 2005, WACC of ACCCL in 2005 is about 17.86%[24].Referring to the outcome of calculation and considering the average IRR level achieved by past investments in ACCCL, ACCCL applied 17.86% as a benchmark for the investments.

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

The major parameters and assumptions are listed in the following table to calculate the financial indicators of the Project.

Table 4. Parameters and Assumptions for Financial Assessment

Items	Units	Amount	Source
Generation Capacity	MW	28.6	FSR
Total fixed assets Investment	Million RMB Yuan	217.836	FSR
In which: loan	Million RMB Yuan	100	Lending contract
Estimated annual delivered generation	MWh	204,600	FSR
Purchase Tariff (including VAT)	RMB Yuan /kWh	0.453	FSR
O&M cost	Million RMB Yuan	25.22	FSR
VAT rate	%	17	
Income tax rate	%	33	
Lifetime	Year	12	FSR

[23] Denzil.W and Antony.H(2001) 'Corporate Finance-Principles & Practice'(second edition),Prentice Hall

[24] Attached calculation of WACC of ACCCL

CERs Crediting Period	Year	10	

1. The main result of financial indicator calculation

The financial indicators obtained based on the above parameters are presented in the following Table, including equity IRR without CERs revenues. Obviously, without CERs revenues, the equity IRR of the Project is only 16.54% lower than the benchmark. Therefore, it could be concluded that the proposed Project is not financially feasible.

Table 5 Comparison of Equity IRR without CERS revenues and with CERs

Item	Unit	Without CERs revenue	Benchmark
equity IRR	%	16.54	17.86

Sub-step 2d. Sensitivity analysis:

The sensitivity analysis is to show that if the financial attractiveness of the proposed project is robust to reasonable variations in the critical assumptions, in other words, if sensitivity analysis could consistently supports the conclusion that the Project is unlikely to be financially attractive. In that case, the sensitivity of the IRR to CERs price is not included in the following analysis.

As the power tariff rate is priced by the government in China[25] ,it does not fluctuate as market. Therefore, tariff rate is not included in sensitivity analysis. The following three parameters are considered in the sensitivity analysis:

1. Construction investment
2. Annual generation
3. Annual O&M cost

The results are shown in Table 6 and Figure 4 below.

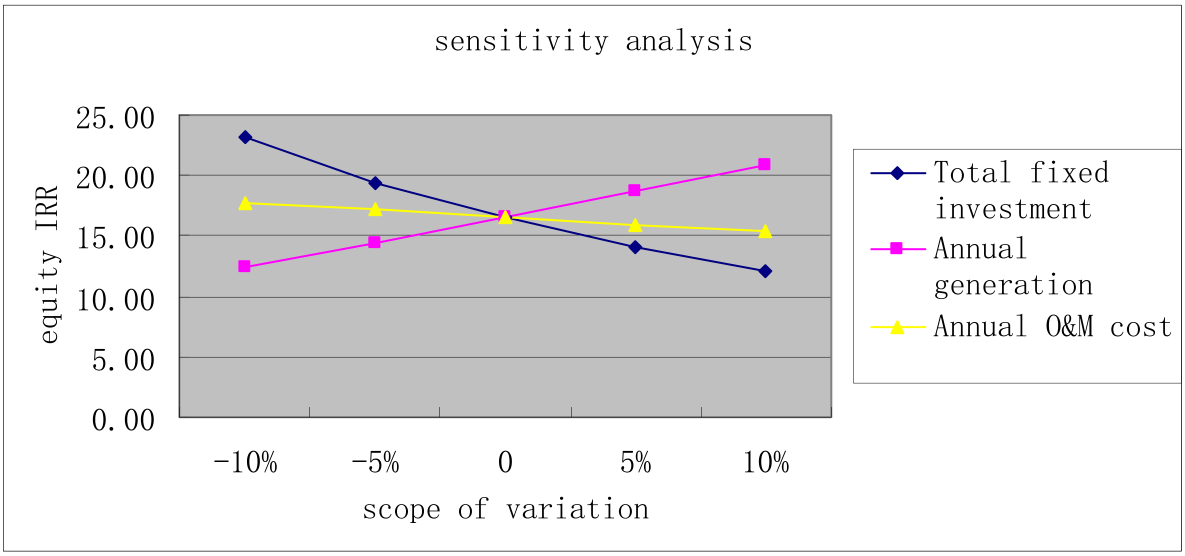
Table 6 Sensitivity analysis table of the Equity IRR

	-10%	-5%	0	5%	10%
Total fixed investment	23.10	19.45	16.54	14.14	12.12
Annual generation	12.42	14.47	16.54	18.65	20.81
Annual O&M cost	17.73	17.14	16.54	15.94	15.34

Figure 4. Sensitivity Analysis Graph of Equity IRR

[25] NDRC of PRC Decree 11, the Catalog priced by NDRC and Relevant Ministries State Council, July 4th, 2001

http://www.hbxy.gov.cn/old/bumenzhandian/wujia/jgfg/zcfg/f0010.htm



The project is very sensitive to investment costs. It is noticed that the IRR is above benchmark when the investment is lowered by 5%. In 2003 and 2004, national general growth rate of purchasing prices of raw materials, fuels and power are, 4.8% and 11.4% respectively. In 2003 and 2004 national total price indices of investment in fixed assets are 2.2% and 5.6% respectively[26]. There is clearly a trend of increasing investment costs and therefore the total fixed cost of this project is extremely unlikely to decrease.

The project also shows sensitivity to power generation. When the generation increase by 5%, the equity IRR is above benchmark. This is extremely unlikely to happen because the power generation of the project is dependent on waste heat generated by the clinker production which will be influenced directly by the clinker output and equipment operating hours. The designed annual operation time of clinker production line of ACCCL is about 310 days, equal to 7440 hours a year[27]. Whereas the estimated power generation is calculated on the basis of 7692 hours which requires over performance of the cement plant and full load of the waste heat recovery plant for all of those hours. As such this forecast is already too optimistic and any over performance should not be expected.

The project is not sensitive to operation cost. The equity IRR is still below benchmark within a scope of changes of -10% to 10%.

When the project's lifetime is up to 20 years, the equity IRR will be 16.90%, but equity IRR is still below benchmark.

Therefore, from the above analysis we can draw a conclusion that the proposed project is not financial attractive to ACCCL. The project will not achieve the financial returns comparable to an investment in clinker production. Without further incentivisation, in this case from the CDM, ACCCL would not to invest in the proposed project

Step 3. Barrier analysis

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[26] China Statistic Year Book,2005

[27] FSR of the 4000 t/d Clinker Cement Production Retrofit Engineering of Baimashan Conch Cement Company Limited; FSR of the 4000 t/d Clinker Cement Production Retrofit Engineering of Huaining Conch Cement Company Limited; the FSR of the 5000 t/d Clinker Cement Production Retrofit Engineering of Zongyang Conch Cement Company Limited; the FSR of the 5000 t/d Clinker Cement Production Retrofit Engineering of Digang Conch Cement Company Limited

1. Investment Barriers

(**i) Financing barriers**

Cement production is the core business of ACCCL rather than waste heat recovery power generation.

Over last a few years, there has been overheated investment in fixed assets and property that has led to rapid development of the cement sector in China. The latest rapid expansion of production capacity in China started in 2001. According to published statistics[28], the compound growth rate of the cement sector reached 13% between 2001 and 2004. This is far higher than the compound growth rate of the GDP in China. However, It has been also stated by The National Development and Reform Commission that there are two structural contradictions in the development of the Chinese cement industry: over-development of production capacity for low grade cement products and a shortage of high grade products, as well as decreased centralization of distribution.

In 2005, there were 5000 cement plants with sales revenue over RMB 5 million yuan. The number of plants was equal to the total number globally outside China. The average production capacity in China was 220,000 tonnes, far below worldwide averages[29], demonstrating both the overcapacity and the inefficiencies of the Chinese cement sector.[30].

Among the total production capacity in China , rudimentary production e.g vertical kilns and wet approach comprised 60% of total and percentage of pulverised coal (PC) kiln was only 40%[31]. Compared to the vertical kiln with wet approach, the PC kiln is of higher efficiency, lower energy consumption and less emission. The low level and quality cement products such as Grade.32 accounted for 85% of total output[32] . This led to waste plenty of resources and higher energy consumption, higher pollution

As a result of the problems highlighted above the Chinese Government has adopted proactive fiscal policies towards the cement sector to ensure that the pace of development is sustainable. To continue enhancing the policy of industry restructuring; to reinforce the assessment and approval of project implementation; to raise the entrance barrier into the industry; focused support for places equipped with adequate resources to construct clinker bases having a daily production capacity of more than 4000 tonnes and adopting new drying methods; and encourage the elimination of rudimentary production, raise the technology and capacity standards, encourage the closure of inefficient plants[33,34,35.]

To respond to these macroeconomic policy changes, ACCCL prioritises the expansion, upgrade and restructuring of cement production, and has concentrated its limited capital into this programme. From 2002 to 2004, the amount of aggregate investment activities and capital expenditure of ACCCL amounted to RMB8.884 billion yuan[36]. All of this capital was for new high grade cement projects, acquisition and investment in subsidiaries and upgrade. This was stated in the development strategy of each annual financial statement. In return, ACCCL has been benefited from this investment strategy. In 2002, 2003

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[28] Security Times June 22, 2005

[29]The circular on issuing Cement Industry Development Plan ,fazhangongye No.2222,2006

[30] The current situation of restructuring of cement industry and existing problems, NDRC, Oct.11,2005

[31]The circular on issuing Cement Industry Development Plan ,fazhangongye No.2222,2006

[32] The current situation of restructuring of cement industry and existing problems, NDRC, Oct.11,2005

[33] The circular of some opinions from National Development and Reform Commission and other ministries on stopping bind investment in iron and steel, electrolytic aluminium and cement industry transmitted by office of State Council, Guobanfa No.103,2003

[34] The circular on issuing Cement Industry Development Plan ,fazhangongye No.2222,2006

[35] NDRC of PRC Decree 50, Development Policies of Cement, Oct 17,2005

[36] 2003, 2004,2005 Conch Financial Statement

and 2004, operating profit in core business (cement production) rose by 38.28% 130.4% and 17.2% respectively[37]. ACCCL is therefore operating in the high grade cement market that is under supplied and this is a major reason for their success.

As such, with good returns in its core business and macro-development policies in cement sector, ACCCL would not switch its capital from its core business into the proposed project in which it has no experience.

(2) Poor financial attractiveness

The ACCCL portfolio of core investments has been in the field of clinker production rather than power generation. As such it is easily understood that the waste heat recovery investment must bring the same return as other investment in their portfolio otherwise capital would not be switched from the core business of investment in clinker.

The investment analysis above shows that the equity IRR of the proposed project is lower than companies weighted average cost of capital. This means that the expected return could not meet the minimum requirement of ACCCL. Compared with clinker production, the expected returns of the project are definitely lower and certainly above 18% equity IRR. This can be demonstrated by evaluation of recent investments undertaken by ACCCL over the last few years. It can be seen from evaluation of the feasibility study reports of all projects invested since 2002 that the equity IRRs are above 18%. See Sub-step 2b – Option III. Apply benchmark analysis above.

Outside of the ACCCL it can also be demonstrated that equity returns on cement production investments will be above 18% and more attractive than waste heat recovery projects. Project owners would therefore prefer to invest in new production, upgrade and restructuring rather than waste heat recovery. For example:

- The 5500 t/d Clinker Production Line of Jiangshu United Cement Company Limited, equity IRR is 22.05%[38];
- The 2x4500t/d clinker production line of Tongshan Copper Mine, Tongling Nonferrous metal Group, equity IRR is 23.69%[39];
- The 2x5000t/d clinker production line of Taiwan Cement (Yingde) Company Limited, equity IRR is 22.78%[40];
- The upgrade project of the 4000t/d clinker production line of Shanggao Hongshi Cement company Limited, equity IRR is 24.22%[41];
- The 4500t/d clinker production line with a new dry approach of Hezhou Datong Cement Limited, Hunan, equity IRR is 26.48%[42];
- The 4500t/d clinker production lines of Huarun Cement(Pingnan) Company Limited, equity IRR is 19.87%[43].

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[37] 2002,2003,2004 Conch Financial Statement

[38] FSR of 5500 t/d Clinker Production Line of Jiangshu United Cement Company Limited

[39] FSR of 2x4500t/d clinker production line of Tongshan Copper Mine, Tongling Nonferrous metal Group,

[40] FSR of 2x5000t/d clinker production line of Taiwan Cement (Yingde) Company Limited

[41] FSR of Upgrading project with 4000t/d clinker production line of Shanggao Hongshi Cement company Limitd

[42] FSR of 4500t/d clinker production line with a new dry approach of Hezhou Datong Cement Limited, Hunan,

[43] FSR of 4500t/d clinker production lines of Huarun Cement(Pingnan) Company Limited

2. Operation risks

(i)Risk in supply with waste heat due to uncertain demand in Chinese cement market

The proposed project relies on waste heat generated from clinker production. Clinker production relies on the demand for cement, which is in turn closely linked to economic development.

Moreover, waste energy projects are entirely reliant upon the smooth operation of the cement plant and are therefore subject to the market dynamics in cement production and demand that are not characteristic of the power sector.

This means that the project is subject to macroeconomic effects on the cement sector as well as operational effects of the cement plant itself. Both of these variables add to the risk profile of the waste heat recovery projects.

(ii) Risk in prevailing operation

The Anhui Conch Cement Company has experience in waste heat technology operation through the two waste heat recovery projects implemented at the Ningguo cement plant. These were financed through grant finance and the CDM. However, the two projects at Ningguo imported the key equipment from Japan. The proposed project is using technology designed by Japan, but made, for the first time in China.

This means that there is the operational risk that the Chinese manufactured equipment may not meet the design specifications of the Japanese technology provider due to the lack of experience in production.. This may lead to bad performance of the technology in it's operation.

There is also an additional problem that all components are purchased in China and there is likely to be compatibility problems with the foreign design of the main equipment. This could lead to operational problems. Incompatibles may occur. All of this will certainly influence power generation

Step 4. Common Practice Analysis

Sub-step 4a. Analyze other activities similar to the proposed Project Activity

In East China where the proposed project is located, heat recovery boilers and turbines fitted to large cement works of similar size to the Project Activity have been identified and are listed in Table 7 together with any facilitating circumstances. The only project in the list that utilises the same foreign technology was entirely grant financed by the Japanese Government and also belongs to Conch Group.

Table 7. Other similar projects at similar sized cement plants and facilitating circumstances in East China

No.	Project Name	Public Source / reference	Facilitating circumstances
1	Anhui Ningguo Cement Plant (4000 t/d and 5000 t/d))	http://www.ccement.com/news/2007/4-5/C15386705.htm	First phase was Japanese NEDO granted Equipment and the second phase used the CDM
2	Zhejiang Sanshi Cement Works (23.5MW)	http://cdm.unfccc.int/Projects/registered.html	Applying CDM project
3	Zhejiang Hongshi Cement Works (30MW)	http://cdm.unfccc.int/Projects/registered.html	Applying CDM project

4	Zhejiang Huzhou Zhonglida Cement Plant (2500t/d)	http://zw.hzgy.gov.cn/html/ShowDetail.aspx?serial=No_200462_152651156;http://www.youyafengshang.com.cn/html/18/20071025/388.html	Used domestic design and equipment. With the nature of foreign investment enterprises
5	Sanshi Zhejiang Changxing Cement Plant (5000t/d)	http://www.chinacements.com/news/2004/9-20/C1775652479.htm	Used domestic design and equipment. In the nature of Joint-venture with Sino-Hongkong
6	Shanghai Wan'an Cement Plant (1500t/d)	http://www.ccement.com/news/2007/4-5/C15386705.htm	Used domestic design and equipment. One of testing projects of domestic technology
7	Sanshi Zhejiang Changxing Cement Plant (2500t/d+5000t/d))	http://www.ccement.com/news/2007/4-5/C15386705.htm	Used domestic design and equipment. One of testing projects of domestic technology
8	Zhejiang Changxing Mei Shan Zong Sheng Cement Plant (5000t/d)	http://www.ccement.com/news/2007/4-5/C15386705.htm	Used domestic design and equipment. One of testing projects of domestic technology
9	Zhejiang Changxing Xiao Pu Zong Sheng Cement Plant (2500t/d)	http://www.ccement.com/news/2007/4-5/C15386705.htm	Used domestic design and equipment. One of testing projects of domestic technology
10	Zhejiang Tongxiang Shenhe Cement Plant (2500t/d)	http://www.ccement.com/news/2007/4-5/C15386705.htm	Used domestic design and equipment. One of testing projects of domestic technology
11	Zhejiang Longyou Qinglongshan Cement Plant (2500t/d)	http://218.72.253.122/news/shownews.asp?newsid=408	Used domestic design and equipment. One of key programme projects of developing recycling economic in Longshan

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

From Tab. 5, it can be shown that No.1 projects were undertaken at the Anhui Ningguo site entirely with Japanese technology (these projects were grant financed by the Japanese Government). The other projects used domestic design and equipment. No. 2 and No.3 projects in the list are also applying CDM projects. No.4 and No.5 were built in 2004 and 2005 respectively and used foreign investment[44] that meant that the project owner can enjoy preferential income tax policies. Hence, they pay less income tax compared to domestic company. This can lead a higher equity return due to less cash outflow. This is why they are different from the conch projects. Projects No.6 to No.10 were demonstration projects for domestic technology with low-temperature waste heat for power generation. These were part of the Eighth Five-Year Plan to tackle key technology barriers and demonstrate domestic technology[45]. There is no doubt that these projects were given strong support by the state government to ensure implementation. No.11 is a key part of the programme of projects to encourage the circular economy development in Longshan County. This is also a key demonstration county of the Zhejiang Provincial circular economy

[44] http://www.chinacements.com/news/2004/9-20/C1775652479.htm; http://zw.hzgy.gov.cn/html/ShowDetail.aspx?serial=No_200462_152651156;http://www.youyafengshang.com.cn/html/18/20071025/388.html

[45] http://www.ccement.com/news/2007/4-5/C15386705.htm

development[46]. Again, both Zhejiang province and Longshan County certainly gave a great deal of political support to this project.

In addition, the equipments designed and manufactured domestically in most projects of the East China. Even though some of the implemented waste heat recovery projects did not apply for CDM, those projects can enjoy preferential policies or obtain supports from government which are not the case the same as the proposed project. If without these special treatments in policies etc., the projects would not have been implemented. Also the form of the most equipment manufactured and procured domestically and the technology introduced from abroad does not turn up in the projects implemented in China.

The common practice analysis above demonstrates that waste heat recovery power generation projects are very far from being common practice with most projects acting as demonstrations of domestic technology. Projects that adopt foreign technology have not been implemented without the support of foreign aid and none since the first one in 1998 the Japanese Government implemented a number of projects in the cement sector including the Ningguo waste heat recovery project. Experience from this programme has shown that the technology transfer has not been successful. This is demonstrated by the fact that no projects have been implemented since this grant funded programme until Conch were able to use the CDM to support projects. Conch has since initiated a programme of projects for implementation under the CDM, including the Ningguo phase 2 project that is already registered and this Chizhou waste heat recovery project is the second in the programme.

The common practice set out above clearly shows that the proposed project is additional and that the investment analysis and barrier analysis above are justified since there are no comparable projects in the sector in East China.

In summary, this project shows substantial barriers in financing and uncertainties in operation and most importantly it will not provide Conch with the returns that are required by the Conch Group(ACCCL) to satisfy the internal hurdle rates specified by the WACC. The WACC has been shown to be an important tool to demonstrate clearly what the requirements of projects are and how they relate to a companies key performance indicators and ultimately Shareholder returns. Consequently projects that fall below the WACC would not be approved by the Board as they would jeopardize such returns.

Additionally, the common practice sections clearly demonstrates that all similar projects have either been grant financed, have applied for the CDM, have been demonstration projects stated in the corresponding five year plan or have enjoyed preferential tax policies as incentivisation. Almost all of the projects in the common practice analysis use domestic technology rather than the foreign technology been deployed by Conch. The only other project that also used foreign equipment also was entirely grant financed, thus demonstrating both the financing barriers and the fact that the returns are too low to incentivise investment without the CDM.

It is for all of these reasons that the Conch Group has not implemented another waste heat recovery project without the CDM since the first project funded by the Japanese at the Ningguo project site in 1998. Knowing the CDM from the China-Japan CDM Workshop on the 9th October 2004[47], after the positive the knowledge on CDM was confirmed the CDM has therefore been instrumental in rolling out this original technology to other sites in the group and in the case of the Chizhou Conch project identified the CDM as a key mechanism to enable this project to go forward in 2005[48].

In July 2005 the ACM0004 methodology was made available for waste heat recovery projects and indeed in September 2005 the AM0024 methodology was also made available. As such ACCCL started to consider developing the waste heat recovery projects, the first WHR project of ACCCL which was

[46]http://218.72.253.122/news/shownews.asp?newsid=408

[47] Report on the China-Japan CDM Workshop

[48] Request for Instructions on Waste Heat Power Generation-Related CDM Projects of the Second Phase of Ningguo Cement Plant, Chizhou Conch Cement Plant and Zongyang Conch Cement Plan

developed as a CDM project is second phase of Ningguo which has registered as CDM project. In terms of the experience in Ningguo, In November 2005 ACCCL initiated a public tender to invite companies to bid to develop this project and others under the CDM[49,50]. In February 2006 they began construction, knowing that this process was in full development and that they would qualify for the CDM according to both of these methodologies.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Calculate the emissions reductions of the Project Activity versus the baseline as per the Approved Consolidated Baseline Methodology ACM0004**.**

Step 1: Project Emissions, PEy

Project Emissions are applicable only if auxiliary fuels are fired for generation startup, in emergencies, or to provide additional heat gain before entering the Waste Heat Recovery Boiler.

Project Emissions are given as:

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \qquad (1)$$

where:

PEy : Project emissions in year y (tCO_2)
Qi : Mass or volume unit of fuel *i* consumed (t or m^3)
NCVi : Net calorific value per mass or volume unit of fuel *i* (TJ/t or m^3)
EFi : Emission factor for the project emission estimation. (tC/TJ)
OXIDi : Oxidation factor of the fuel *i* (%)

According to the feasibility study report, this project activity will not need auxiliary fuels to provide additional heat. Therefore, project emission (PEy) is zero.

Step 2: Baseline Emissions, BEy

Baseline emissions are given as:

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

Where:

EGy Net quantity of electricity supplied to the manufacturing facility by the project during the year *y* in MWh, and
EFy CO_2 baseline emission factor for the electricity displaced due to the project activity during the year *y* (tCO_2/MWh).

The baseline Scenario of this project activity is import of electricity from the grid (the option 2 calculating baseline emission factors in the methodology), and with the requirements of the methodology, the emission factor for displaced electricity is calculated according to the ACM0002 methodology.

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[49] *Bidding Requirements for the Consultation Contract on the Waste Heat Power Generation CDM Project of Anhui Conch Cement Co., Ltd.*

[50] Meeting minutes of CDM projects between Clearworld Energy and Hailuo Cement Corporation.

Determination of Operating Margin and Build Margin (OM & BM[13])

EF (tCO_2/MWh) = $(EF_{OM} + EF_{BM}) / 2$ (3)

According to the approved consolidated baseline methodology ACM0002, "Simple OM" method is used for calculating Operating Margin emission factor ($EF_{OM,y}$). Equation is given as follows:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (4)$$

Where:
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y,
$COEF_{i,j\,y}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by province j and the oxidation percent of the fuel in year(s) y, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by province j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i$$

where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i and is specifically given by the country.
$OXID_i$ is the oxidation factor of the fuel (IPCC default values), and
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i (IPCC default values).

In addition, in the case that grid gains net import and the specific power plant(s) is known, emission factor of the imported power from the specific power plant(s) should be used. In the case of unknown specific power plant(s), average emission factor of exporting grid should be used.

According to the approved consolidated baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants m, as follows:

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

Where:
$F_{i,j,y}$ is the amount of fuel i (tce, tonnes of standard coal) consumed by power plants m in year(s) y,
$COEF_{i,j\,y}$ is the CO_2 emission coefficient of fuel i (tCO_2 /tce), taking into account the carbon content of the fuels used by power plants m and the oxidation percent of the fuel in year(s) y, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by power plants m.

[13] Source: 'the *Notification on Determining Baseline Emission Factor of China's Grid*' issued by the NDRC on 9th August, 2007, http://cdm.ccchina.gov.cn/web/index.asp

The Methodology has two options for calculating BM:

1) Calculate the Build Margin emission factor $EF_{BM,y}$ ex-ante based on the recent 3 years available data at the time of PDD submission.
2) For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above.

The result of $EF_{BM,y}$ is based on *ex-ante* calculated according to option 1, and no *ex-post* monitoring and updating is needed.

On account of the data availability, the following calculation adapted alternative approved by EB. According to the alternative, newly-built capacity and its composition of power generation technologies is calculated first, then the weights of newly-built capacity for those technologies, and finally the emission factors are calculated using commercially optimal efficiencies of the technologies.

Because capacities of technologies using coal, oil and gas cannot be separated from the total thermal power generation from available statistics, the following method is used for the calculation: first, use the recent one year available energy balance data and calculate percentages of CO2 emission of power generation using solid, liquid and gas fuel in total CO2 emission. Second, calculate grid thermal power emission factors, using the percentages (as weights) and emission factors of technologies corresponding to commercially optimal efficiencies. Last, thermal power emission factor is multiplied by the percentage of thermal power in 20% newly built capacity in the grid, and the result is the Build Margin emission factor of the grid.

Steps and equations are as follows:

Step A: calculate percentages of CO2 emission of power generation using solid, liquid and gas fuel in total CO2 emission.

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

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

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

Where:
$F_{i,j,y}$ is the amount of fuel *i* (tce) consumed by province *j* in year(s) *y*,
$COEF_{i,j\,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 /tce), taking into account the carbon content of the fuels used by province *j* and the oxidation percent of the fuel in year(s) *y*,
COAL,OIL and *GAS* refer to coal fuel, oil fuel and gas fuel in the subscript set.

StepB: calculate thermal emission factor.

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

Where:
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are emission factors corresponding to commercially optimal efficient power generation technology using coal, oil and gas[14].

Step C: calculate grid Build Margin emission factor.

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

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

The calculation result confirms that 600MW domestic sub-critical generation unit is designated commercially optimal efficiency coal – fired technology. The generation-weighted average data of newly built 14 power plants with 600MW coal-fired units in 2005 is regarded as the approximate estimation of commercially optimal efficiency technology. Coal consumption of 600MW domestic sub-critical generation unit for power generation is 343.33gce/kWh that means electricity supply efficiency is 35.82%.

200MW combined cycle unit is designated the commercially optimal efficiency technology of gas turbine power plant (including fuel oil and gas). The technology is equivalent to 9E unit of GE. According to the statistics of gas turbine power plants in 2004, gas turbine power plants with maximum electricity supply efficiency in actual operation is chosen as the approximate estimation of commercially optimal efficiency technology. Coal consumption of gas turbine power plants is 258gce/kWh that means electricity supply efficiency is 47.67%.

Emission factor value provided by Office of National Coordination Committee on Climate Change National Development and Reform Commission[15]

	OM(tCO_2/MWh)	**BM(tCO_2/MWh)**	**CM(tCO_2/MWh)**
ECPG	0.9421	0.8672	0.9047

Step 3: Leakage
According to the methodology no leakage is considered.

Step 4: Emission Reduction
Since the project emissions and leakage of the project are both zero, the emission reduction of the Project Activity is the baseline emission of the project.

$ER_y = BE_{electricity,y}$

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

Data / Parameter:	$F_{i\,j,y}$

[14] The specific parameters and calculation process can be seen in the “Calculation Process of China’s Gird Build Margin Emission Factor ” issued by the NDRC on 9th August, 2007, http://cdm.ccchina.gov.cn/web/index.asp

[15] The source of data of power generation and efficiency of power of the cement plant required to calculate OM and BM is China Electric Power Yearbook, 1998-2005. The source of data to calculate fuel consumption for power generation and low calorific value is China Energy Statistic Yearbook 2000-2005. The source of the potential emission factors of different fuels and oxidation percent of the carbon is ‘Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook’, Chapter 1, Table 1-2, P16 and Table 1-4, P18

Data unit:	$t(m^3)$
Description:	The total amount of fossil fuels i used by power plants of province j in year y
Source of data used:	China Electric Statistical Yearbook
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from official channels.
Any comment:	None

Data / Parameter:	$GEN_{j,y}$
Data unit:	GWh
Description:	The electricity generated by power plants of province j in year y
Source of data used:	China Electric Power Year
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from official channels.
Any comment:	None

Data / Parameter:	-
Data unit:	%
Description:	auxiliary electricity consumption rate for power plants of province j
Source of data used:	China Electric Power Yearbook
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from China Electric Power Yearbook which is reliable
Any comment:	None

Data / Parameter:	$OXID_j$
Data unit:	%
Description:	Oxidation factor of power generation fuel
Source of data used:	IPCC
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value is used because no national specific data is public issued.
Any comment:	

Data / Parameter:	NCV_j
Data unit:	$MJ/t(kJ/m^3)$
Description:	Net caloric value
Source of data used:	IPCC
Value applied:	Refer to Annex 3
Justification of the choice of data or description of	IPCC default value is used because no national specific data is public issued.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$EF_{co2,j}$
Data unit:	tCO_2/TJ
Description:	Carbon content of power generation fuel
Source of data used:	IPCC
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value is used because no national specific data is public issued.
Any comment:	None

Data / Parameter:	CAP_j
Data unit:	MW
Description:	Newly installed capacity of many kinds of fuel in ECPG
Source of data used:	China Electric Power Year
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from official channels.
Any comment:	None

Data / Parameter:	Eff_i
Data unit:	%
Description:	Power generation efficiency by current commercially usable technology of many kinds of fuel *i* in ECPG.
Source of data used:	China CDM DNA
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the deviation of EB, maximum efficiently used technology is the representatives. It accord conservative principle.
Any comment:	None

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

According to B.6.1, the emission reduction of the Project Activity is the baseline emission of the project, namely:

$$ER_y = BE_{electricity,y} = EG_y * EF_{electricity,y}$$

Baseline emission factor EF_y is determined in advance which is 0.9047 tCO_2/MWh. The yearly net power supply of the project amounts to 204,600 MWh according to the feasibility report of the project.

Therefore the yearly emission reductions of the project will be estimated to be185,102 tCO_2e.

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008 (Mar to Dec)	0	154,252	0	154,252
2009	0	185,102	0	185,102
2010	0	185,102	0	185,102
2011	0	185,102	0	185,102
2012	0	185,102	0	185,102
2013	0	185,102	0	185,102
2014	0	185,102	0	185,102
2015	0	185,102	0	185,102
2016	0	185,102	0	185,102
2017	0	185,102	0	185,102
2018 (Jan to Feb)	0	30,850	0	30,850
Total (tonnes of CO_2e)	0	1,851,020	0	1,851,020

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

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_{GEN}
Data unit:	*MWh/yr*
Description:	*overall generation*
Source of data to be used:	*on-line monitoring*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*220,000*
Description of measurement methods and procedures to be applied:	*Total power generation will be monitored continuously by standard power meter(s) and will be collected and archived by the CDM monitoring working group every month*
QA/QC procedures to be applied:	*Measuring instrument will be installed and adjusted according to the requirement of the power company and the technical supervision department, The accuracy of the power meter will be no less than 0.5S.*
Any comment:	

Data / Parameter:	EG_{AUX}
Data unit:	*MWh/yr*
Description:	*Auxiliary power*
Source of data to be used:	*On-line monitoring*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*15,400*
Description of measurement methods and procedures to be applied:	*Power consumption of the project activity will be monitored continuously by standard power meter(s) and will be collected and archived by the CDM monitoring working group every month*

QA/QC procedures to be applied:	*Measuring instrument will be installed and adjusted according to the requirement of the power company and the technical supervision department. The accuracy of the power meter will be no less than 0.5S.*
Any comment:	

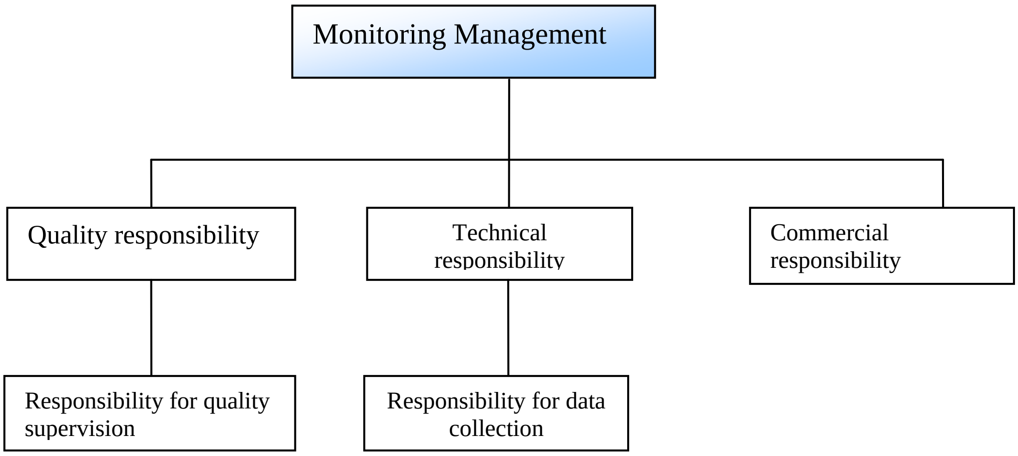
Data / Parameter:	EG_y
Data unit:	*MWh/yr*
Description:	*power supplied to the cement plant*
Source of data to be used:	*Calculation value*（$EG_{GEN} – EG_{AUX}$）
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*204,600*
Description of measurement methods and procedures to be applied:	*The net power supply of the project equals to the total power generation from the project gained by monitoring minus the power consumption of the project activity obtained by monitoring and the calculation result will be collected according to the measure and be recorded and archived every month by the CDM monitoring working group.*
QA/QC procedures to be applied:	*The data will be calculated and checked by staff in the CDM workgroup. In case of meter failure, data from back-up meters measuring net power generated will be used. The accuracy of the power meter will be no less than 0.5S. The meter will be regularly maintained following the relevant Chinese regulations and standards.*
Any comment:	

B.7.2. Description of the monitoring plan:

1.Management Structure for Monitoring

The figure below outlines the operational and management structure that the project operator will implement for the CDM Project Activity and to monitor emissions reductions and any leakage effects, generated by the project activity.

Figure 5. Operational and Management Structure for Monitoring the Project Activity



2. Key Monitored Parameters

There are three key types of information that must be monitored according to the new proposed monitoring methodology “Consolidated monitoring methodology for waste gas and/or heat and/or pressure for power generation”:

1) Measurable/calculated information that is collected once prior to validation of the Project Design Document
2) Documented evidences of various sorts that are collected once prior to validation of the Project Design Document
3) Information that must be monitored ex-post, notably:

The total generation output from the Project Activity $\mathbf{EG_{GEN}}$; the electricity consumed in power plant $\mathbf{EG_{AUX}}$; and the electricity supplied to the cement plants from the project activity $\mathbf{EG_{y}}$.

For items 1 and 2 above, copies of these values/documents will be included in the Project’s Monitoring and Verification Plan, which the validator and verifier can check annually.

For item 3 above, an outline of the specific ex-post monitoring plan for the Project is now described.

Monitoring $\mathbf{EG_{GEN}}$, $\mathbf{EG_{AUX}}$, $\mathbf{EG_{y}}$

The monitoring system is shown in Annex 4. The monitoring system of the projects is described as follows:

Phase I

Total power generation (EG_{GEN}) by phase I of the project is measured with power meter 52G-I, while auxiliary power consumed by the project activity (EG_{AUX}) is measured with power meters 52H-I and 53B-I.

The net power (EGy) supplied from phase I of the project is calculated as the difference between EG_{GEN} and EG_{AUX}.

Also, for back-up, a power meter 52F-I will be installed to directly measure net electricity (EGy) generated by the project.

Phase II

Power generation (EG_{GEN}) by phase II of the project is measured with power meter 52G-II, while auxiliary power consumed by the project activity (EG_{AUX}) is measured with power meter 52H-II.
The net power (EGy) supplied from phase II of the project is calculated as the difference between EG_{GEN} and $EG_{AUX..}$ Also a back-up meter 52F-II will be installed to measure net electricity.

The total net power supplied to cement plant by the project is the sum of the two phases, and will be used to calculate the baseline emission reductions.

The meters are maintained and recorded on a monthly basis by the cement plant. Net electricity will be calculated by total generation deducting self-consumption. This amount will be checked against meter readings. The meters are calibrated according to the related internal procedures and by qualified staff from the local power grid company. Meter inspections are carried out with all parties to the meter reading being present to witness the reading.

The accuracy of all power meters will be 0.5S.

3. Calibration & Maintenance procedures

The measurement mode and calibration procedure must be carried out consistently to ensure the accuracy of the equipment and the precision of readings.

i. Power meters will be calibrated by a certified Party at least once per year in accordance with the manufacturer's recommendations and National Regulations for ensuring reliability of the system. The accuracy of the power ammeter will be no less than 0.5S.

ii The power meters should be tested in regular basis in case that the error of the readings ammeters exceeded the permitted limit.

iii Calibrations shall be evidenced with certificates of calibration for the relevant meter(s) issued by a qualified body. Back up power meters and alternative sources of data (and cross-check procedures for the alternative data sources) have been identified in case the first data set is not within specified error limits. A calibration and error log will be maintained to provide transparency and sound management.

4.Training, Recorded Keeping, Error handling and Reporting Procedures

Training

Members of staff who are involved in the CDM project will be given training on the CDM and reporting requirements, prior to registration of the project. New members of staff joining the CDM project team will also be given training in relation to their responsibilities. Full training procedures and a training plan will be detailed in the CDM Manual.

Record Keeping and Internal Reporting Procedure

This will be developed in accordance with the company's management procedures.

Error Handling Procedure

In the event that a meter has lost calibration over the allowable error limit then this shall be corrected at the earliest opportunity and re-calibrated and the data recorded from this meter since the last successful calibration shall be ignored.

In the event that there is uncertainty over the accuracy of the data set for net electricity generated from the main meters (e.g. the meter has lost calibration over the acceptable error limit) then the data from the back-up meters shall be used.

The check of the CDM Project Officer and then the third party verifier prior to issuance of the CERs is considered adequate for errors in the calculations. Where errors in the calculations are discovered by either of these Parties, the monitoring report shall be modified and the corrected version shall be resubmitted to the verifier.

Procedure for corrective actions arising

The CDM Project Officer is responsible for identifying corrective actions arising from the above procedures and for liaising with the purchaser, the 3rd party verifiers and other stakeholders to take necessary steps to implement the corrective actions.

Monitoring Report

The project owner will entrust professional organization to prepare monitoring report, which will be submitted to DOE for verification and issuance of CERs.

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 methodology to the project activity study: 25/05/2007

Contact information of person/entity in charge of application of the baseline methodology and the monitoring methodology to the project activity	**Is organisation a Project Participant *Yes/No***
Maureen Mo(Zhihan) CAMCO International Limited 14th Floor, Lucky Tower A, No. 3 North Road, East 3rd Ring Road, Chaoyang District, Beijing 100027, China Tel: (86 10) 8448 3025/3049/1385/1623 Fax：(86 10) 8448 2499/2432 email: Maureen.mo@camcoglobal.com.cn Website: www.camcoglobal.com	Yes

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 staring date of the project is 20/02/2006. (Starting date of construction)

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

12 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:

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The starting date of the project is 01/03/2008 or the date of registration whichever come later

C.2.2.2. Length:

10 years.

SECTION D. Environmental impacts

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

The cement production lines involved in the Project Activity has undergone and passed full Environmental Impact Assessments (EIA) in line with the requirements of the Chinese Government, all of which are available for review. The Project Activity is an internal project to the general company and has entrusted “Assessment department of Technology Consulting Centre of An Hui Province” to undergo a separate EIA and has obtained the official reply from Anhui Environmental Protection Bureau. The main conclusions are as follows:

Noise impacts

Table 6 The noise status of existing projects at the site of the project activity:

The site of the project activity	Plant boundary noise standard	Situation of exceeding standard/ sensitive point
Chizhou	The noise of the project in the daytime in the directions of east, west, south and north of the plant accords with Category II standards of *Noise Standards for Industry and Enterprise*（GB12348-90）. The noise to the south of the plant at night accords with Category II standards.	The noise exceeds the standard at night. The reasons are the impacts of the three production lines and insects cry is one of the reasons leading to the noise exceeding the standards.

The boilers used by the cement plant of the project are all static equipment without noise. The major sources of noise pollution are the power equipment (for example steam turbine, generator, and water pump and so on), whose noise is small. According to the on-site inspection, the noises of steam turbine and generator are 90dB(A) and 84dB(A). In order to reduce noise pollution, steam turbine is located in a closed workshop, the noise pollution is minimal outside the workshop and it has few impacts on the plant boundary noise. The water pump will be installed below ground level and therefore the noise pollution is minimal. Thus it can be seen from the noise impacts analysis that the plant boundary noise and sensitivity outside the plant boundary will not be impacted after implementation of the project and will accord with the National Noise Standards for Industry and Enterprise.

Air Quality Impacts

Initially air quality impacts are limited to increased level of dust from use and movement of construction equipment. The project applies the technology of waste heat recovery for power generation without fuel supplement facilities and new pollution sources and new dust emission site. Instead, the implementation of the project can improve the dust removing effect of the already existing electro static precipitator, so the project will not add dust removing equipment and dust emissions will be less than before. Once the project is operational it is expected to lead to reductions in air pollutant such as dust, CO_2 and SO_2 and so on due to the avoidance of fossil fuel for generation. This will have a positive impact on local air quality.

For coal fuel for power generation project versus the project of the waste heat recovery for power generation, SO_2 in the coal is calculated by 0.8% and the emissions of CO_2 and SO_2 will be increased annually. Some emission reductions due to the implementation of the project are shown as follows:

Table 7 Partial emission reductions due to the implementation of the project

CO_2 emission reductions t/a	**SO_2 emission reductions t/a**
185,102	1372.8

Water Usage Impacts

The waste water added newly caused by the implementation of the project are mainly living liquid waste and waste water from chemical disposal in the production process, which are separately 4.8 t/d and 17 t/d.

The living liquid waste caused by the implementation of the project will be put into the existing treatment system for living liquid waste of the plant and will be drained off after the water disposed of reaches the standard. Waste water from chemical disposal system will be disposed of in the acid-base neutralization equipment proposed by the plant to reach the standard and then will be drained off.

The cement plant designed by the project uses a circulating water system, through which the waste water is drained cleanly without pollution and used as the water for evaporation. The water impact of the project is minimal.

Other environmental impacts

Visual Impacts

The visual impact of the Project Activity is minimal as the major equipment is fitted within the middle of the existing cement works and the equipment is lower than the main stacks.

Interference with Communications

There is not expected to be an increase in interference with communications as a result of the Project Activity.

Land Use Impacts

There are no land use impacts as the Project Activity is within the existing sites which have already been converted to industrial use for the construction of the cement plants of the Conch Group.

The project will therefore have a net environmental benefit in addition to the greenhouse gas emissions reductions.

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 Environmental impacts of the Project are considered to be positive and not significantly negative.

SECTION E. Stakeholders' comments

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

In order to seek comments of local stakeholders on the proposed project, the project owner posted the notification of stakeholder meeting in public place to invite local residents who are involved in the project to attend the meeting. The project owner also sent a notification to government bodies and entities to invite them to attend the meeting. As a result, the Project owner organized a an open public stakeholders meeting in a meeting room on the second floor of the office building of Chizhou Conch Cement Company Limited on July.12th, 2006.

17 representatives of local stakeholders including representatives of local residents, government bodies, and entities attended the meeting. Mr. Sunhai, who is a vice director of Development Department of the Project, made a presentation to the local stakeholders regarding the brief introduction to the objectives, plan, the process diagram of the project, and the reason to apply for CDM registration. The emphasis of the presentation and discussion was on the dust emissions, water resources and the local environment as these were the main concerns of the local population. mainly concerned by the local population. After the presentation, all the participants are invited to give their comments on the following issues:

1. Stakeholders concern the proposed project
2. Attitude of stakeholders to the project
3. Impact on the environment
4. Improvment to local employment opportunities

E.2. Summary of the comments received:

The comments from the local population mainly concerned expropriation of land, impacts on water resources and the local environment. Regarding these concerns, the project owner gave a thorough and clear explanation, which is summarized as follows:

The Project Activity occurs in the Chizhou Conch Cement Company Limited and does not need to occupy new land. The Project Activity will reduce the emission of contamination, such as dust, NOx, SO_2. The water use of company will be decreased by decreasing the water supply of humidifying equipment.

After hearing about the CDM and the Project's positive environmental benefits (including zero impact with regard land expropriation and positive impact on water resource usage and conservation), all were supportive of the Project.

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

As there are no adverse comments to the Project Activity and all are supportive of the project, the proponents have completed this Project Design Document for being examined and approved by the relevant authorities.

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 of the Project Activity.

Annex 3

BASELINE INFORMATION

Data recommended in the *Notification on Determining Baseline Emission Factor of China's Grid* for the East China Power Grid are adopted for the Project.

The following tables summarise the numerical results from the equations listed in the approved methodology ACM0002 (version 6). The information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Fuel-fired electricity generation of the East China Power Grid in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shanghai	69444000	5.14	65874578
Jiangsu Province	133277000	5.9	125413657
Zhejiang Province	83089000	5.31	78676974
Anhui Province	54156000	6.06	50874146
Fujian Province	42146000	5.07	40009198
Total			360848554

Data source: China Electric Power Yearbook 2004.

Table A2. Fuel-fired electricity generation of the East China Power Grid in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shanghai	71127000	5.22	67414171
Jiangsu Province	163545000	5.93	153846782
Zhejiang Province	95255000	5.68	89844516
Anhui Province	59875000	6.03	56264538
Fujian Province	50490000	6.07	47425257
Total			414795263

Data source: China Electric Power Yearbook 2005.

TableA3. Fuel-fired electricity generation of the East China Power Grid in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Shanghai	74606000	5.05	70,838,397
Jiangsu Province	211429000	5.96	198,827,832
Zhejiang Province	108110000	5.59	102,066,651
Anhui Province	62918000	5.9	59,205,838
Fujian Province	48600000	4.57	46,378,980
Total			477,317,698

Data source: China Electric Power Yearbook 2006

Table A4. Calculation of simple OM emission factor of the East China Power Grid in 2003

Energy	Unit	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total Fuel F=A+B+C+D+E	EF (tC/TJ) G	Oxidation rate (%) H	NCV (MJ/t or 1000m^3) I	Emission (tCO_2e) J
Raw coal	10^4t	2618	6417.74	3442.4	2669.67	1754	**16901.81**	25.8	100	20908	334300359.13
Cleaned coal	10^4t						**0**	25.8	100	26344	0.00
Other washed coal	10^4t						**0**	25.8	100	8363	0.00
Coke	10^4t						**0**	25.8	100	28435	0.00
Coke oven gas	10^8m^3	1.99	0.06				**2.05**	12.1	100	16726	152125.76
Other gas	10^8m^3	66.34					**66.34**	12.1	100	5227	1538454.90
Crude oil	10^4t						**0**	20	100	41816	0.00
Gasoline	10^4t							18.9	100	43070	0.00
Diesel	10^4t	1.26	14.71	13.99			**29.96**	20.2	100	42652	946463.80
Fuel oil	10^4t	95.49	0.76	174.48		18.89	**289.62**	21.1	100	41816	9369683.52
LPG	10^4t						**0**	17.2	100	50179	0.00
Refinery gas	10^4t	0.49	0.96				**1.45**	18.2	100	46055	44564.35
Natural gas	10^8m^3						**0**	15.3	100	38931	0.00
Other petroleum products	10^4t	18.91	5.3	15.04			**39.25**	20	100	38369	1104387.72
Other coke chemical products	10^4t						**0**	25.8	100	28435	0.00
Other energy	10^4tCe	5.68		7.08			**12.76**	0	100	0	0.00
Delivered to the ECPG from CCPN (MWh)					**13756040**						
Total emission of ECPG (tCO_2e)					**368593903**						
Fossil power supply of ECPG (MWh)					**385310464**						
OM emission factor of the ECPG (tCO_2e/MWh)					**0.956615**						

Data source: China Electric Power Yearbook 2004

Table A5. Calculation of simple OM emission factor of the East China Power Grid in 2004

Energy	Unit	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total Fuel F=A+B+C+D+E	EF (tC/TJ) G	Oxidation rate (%) H	NCV (MJ/t or $1000m^3$) I	Emission (tCO_2e) J
Raw coal	10^4t	2779.6	7601.9	4008.9	2906.2	2183.7	**19480.3**	25.8	100	20908	385300230.33
Cleaned coal	10^4t						**0**	25.8	100	26344	0.00
Other washed coal	10^4t		5.46			4.63	**10.09**	25.8	100	8363	79826.01
Coke	10^4t						**0**	25.8	100	28435	0.00
Coke oven gas	10^8m^3	2.59					**2.59**	12.1	100	16726	192197.91
Other gas	10^8m^3	72.46					**72.46**	12.1	100	5227	1680380.49
Crude oil	10^4t						**0**	20	100	41816	0.00
Gasoline	10^4t						**0**	18.9	100	43070	0.00
Diesel	10^4t	2.69	27.17	6.23			**36.09**	20.2	100	42652	1140116.11
Fuel oil	10^4t	58.52	55.07	202.89		23.26	**339.74**	21.1	100	41816	10991147.99
LPG	10^4t						**0**	17.2	100	50179	0.00
Refinery gas	10^4t	0.77	0.55				**1.32**	18.2	100	46055	40568.93
Natural gas	10^8m^3		0.14				**0.14**	15.3	100	38931	30576.41
Other petroleum products	10^4t	21.22	1.37	24.89			**47.48**	20	100	38369	1335957.42
Other coke chemical products	10^4t						**0**	25.8	100	28435	0.00
Other energy	10^4tCe	6.43		15.48			**21.91**	0	100	0	0.00

Delivered to the ECPG from CCPG (MWh)	**26933850**
Total emission of ECPG (tCO_2e)	**434050485**
Fossil power supply of ECPG (MWh)	**453378723**
OM emission factor of the ECPG (tCO_2e/MWh)	**0.957368**

Data source: China Electric Power Yearbook 2005

Table A6. Calculation of simple OM emission factor of the East China Power Grid in 2005

Energy	Unit	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total Fuel F=A+B+C+D+E	EF (tC/TJ) G	Oxidation rate (%) H	NCV (MJ/t or 1000m^3) I	Emission (tCO_2e) J
Raw coal	10^4t	2847.31	9888.06	4801.52	3082.9	2107.69	**22727.48**	25.8	100	20908	449526099.64
Cleaned coal	10^4t						**0**	25.8	100	26344	0.00
Other washed coal	10^4t						**0**	25.8	100	8363	0.00
Coke	10^4t			0.03			**0.03**	25.8	100	28435	806.99
Coke oven gas	10^8m^3	1.68	1.38		1.71		**4.77**	12.1	100	16726	353970.67
Other gas	10^8m^3	83.72	24.97	0.06	30		**138.75**	12.1	100	5227	3217675.86
Crude oil	10^4t			27.01			**27.01**	20	100	41816	828263.45
Gasoline	10^4t						**0**	18.9	100	43070	0.00
Diesel	10^4t	1.25	16	4.52		1.67	**23.44**	20.2	100	42652	740491.04
Fuel oil	10^4t	59.39	13.22	153.22		7.45	**233.28**	21.1	100	41816	7546991.82
LPG	10^4t						**0**	17.2	100	50179	0.00
Refinery gas	10^4t	0.57	0.83				**1.4**	18.2	100	46055	43027.65
Natural gas	10^8m^3	1.09	1.85	0.62			**3.56**	15.3	100	38931	777514.36
Other petroleum products	10^4t	21	8.38	34.8			**64.18**	20	100	38369	1805849.77
Other coke chemical products	10^4t						**0**	25.8	100	28435	0.00
Other energy	10^4tCe	12.36		15.29			**27.65**	0	100	0	0.00
Delivered to the ECPG from CCPG (MWh)					**160410000**						
Total emission of ECPG (tCO_2e)					**661062081**						
Fossil power supply of ECPG (MWh)					**714971698**						
OM emission factor of the ECPG (tCO_2e/MWh)					**0.924599**						

Data source: China Electric Power Yearbook 2006

Table A7 Weighted average OM emission factor of the East China Power Grid

	2003	2004	2005	Weighted average OM emission factor
Total emission (tCO2)	**368593903**	**434050485**	**661062081**	**1463706469**
Total power supply (MWh)	**385310464**	**453378723**	**714971698**	**1553660885**
OM emission factor (tCO2/MWh)	**0.956615**	**0.957368**	**0.924599**	**0.942102**

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel （tc/TJ）	Oxidation rate	Emission factor （tCO2/MWh）
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Table A9. The proportion of CO2 emission generated by solid, liquid and gaseous fuels using for power generation in the total emission (East China Power Grid)

		Shanghai	**Zhejiang**	**Jiangsu**	**Anhui**	**Fujian**	**Total**	**Calorific Value (kJ/kg)**	**EF （tc/TJ）**	**Oxidation rate**	**Emission**
Fuel	Unit	A	B	C	D	E	F=A+…+E	G	H	I	J=F*G*H*I*44/12/100
Raw coal	10^4t	2847.31	4801.52	9888.06	3082.9	2107.69	22727.48	20908	25.8	1	449,526,100
Cleaned coal	10^4t	0	0	0	0	0	0	26344	25.8	1	0
Other washed coal	10^4t	0	0	0	0	0	0	8363	25.8	1	0
Coke	10^4t	0	0.03	0	0	0	0.03	28435	25.8	1	807
Sum											**449,526,907**
Crude oil	10^4t	0	27.01	0	0	0	27.01	41816	20	1	828,263
Gasoline	10^4t	0	0	0	0	0	0	43070	18.9	1	0
Coal oil	10^4t	0	0	0	0	0	0	43070	19.6	1	0
Diesel	10^4t	1.25	4.52	16	0	1.67	23.44	42652	20.2	1	740,491
Fuel oil	10^4t	59.39	153.22	13.22	0	7.45	233.28	41816	21.1	1	7,546,992
Other petroleum products	10^4t	21	34.8	8.38	0	0	64.18	38369	20	1	1,805,850
Sum											**10,921,596**
Natural gas	10^7m^3	10.9	6.2	18.5	0	0	35.6	38931	15.3	1	777,514
Coke oven gas	10^7m^3	16.8	0	13.8	17.1	0	47.7	16726	12.1	1	353,971
Other gas	10^7m^3	837.2	0.6	249.7	300	0	1387.5	5227	12.1	1	3,217,676
LPG	10^4t	0	0	0	0	0	0	50179	17.2	1	0
Refinery gas	10^4t	0.57	0	0.83	0	0	1.4	46055	18.2	1	43,028
Sum											**4,392,189**
Total											**464,840,691**

Data source: China Energy Statistical Yearbook 2006

Calculate with data provided in Table A 9and formulae (4)~(6)，the value for λ_{Coal} is 96.71%，the value for λ_{Oil} is 2.35% and the value for λ_{Gas} is 0.94%. Therefore $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9372 tCO2e/MWh.

Table A10 Installed capacity of the ECPG in 2005

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power (MW)	M	13113.5	42506.4	27688.1	11423.2	9345.4	104076.6
Hydropower (MW)	M	0	142.6	6952.1	749.8	8224.9	16069.4
Nuclear power (MW)	M	0	0	3066	0	0	3066
Wind power and Other (MW)	M W	253.3	58.8	37.2	0	52	401.3
Total (MW)	M	13366.8	42707.8	37743.4	12173	17622.3	123613.3

Data source: China Electric Power Yearbook 2006

Table A11 Installed capacity of the ECPG in 2004

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power (MW)	M	12014.9	28289.5	21439.8	9364.5	8315.4	79424.1
Hydropower (MW)	M	0	126.5	6418.4	692.8	7180.1	14417.8
Nuclear power (MW)	M	0	0	3056	0	0	3056
Wind power and Other (MW)	M	3.4	17.6	39.7	0	12	72.7
Total (MW)	M	12018.3	28433.6	30953.9	10057.3	15507.5	96970.6

Data source: China Electric Power Yearbook 2005

Table A12 Installed capacity of the ECPG in 2003

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Thermal power (MW)	M	11092.6	22245	15321.2	9284.9	7092.8	65036.5
Hydropower (MW)	M	0	137.8	6054.5	649.1	6761.1	13602.5
Nuclear power (MW)	M	0	0	2406	0	0	2406
Wind power and Other (MW)	M	0	0	39.7	0	12	51.7
Total (MW)	M	11092.6	22382.7	23821.4	9934	13865.8	81096.5

Data source: China Electric Power Yearbook 2004

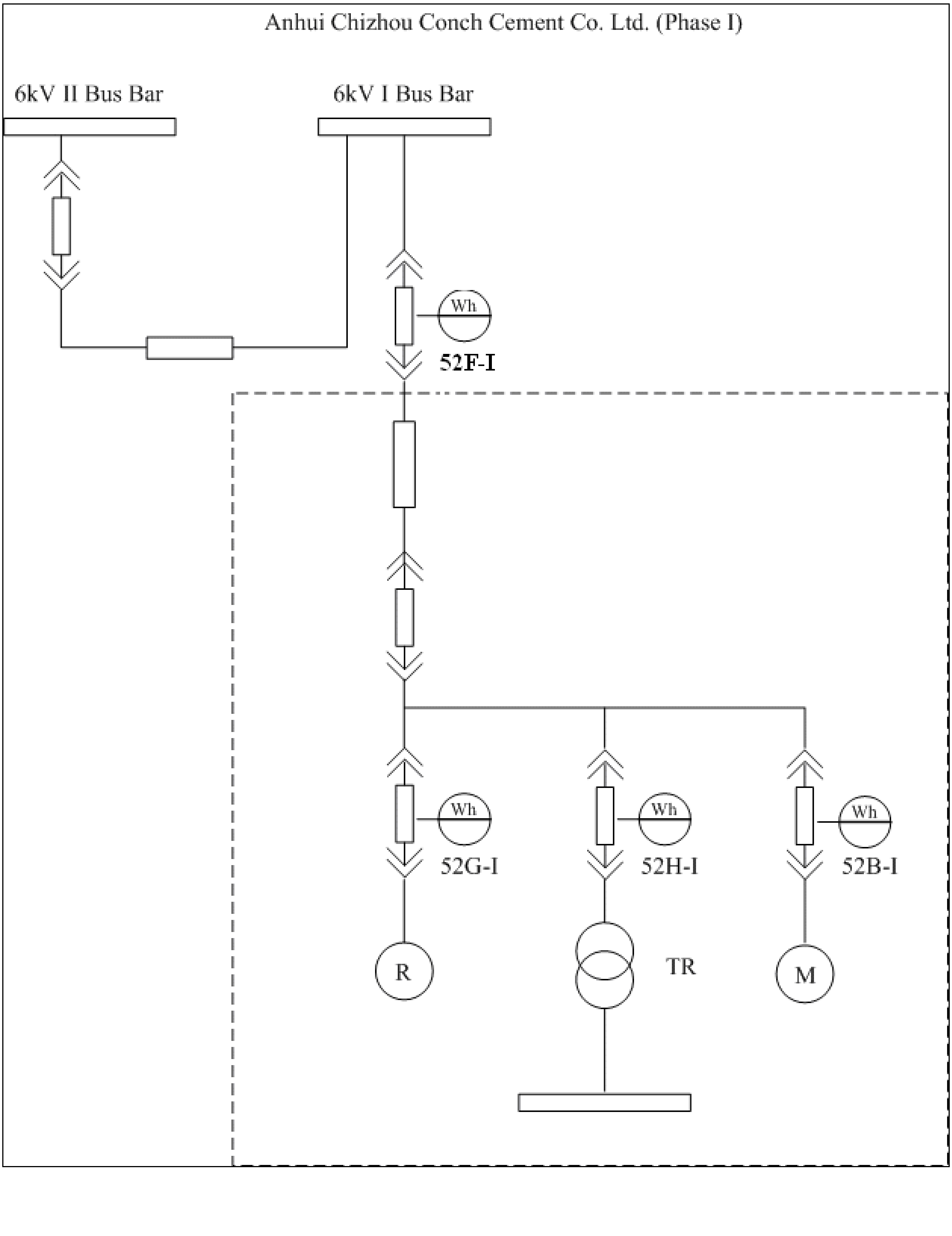
Table A13. Calculation of BM emission factor of the East China Power Grid

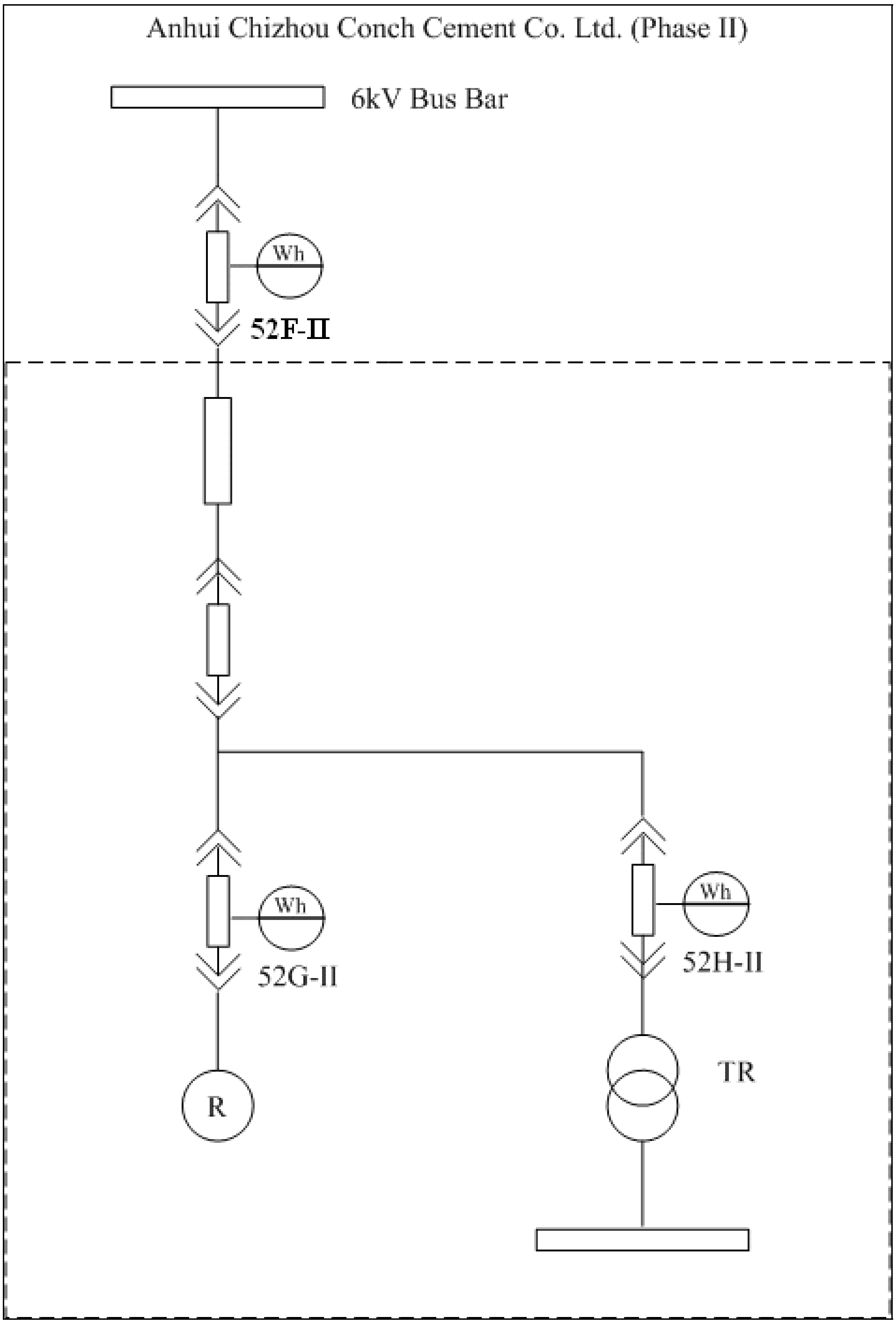
	Installed capacity in 2003 (MW)	Installed capacity in 2004 (MW)	Installed capacity in 2005 (MW)	Capacity additions from 2004 to 2005 (MW)	Share in total capacity addition
	A	**B**	**C**	**D=C-B**	
Thermal power	65036.5	79424.1	104076.6	24652.5	92.53%
Hydropower	13602.5	14417.8	16069.4	1651.6	6.20%
Nuclear power	2406	3056	3066	10	0.04%
Wind power	51.7	72.6	401.3	328.7	1.23%
Total	**81096.5**	**96970.5**	**123613.3**	**26642.8**	**100%**
Share in total installed capacity of 2005	65.60%	78.45%	100%		

$EF_{BM,y}$ =0.9372×92.53%=0.8672 tCO_2e/MWh.

Annex 4

MONITORING INFORMATION




Anhui Chizhou Conch Cement Co. Ltd. (Phase II)
6kV Bus Bar
Wh
52F-II
Wh
52G-II
Wh
52H-II
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