



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

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**SECTION A. General description of project activity****A.1. Title of the project activity:**

Xiaoshan Power Plant's NG Power Generation Project of Zhejiang Southeast Electric Power Co., Ltd.

Version of document: 03.1 as per the request of review at EB 37 Meeting

Date of document: 03/03/2008

A.2. Description of the project activity:

Xiaoshan Power Plant's NG Power Generation Project of Zhejiang Southeast Electric Power Co., Ltd. (hereafter called "the project") is the construction and operation of a new natural gas fired grid-connected power plant owned by ZheJiang Southeast Electric Power Co., Ltd. The project will install two sets of gas-steam combined cycle for power generation units with the total rated output of 2×403MW.

According to baseline scenario analysis described in section B.4, in the absence of the project activity, the baseline alternative is the construction of the 600MW coal-fired plant. Comparing with the coal-fired plant, the project activity leads to substantial greenhouse gas emission reductions due to the use of less carbon intensive fuel and the application of the much higher efficient power generation technology. It is expected that the project will achieve an *ex-ante* estimated average emission reductions of 937,067tCO₂e/year and 6,559,469 tCO₂ over the first seven-year crediting period.

The electricity generated by the proposed project will be sold to the East China Power Grid (ECPG), which includes Shanghai, Zhejiang, Jiangsu, Anhui and Fujian Provincial Grids. The project activity will not only meet the rising demand of electricity demand of ECPG, but also improve the peak load regulating capability of the grid. Furthermore, the project will contribute to the sustainable development to both local, global and the host country in a number of ways:

- The project will lead a reduction in greenhouse gas emissions compared to a business as usual approach, thereby benefit the global climate change;
- The project will reduce other pollutants (e.g. SO₂, NO_x, dust, etc) compared to a business as usual approach, thereby improve the local environment quality;
- The project will enhance the ability of peak regulation to the local grid and improve the electric quality of the local grid;
- Promoting greatly the use of natural gas in a traditionally coal gas metropolitan city for better safety and environment;
- Promoting the application of gas-fired combined cycle power generation technology widely in the East China Region.
- The project will create the employment opportunities for the local people.

A.3. Project participants:



Name of Party involved (*) ((host))	Private and/or public entity(ies) project participants (*)	Kindly indicate if the Party involved wishes to be considered as project participant
P.R. China (host)	Zhejiang Southeast Electric Power Co., Ltd.	No
U.K.	Trading Emissions PLC.	No

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:****A.4.1.1. Host Party(ies):**

People's Republic of China

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

Zhejiang Province

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

Xiaoshan District, Hangzhou City

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

The project locates in Xiaoshan Power Plant, Xiaoshan District, Hangzhou City, Zhejiang Province, which is on the south bank of Qiantangjiang River. It is 2km northwest from Linpu Town, 15km far from the centre of Xiaoshan District and 23km far from the centre of Hangzhou City. The project has geographical coordinates with longitude of 120°14'E and latitude of 30°03'N. The location of the project site is shown in the following figures.

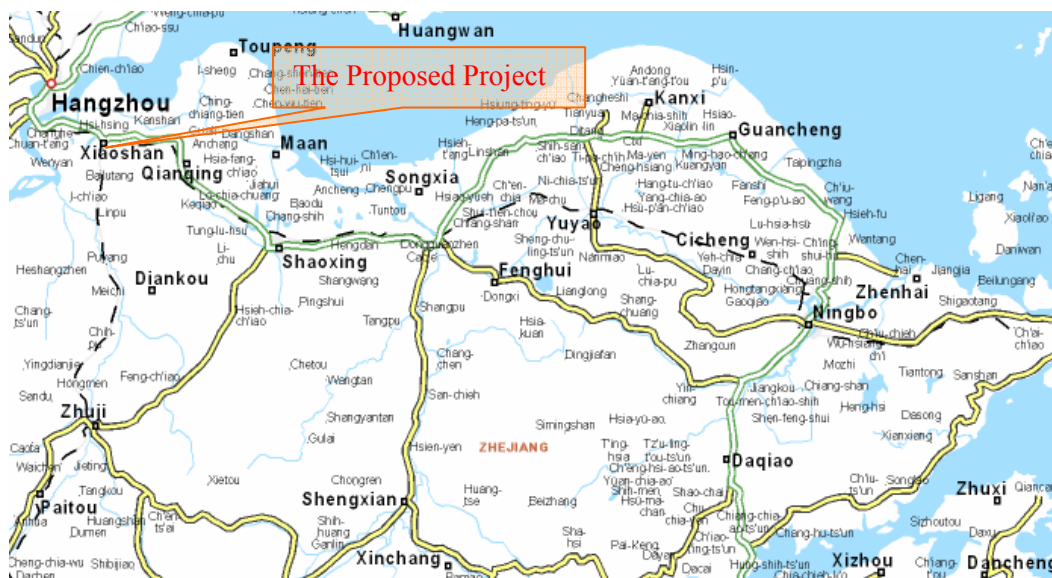


Figure A1 the location of the proposed project

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

The project activity falls in the Sectoral scope1: Energy Industries.

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

The proposed project activity applies large-scale gas-steam combined cycle power generation technology provided by SIEMENS.

The operation principle of the gas-steam combined cycle power generation is: the gas turbine drives the power generator to generate electricity. At the same time the exhaust gas from the gas turbine after combustion of nature gas enters the heat recovery steam generator and generates steam using demineralised water, and then, the steam generated enters into the steam turbine and drive the generator to generate electricity. The project involves two sets of gas-steam combined cycle power generation units. Each unit includes a gas turbine, heat recovery steam generator, steam turbine and generator. The thermal efficiency of the technology can arrive 58.2%.

According to the feasibility study report¹, natural gas will be the only type of fuel consumed in the proposed project, with the fuel consumption of 0.206 Nm³/kWh. During the design of the project, the letter of natural gas purchase intent was signed between the Zhejiang Provincial Natural Gas Development Co., Ltd. and Xiaoshan Power Plant of Zhejiang Southeast Electric Power Co., Ltd, which ensures a continuous and stable supply for 20 years.

The information of the main parameters of the gas-steam combined cycle power unit is shown below:

Table A1 Main parameters of the gas-steam combined cycle power unit

Equipment	Manufacturer	Model	Rated output
Gas turbine	SEC-SIEMENS	V94.3A	
Steam generator	Hangzhou Heat Recovery Boiler Plant	NG-V94.3A-R	
Steam turbine	SEC-SIEMENS	H30-25-25, E30-25-2-1×10	139.4MW
Power generator	SEC-SIEMENS	THDF108/53	403MW

The project will extend the existing 220kv switching device to double generatrix connection mode. Among them, the existing 220kv part is taken to be A section, and the recently constructed 220kv part is taken to be B section. The recently constructed B section is utilized 4 outlets, which include 2 lines 11km long to Xiaonan and 2 lines 20km long to Xingnan.

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

The project activity is expected to generate emission reductions of about 937,067 tCO₂e per year during

¹ The feasibility study report of the Xiaoshan Power Plant's NG Power Generation Project of Zhejiang Southeast Electric Power Co., Ltd. is completed by Zhejiang Power Design Institute, an independent party, which is rated as A class for power designing.



the first 7-year crediting period from 2007 to 2014.

Years	Annual estimation of emission reductions in tons of CO ₂ e
2008 ²	937,067
2009	937,067
2010	937,067
2011	937,067
2012	937,067
2013	937,067
2014	937,067
Total estimated reductions(tons of CO ₂ e)	6,559,469
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO ₂ e)	937,067

A.4.5. Public funding of the project activity:

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

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

AM0029 (Version 01, 19 May 2006): “Baseline Methodology for Grid Connected Electricity Generation project using Natural Gas” and “Monitoring methodology for grid connected generation plants using non-renewable and less GHG intensive fuel”

This methodology also uses the build margin (BM) and operating margin (OM) approach as specified in ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources” and makes reference to the latest approved version of the “tool for the demonstration and assessment of additionality”.

For more information regarding the methodology please refer to Website of Executive Board.

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

² The first crediting period is expected to be from 1 January 2008 to 31 December 2014.

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

The application of the baseline methodology AM0029 to the proposed project is justified for satisfying the three conditions:

- ✧ Condition 1: The project activity is the construction and operation of a new nature gas fired grid-connected electricity generation plant.

The project activity is a new nature gas fired grid-connected electricity generation plant and no other fuel except natural gas is consumed. The project activity is currently under construction and will be commission completely in August of 2007.

- ✧ Condition 2: The geographical/physical boundaries of the baseline grid can be clearly identified and information pertaining to the grid and estimated baseline emissions is publicly available.

The electricity generated by the proposed project will be sold to Zhejiang Power Grid, which is an integrated part of the East China Power Grid. As demonstrated in B.6, the grid for baseline emissions calculation is the East China Power Grid, whose geographical/physical boundaries can be clearly identified and the information pertaining to the East China Power Grid and estimated baseline emissions is publicly available³.

- ✧ Condition 3: Nature gas is sufficiently available in the region or country, e.g. future nature gas based power capacity additions, comparable in size to the project activity, are not constrained by the use of nature gas in the project activity.

Natural gas is sufficiently available in Zhejiang Province. According to the *Natural Gas Pipeline Network Planning of Zhejiang Province (Gui-497, September of 2005)*, the natural gas supply of Zhejiang Province comes from three sources: natural gas transferred from west, East China Sea gas field and imported LNG. The natural gas supply is as follows:

Table B1 Natural Gas Supply in Zhejiang Province (unit: $10^8 \text{Nm}^3/\text{a}$)

	Natural Gas source	2005	2010	2015	2020
1	Natural gas transferred from west	7.98	14.5	18	19.2
2	East China Sea gas field	0.8	23.3	23.3	23.3
3	Imported LNG	0	44.18	88.36	132.54
Total supply		8.78	81.98	129.66	175.04

³ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf>



The natural gas supply in Zhejiang Province is responsible and operated by Zhejiang Provincial Natural Gas Development Co., Ltd.⁴. According to the feasibility study report of the project, the expected consumption of natural gas by the proposed project is $5.3354 \times 10^8 \text{ Nm}^3/\text{a}$, which is very small amount compared with the total natural gas available in Zhejiang Province. Furthermore, according to the *Natural Gas Pipeline Network Planning of Zhejiang Province*, the natural supplying to industry user, natural gas power plant, natural gas thermal plant and civil use is ensured. Therefore the natural gas which will be consumed by the proposed project would not displace the natural gas that would otherwise be used elsewhere in an economy.

To summarize, the approved baseline methodology, AM0029: “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas” is applicable to the proposed project.

The approved monitoring methodology AM0029 “Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel” is applicable for:

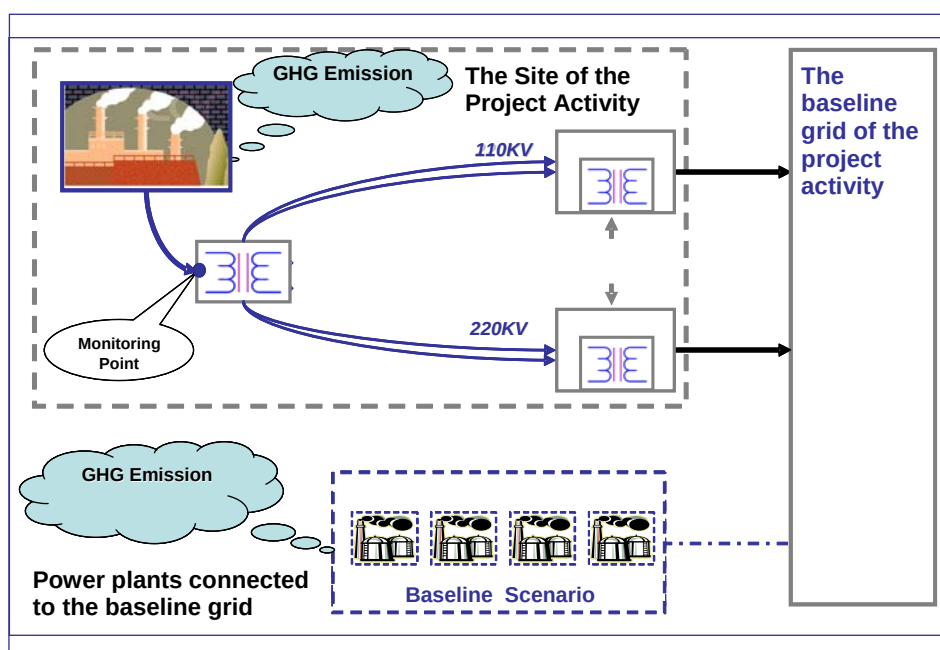
- ✧ The applicability of the associated baseline methodology is justified. Under the same conditions this monitoring methodology is applicable.
- ✧ This monitoring methodology is used in conjunction with the approved baseline methodology AM0029 for the proposed project.

Based on the discussion above, the approved monitoring methodology AM0029 is applicable to the proposed project.

B.3. Description of how the sources and gases included in the <u>project boundary</u>:

The spatial extent of the project activity boundary includes the project site and all power plants connected physically to the baseline grid as defined in ACM0002.

⁴ Approval letter of the Establish of Zhejiang Provincial Natural Gas Development Co., Ltd. by Zhejiang Provincial Development and Plan Commission, [2001]758



The greenhouse gases included in or excluded from the project boundary are shown in below table:

	Source	Gas	Included?	Justification / Explanation
Baseline	Power generation in baseline	CO ₂	Yes	Main emission source
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
Project Activity	On-site fuel combustion due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Excluded for simplification.
		N ₂ O	No	Excluded for simplification.

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

According to AM0029, baseline scenario is identified using the following steps:



Step 1: Identify plausible baseline scenarios

Step 2: Identify the economically most attractive baseline scenario alternative

In step 2 of the above, the following sub-steps are involved.

Sub-step 1: Calculate levelized cost of electricity production in Yuan / kWh for all alternatives remaining after step 1.

Sub-step 2: Sensitivity analysis for all alternatives remaining after step 1.

Step 1: Identify plausible baseline scenarios

According to AM0029, the identification of alternative baseline scenarios of the project activity should include all possible realistic and credible alternatives that provide outputs or services comparable with the project activity within the project's boundary. The plausible baseline scenarios identified include:

(1) The project activity not implemented as a CDM project

Scenario (1) is a plausible baseline alternative which can deliver similar services as the proposed project.

(2) Power generation using natural gas, but technologies other than the project activity

Natural gas for power generation using technologies other than the project activity, i.e. simple cycle gas turbine, has relatively lower thermal efficiency of 32%-35%⁵ and is rarely used now⁶ in east of China. According to the official statistics⁷, all other natural gas projects that have recently been constructed or are under construction or are being planned in the region, which can deliver the similar service as the proposed project, apply or will apply the same technology of proposed project - Large-scale gas-steam combined cycle for power generation. Therefore alternative (2) is not the baseline scenario of the proposed project.

(3) Power generation technologies using energy sources other than natural gas

Power generation technologies using energy sources other than natural gas may include (a) renewable energy power plant, (b) nuclear power plant and (c) coal-fired power plant. The proposed project operates as peak load regulation.

⁵ <http://www.bjx.com.cn/files/wx/ahdl/2001-1/2.htm>

⁶ <http://www.hdrqw.com/news/20060505-31.htm>

⁷ Zhejiang Provincial 11th electric power 5-year expansion plan



Pumped storage hydro power station can be constructed for peak load regulation operation. However, according to China's latest survey on hydro resources⁸, 70.6% of hydro resources are located in the southwest region while only 4% exist in the eastern region. Moreover, 56.3% of exploitable hydro resource in east of China has already been developed. The hydro sources based on large rivers within the project's boundary were developed many years ago, such as Xin'anjiang Hydro Station, Fuchunjiang Hydro Station, etc.⁹. The remaining limited hydro sources have low utilization hours, small installed capacity and are difficult to be developed¹⁰, which can not provide similar service of peak load regulation as the proposed project. Furthermore, the development of the wind-electric sources in china is being at the start-up status, the installation capacity of wind power plants is relatively smaller. Besides, wind power does not provide peak load regulation service¹¹. So (a) is not a realistic and credible baseline alternative.

At present, the nuclear power stations provide the base load electricity to the grid and don't provide the peak regulation service.¹² So it does not provide similar services compared with the proposed CDM project. Scenario (b) is not a realistic and credible baseline alternative.

According to the data from China Power Yearbook 2004, the total installed capacity of the East China Power Grid in 2003 is 81,096.7MW, in which coal-fired installed capacity is 65,036.5MW, accounting for 80.2%. Therefore, the East China Power Grid generation system is dominated by coal-fired power, and this fact will not change in quite a long time in future. So construction of a coal-fired power plant to operate as peak load and medium load power, with comparable capacity or electricity generation is business-as-usual scenario. Considering the generation capacity commonly used in China now, (c) 300MW and 600MW desulfurized coal-fired power unit is selected as realistic and credible baseline alternatives.

(4) Import of electricity from connected grids.

East China Power Grid(ECPG) imports electricity from Central China Power Grid (CCPG). Connected to CCPG there is a large capacity of must run hydro power stations relative to fossil fuel generation. To be efficient these hydro plant utilise the hydro resource when it is available i.e. they are not flexible and so operate on a must run basis providing baseload. Due to the relatively low level of flexible fossil fuel plant connected to the CCPG, it is not feasible for the CCPG to export electricity to ECPG in a manner that would provide peak load regulation. This fact is evidenced by the low peak to base ratio of the power exported to ECPG.

Central China Power Grid exports electricity to ECPG on a peak to base ratio of 1:0.75¹³. The demand profile of East China Power Grid requires a peak to base load ratio of 1:0.65¹⁴. Therefore to balance the

⁸ <http://www.shp.com.cn/zhwx/showcontent.asp?id=18090>

⁹ *White Book of Zhejiang Provincial Energy Development Status, 2003*

¹⁰ White Book on Energy of Zhejiang, the People's Government of Zhejiang Province, Zhejiang Daily, 09 December, 2004,

<http://zjdaily.zjol.com.cn/gb/node2/node802/node803/node274189/node274194/userobject15ai3603909.html>

¹¹ <http://tech.163.com/05/0330/15/1G3OHFFD00091537.html>

¹² <http://np.chinapower.com.cn/article/1000/art1000062.asp>

¹³ Peak to Base ratio reflects the demand for peak electricity compared to the demand for base load electricity

¹⁴ The official explanation letter issued by Zhejiang Province Electricity Distribution Centre has been provided to DOE to validate.

CCPG provides base load to ECPG can be also supported by the article in Hydropower Energy Science on engine.cqvip.com/content/tv/95255x/1998/016/003/gc23_tv1_3203139.pdf.

supply from CCPG to the demand profile of the grid, it is necessary for ECPG to install more flexible plant which can provide peak load regulation.

In conclusion due to the large amount of must run hydro connected to CCPG the ratio of peak to base power exported to ECPG is low. It is because of the low peak to base ratio that ECPG needs to add plant which can provide peak load regulation. Therefore the scenario of the import of electricity through the grid interconnector to provide peak load regulation is not feasible and does not form the baseline.

As analyzed above, scenario (1) and scenario (c) of (3) are selected as realistic and credible alternatives, listed as Table B-1. The further investment analyses are used in Step 2 to identify the economically most attractive baseline scenario alternative.

Table B2 Identified Plausible Baseline Scenarios

No.	Baseline Alternative
(i)	The project activity not implemented as a CDM project
(ii)	Construction of a 300MW coal-fired power unit
(iii)	Construction of a 600MW coal-fired power unit

Step 2 Identify the economically most attractive baseline scenario alternative

According to AM0029, the economically most attractive baseline scenario alternative is identified using investment analysis. The levelised cost of electricity production should be used as a financial indicator in the investment analysis for all alternatives remaining after step 1. The levelised cost methodology used is based on Appendix 5 of *Projected Costs of Generation Electricity* published by IEA¹⁵. The formula applied to calculate the levelised cost of electricity (*LCOE*) is the following:

$$LCOE = \frac{\sum_t \frac{I_t + M_t + F_t}{(1+r)^t}}{\sum_t \frac{E_t}{(1+r)^t}} \quad (1)$$

Where:

LCOE: levelised cost of electricity per kWh

I_t : Capital expenditures in the year t

M_t : Operation and maintenance expenditures in the year t

F_t : Fuel expenditures in the year t

E_t : Electricity generation in the year t

r : Discount rate

$\sum_t$: The summation over the period including construction, operation during the economic lifetime and decommissioning of the plant as applicable

The parameters needed in *LCOE* calculating for the three baseline alternatives are listed in the following

¹⁵Projected Costs of Generating Electricity- 2005 Update, International Energy Agency, http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1472



Tables.

Table B3 Parameters in the calculation of the levelised cost of electricity per kWh for the alternatives

Item in the formula	Parameter	Unit	The proposed project ¹⁶	300MW coal-fired power unit	600MW coal-fired power unit
Capital Expenditures ¹⁷	Unit Cost	RMB/kW	3551	4246	4281
	Discount Rate	%	6.21%	6.12%	6.12%
Operation and Maintenance Expenditures ¹⁸	Material Expenditure	RMB /MWh	8.5	6	5
	Water Expenditure	RMB/MWh	0.03	1	1
	Desulfuration Expenditure	RMB/ton fuel	NA	3.64	3.64
	Waste Expenditure	10 ⁴ RMB/unit	NA	626	1136
	Repair Expenditure	%	2.5%	2.5%	2.5%
	Issuance Expenditure	%	0.25%	0.25%	0.25%
	Pay & Welfare	10 ⁴ RMB/Year.Person	8.7696	8	8
	Quantity of employees	Person/MW	120	234	247
	Other Expenditure ¹⁹	RMB/MWh	15	12	10
	Annual Operation Hour	Hour	3500	5000	5000
Fuel Expenditure ²⁰	Fuel Consumption	gce/kWh Nm ³ /kWh	0.206	322	314
	Fuel Price	RMB/ton SCE RMB/Nm ³	1.31 ²¹	430	430
Electricity generation	Capacity	MW	740 ²²	300	600

¹⁶ Project feasibility study report

¹⁷ Construction Cost of power engineering in East China Areas, Provided by State Electricity Regulation Committee

¹⁸ Unit Cost Referenced Index of coal-fired power engineering and design of 2005, China Electricity Power Press, Beijing, 2006

¹⁹ According to the FSR and related references, other fee including disposal & clean of construction place, project management in construction period, project technical service in construction period and production preparation, etc.

²⁰ Statistic Annals of China Power Industry 2005, Provided by State Electricity Regulation Committee

²¹ Notice regarding the price of natural gas, National Development and Reform Commission, 28 September 2003, [2003] No. 1323.



Based on the above data, the levelised cost of electricity production in RMB/kWh²³ for the three baseline alternatives can be calculated and the results are presented below:

Table B4 Levelised cost of electricity production in RMB/kWh for the alternatives

	Baseline alternatives	Levelised cost of electricity production in RMB/kWh
(i)	The project activity not implemented as a CDM project	0.387
(ii)	Construction of a 300MW coal-fired power unit	0.214
(iii)	Construction of a 600MW coal-fired power unit	0.172

From the Table B4, levelised cost of 600MW coal-fired power unit is the lowest. A sensitivity analysis is performed for all alternatives to confirm that the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions, i.e. fuel prices and the load factor. The result of sensitivity analysis is shown in Table B5.

Table B5 Sensitivity Analysis of Levelised Cost

Baseline alternatives	Fuel prices					Load Factor				
	-10%	-5%	0	+5%	+10%	-10%	-5%	0	+5%	+10%
The proposed project	0.360	0.374	0.387	0.401	0.414	0.397	0.392	0.387	0.383	0.379
300MW coal-fired	0.202	0.208	0.214	0.22	0.226	0.222	0.218	0.214	0.211	0.208
600MW coal-fired	0.163	0.168	0.172	0.177	0.181	0.181	0.176	0.172	0.169	0.165

The sensitivity analysis shows that when the fuel prices and load factor vary in the range of -10% to +10%, the levelised cost of 600MW coal-fired power unit is always the lowest, that's to say, the pre-selected baseline scenario of 600MW coal-fired power unit is likely to remain the most economically and/or financially attractive, thus is identified as the baseline scenario.

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):

²² Single unit capacity of 740MW is used for the proposed project in the levelised cost calculation to be consistent with that in the investment analysis and is justified as the same reason as that in the investment analysis.

²³ Exchange rate: 1US Dollar=8.2RMB in 2004



According to AM0029, the additionality of the project activity will be demonstrated through the following three steps:

Step 1: Benchmark Investment Analysis

Benchmark Analysis Method

According to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*²⁴ issued by former State Power Corporation of China, the project IRR for total investment should not be lower than 8% for investing in hydropower plants, fuel-fired power plants, as well as wind farm projects. Hence, The IRR of the total investment is used as financial indicator for performing the benchmark investment analysis in this PDD.

Calculation and comparison of financial indicators

According to the feasibility study report of the project, the output of the natural gas-fired electricity generation unit is critical to the working circumstance. Considering the circumstance that the project is located, the output of the electricity generation unit can not reach the rated output all over the year. Therefore, the installed capacity used in the investment analysis of the FSR and the PDD is calculated as 370MW for each set of gas-steam combined cycle power generation unit, with total capacity of 740MW.

Table B6 Basic assumptions in the calculation of IRR

Basic Assumptions	Unit	Amount	Data Source
Static total investment	RMB	2503910000	FSR
Operational Lifetime	years	21	FSR
Installed capacity	MW	740	FSR
Annual operation hour	hours	3500	FSR
Self Electricity Consumption	%	2.5	FSR
Annual electricity supplied to the grid	GWh	2525.25	FSR
Nature gas consumption per unit electricity	Nm ³ /MWh	206	FSR
Natural gas price (Including tax)	RMB/Nm ³	1.31 ²⁵	
Depreciable period	years	15	FSR
Repair expenditure	%	2.5	FSR
Insurance expenditure	%	0.25	FSR
Material expenditure	RMB/MWh	8.5	FSR
Water expenditure	RMB/MWh	0.03	FSR
Employee expenditure	RMB/year/person	54000	FSR
welfare expenditure	%	62.4	FSR

²⁴ *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects, 2003*

²⁵ Notice regarding the price of natural gas, National Development and Reform Commission, 28 September 2003, [2003] No. 1323.



Quantity of employee	person	120	FSR
Other expenditure ²⁶	RMB/MWh	15	FSR
Legal accumulation fund	%	10	FSR
Commonweal fund	%	5	FSR
Value added tax (VAT)	%	17	FSR
Income tax	%	33	FSR
Expected electricity tariff (Including VAT)	RMB/kWh	0.4664	FSR
Expected CERs price	Euro/tCO ₂ e	8	

Based on the above data, The IRR for total investment of the project activity could be calculated and its calculation result is shown below:

IRR for total investment of the project activity not implemented as CDM project	6.34%
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It is clear that the IRR of total investment of the project activity is lower than 8%. Therefore, this CDM project activity can not be considered financially attractive.

Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The following parameters are taken as financial factors for sensitivity analysis:

- 1) Total investment;
- 2) Nature gas price;
- 3) Annual output
- 4) Annual Operation & Maintenance cost

The electricity tariff is not considered in the sensitivity analysis because the tariff is strictly regulated by the government.

The results of the sensitivity analysis are presented in the following table.

Table B7 Sensitivity analysis

Critical assumptions	-10%	-5%	0%	+5%	+10%
Total investment	7.75%	7.02%	6.34%	5.71%	5.13%
Nature gas price	8.41%	7.48%	6.34%	4.95%	3.88%
Annual output	5.04%	5.83%	6.34%	6.95%	7.50%
Annual Operation & Maintenance cost	7.12%	6.73%	6.34%	5.94%	5.53%

²⁶ According to the FSR, other fee including disposal & clean of construction place, project management in construction period, project technical service in construction period and production preparation, etc.



The sensitivity analysis shows that while the total investment, annual output and annual Operation & Maintenance cost vary between -10% to 10%, the IRR for total investment will remain below the benchmark 8%. If the natural gas price decreases by about 8%, the IRR begins to exceed the benchmark. However, the natural gas price is increasing these years. In the document issued by Zhejiang Provincial Price Bureau in 2006, the natural gas supplied to NG power plant increased to 1.445 RMB/Nm³. The price of natural gas is expected to keep on increasing in the following years²⁷, therefore the IRR will not exceed the benchmark 8%.

Based on the results of the sensitivity analysis, the proposed project can not be considered as financially attractive without the income from CERs sales.

Step 2: Common practice analysis

Step 4 (common practice Analysis) of the latest version of the “Tool for demonstration assessment and of additionality” agreed by the CDM Executive Board is used to conduct the common practice analysis.

Sub-step 2a. Analyze other activities similar to the proposed project activity:

The projects are considered similar, if they are in the same region, rely on a broadly similar technology, and are of the similar scale. Considering the conditions of the proposed project, the similar projects in east China region are identified as below:

Table B8 List of Similar Project Activity^{7,28}

The activity similar to the proposed project activity	Information of the projects	Notes
Zhejiang Zhenhai CCGT power project	Location: Zhenhai county, Ningbo City, Zhejiang Province Installed capacity: 2 X 350 MW level Expected operational time: 2007	Under the development as CDM projects
Zhejiang Yuyao CCGT power project	Location: Yuyao County, Ningbo City, Zhejiang Province Installed capacity: 2 X 350 MW level Expected operational time: 2007	Under the development as CDM projects
Zhejiang Banshan CCGT power project	Location: Banshan District, Hangzhou City, Zhejiang Province Installed capacity: 3 X 350 MW level Operational time: 2005	Under the development as a CDM project
Shanghai Shidongkou CCGT power project	Location: Shanghai city Installed capacity: 3 X 300 MW level Expected operational time: 2007	Under the development as CDM projects
Jiangsu Huanengjinling CCGT	Location: Jinling County,	Under the development as CDM

²⁷ <http://www.ocn.com.cn/reports/2006123tianranqi.htm>

²⁸ <http://cdm.ccchina.gov.cn/web/index.asp>, <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1272.pdf>



power project	Nanjing City, Jiangsu Province Installed capacity: 2 X 390 MW Expected operational time: 2007	projects
Fujian Jinjiang CCGT power project	Location: Jinjiang City, Fujian Province Installed capacity: 4 X 350 MW level Expected operational time: 2007	Under the development as CDM projects
Fujian Xiamendongbu CCGT power project	Location: Xiamen City, Fujian Province Installed capacity: 2 X 350 MW level Expected operational time: 2008	This project is fully invested by an international company, East Asia Power (EAP) China, which is owned by RGM International, a multinational corporation with the head office in Singapore. This is the first gas-fired power plant fully invested by a multinational company in China
Fujian Putian CCGT power project	Location: Putian City, Fujian Province Installed capacity: 4 X 350 MW level Expected operational time: 2007	Under the development as CDM projects

Sub-step 2b. Discuss any similar options that are occurring:

Therefore, excluding the projects which have been under development as CDM projects, one similar activity can be identified, Fujian Xiamendongbu CCGT power project. As a foreign enterprise in Xiamen City, Fujian Province, China, this project enjoys lots of benefits²⁹. With the large benefits, this project must be more financially attractive than the proposed project.

To conclude, there are essential distinctions between the proposed project and the similar one. Therefore, the similar projects identified do not contradict the claim that the proposed project activity is financially unattractive.

Step 3: Impact of CDM Registration

According to investment analysis the IRR for total investment of the project is 6.34%, which is obviously lower than the benchmark, showing that the project is unlikely financially attractive without the CERs revenues. The main barrier of the project is that the gas price has increased continuously while the electricity tariff received by the project is unlikely to reach the optimal level. Considering the project can reduce CO₂ emissions due to using natural gas, the less carbon intensive fuel comparing to coal-fired plant, the project owner has been seeking helps from the clean develop mechanism (CDM) since it realized the potential of the proposed project as a CDM project. The incentive of CDM was also

²⁹ <http://www.fjlit.gov.cn/display.jsp?articleId=2385>, <http://www.huaxia.com/gd/csdh/xm/00258615.html>



evaluated and considered when the Hangzhou Branch of China Everbright Bank granted the loans to the proposed project, which is reflected in the Letter of Confirmation and Reply to the Submission of supplementary Loan Evaluation Materials by Hangzhou Branch of China EverBright Bank on 30 January 2005.

If the project activity is registered as a CDM project, and the price of the project's CERs is assumed to be 8 EURO/ tCO₂e, the IRR of the total investment of the project activity will increase to 10.32%, making the project financially attractive.

Project IRR of the proposed project without and with CDM revenues

	Project IRR
Without CERs	6.34%
With CERs	10.32%

The successful registration of the project activity will also encourage the development of the technology of gas-steam combined cycle power generation, and will lead to further GHG emission reductions.

In a summary, all three steps are satisfied, the project is considered additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to AM0029, the procedure for estimation of the emission reductions from the project activity during the crediting period are stated as the following four steps:

Step 1: Project Emissions (PE_y)

The project activity is on-site combustion of nature gas to generate electricity. According to the feasibility study report, natural gas will be the only type of fuel consumed in the proposed project. The CO₂ emissions from electricity generation (PE_y) are calculated as follows:

$$PE_y = \sum FC_y \times COEF_y$$

Where,

FC_y	Quantity of nature gas combusted in the project plant in year 'y'. This parameter will be monitored during the crediting period and its value for <i>ex-ante</i> assessment is $5.3354 \times 10^8 \text{ Nm}^3/\text{a}$, which is based from the FSR of the project.
$COEF_y$	The CO ₂ emission coefficient for nature gas (tCO ₂ /m ³) in year 'y'. This parameter is obtained as the following equation.

$$COEF_y = NCV_y \cdot EF_{CO_2,y} \cdot OXID_{NG}$$

Where,

NCV_y	The net calorific value per volume unit of nature gas in year 'y' (MJ/m ³) as determined from the nature gas supplier. This parameter will be monitored during the crediting period and its value for <i>ex-ante</i> assessment is 33.656 MJ/m^3 , the data is
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	provided by the natural gas supplier - Zhejiang Provincial Natural Gas Development Corporation, as indicated in the FSR of the project.
$OXID_{NG}$	The oxidation factor of nature gas. This parameter will be monitored during the crediting period and its value is 1, which is from IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
$EF_{CO_2,y}$	The CO ₂ emission factor per unit of energy of nature gas in year ‘y’ (tCO ₂ /TJ) as determined from the nature gas supplier, wherever possible, otherwise from local or national data. This parameter will be monitored during the crediting period and its value is converted into 56.1 tCO ₂ /TJ (IPCC default value is 15.3 tC/TJ).

Step 2: Baseline Emission (BE_y)

Baseline emissions are calculated by multiply the electricity generated in the project plant (EG_y) with a baseline emission factor ($EF_{BL,CO_2,y}$), as follows:

$$BE_y = EG_y \times EF_{BL,CO_2,y}$$

Where,

EG_y	Net electricity generation in the project plant in year ‘y’. This parameter will be monitored during the crediting period and its value for <i>ex-ante</i> assessment is 2525.25 GWh which is taken from the FSR of the project.
$EF_{BL,CO_2,y}$	The baseline CO ₂ emission factor (tCO ₂ /MWh) in year ‘y’. The determination of this parameter will be made once at the validation stage based on an <i>ex-ante</i> assessment, once again at the start of each subsequent crediting period. If BM or CM is selected, they will be estimated ex post, as described as ACM0002. This parameter is obtained by calculation as follows.

$$EF_{BL,CO_2,y} = \min(EF_{BL,BM,y}, EF_{BL,CM,y}, EF_{BL,CO_2,option3})$$

Where,

$EF_{BM,y}$	The build margin (tCO ₂ e/MWh), calculated according to ACM0002. Its value is 0.770 tCO ₂ e/MWh.
$EF_{CM,y}$	The combined margin (tCO ₂ e/MWh), calculated according to ACM0002, using a 50/50 OM/BM weight. $EF_{CM,y} = \omega_{OM} \cdot EF_{OM,y} + \omega_{BM} \cdot EF_{BM,y}$ The combined margin is calculated to be 0.844 tCO ₂ e/MWh.
$EF_{BL,CO_2,option3}$	The emission factor (tCO ₂ e/MWh) of the technology (and fuel) identified as the most likely baseline scenario under “Identification of the baseline scenario” in section B.4 of this PDD. In this PDD, the technology (and fuel) of the most likely baseline scenario is 600MW coal-fired power generation unit. This parameter is obtained by calculation as follows.

The calculation of $EF_{BM,y}$ and $EF_{CM,y}$ are as follows:



STEP 1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$)

$EF_{OM,y}$ will be calculated based on one of the four following methods:

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch Data Analysis OM, or
- (d) Average OM.

The method (c) requires the detailed operation and dispatch data of power plants in the grid. But there is no publicly available dispatch data for the East China Grid. Therefore, the method (c) is not applicable.

The method (b), simple adjusted OM, needs the annual load duration curve of the grid. Based on the same reason stated in the above paragraph, the necessary data for the method (b) are difficult to obtain, so the method (b) is not applicable.

The Simple OM method (a) is used when low-cost/must run resources constituted less than 50% of the total grid generation in an average of 5 most recent years. According to the data from *China Power Yearbook 2001~2005*, the share of the low-cost/must run resources in the East China Power Grid are 10.47% (2000), 11.49% (2001), 11.86% (2002), 10.96% (2003), and 9.77% (2004), respectively. Therefore, it is reasonable to select the method (a) to calculate the OM emission factor.

The method (d), average OM, is used when low-cost/must run resources³⁰ constitute more than 50% of total amount of power generation in the grid. Based on the above data, the method (d) is not applicable.

The Simple OM can be calculated using either of the two following data vintages for years(s) y :

- (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

Here *ex-ante* vintage is chosen, and EF_{OM} is fixed during the crediting period.

According to the ACM0002, the Simple OM emission factor ($EF_{OM, simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO₂/MWh) of all generating sources that serve the system, excluding low-operating cost and must-run power plants. The formula of $EF_{OM, simple,y}$ calculation is

$$EF_{OM, simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_j GEN_{j,y}} \quad (6)$$

³⁰ Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal-fired power is obviously a must-run, it should also be included in this list, i.e. excluded from the set of plants.



Where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y , while j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid³¹;

$COEF_{i,j,y}$ is the CO₂ emission coefficient of fuel i (tCO₂ / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y ;

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

The CO₂ emission coefficient $COEF_{i,j,y}$ is obtained as

$$COEF_{i,j,y} = NCV_i \cdot EF_{CO_2,i} \cdot OXID_i \quad (7)$$

Where:

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

$OXID_i$ is the oxidation factor of the fuel i ,

$EF_{CO_2,i}$ is the CO₂ emission factor per unit of energy of the fuel i .

If available, local values of NCV_i and $EF_{CO_2,i}$ shall be used. If not, country-specific values are preferable to IPCC default values. In this PDD, NCV_i of different fuels are obtained from *China Energy Statistical Yearbook 2005*. With regard to the fuel types where NCV_i fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO_2,i}$ of fossil fuel comes from IPCC default values.

The Simple OM Emission Factor ($EF_{OM, simple,y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the East China Grid, excluding those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2003~2005, published annually) and *China Energy Statistical Yearbook* (2000~2005). Based on these data, the Simple OM Emission Factor ($EF_{OM, simple,y}$) of the East China Power Grid is calculated as 0.917 tCO₂e/MWh (see Annex 3 for details).

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$):

According to ACM0002, $EF_{BM,y}$ is determined by the formula as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_m GEN_{m,y}} \quad (8)$$

where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method in step 1 for plants m .

ACM0002 provides two options for sample group m :

³¹ As described above, imports from a connected electricity system should be considered as one power source j .



- (1) The five power plants that have been built most recently, or
- (2) The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The one with larger annual generation should be used.

In the East China Grid, the information on the five power plants built most recently is not available. According to the EB's guidance on DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China", the EB accepted the following deviation³²:

- Use of capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity;
- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

Therefore, this proposed project uses the alternative method to calculate $EF_{BM,y}$, and the formula is

$$EF_{BM,y} = [EF_{BTCA_fire,y} \times CAP_{fire,y-n,y}] / [\sum_j CAP_{j,y-n,y}] \quad (9)$$

Where $CAP_{fire,y-n,y}$ is the incremental installed capacity of fuel-fired power (MW) in y year compared to that of $y-n$ year;

$\sum_j CAP_{j,y-n,y}$ is the total incremental installed capacity of various power sources in the grid during the years from y to $y-n$ year;

$[CAP_{fire,y-n,y}] / [\sum_j CAP_{j,y-n,y}]$ represents the share of incremental installed capacity of fuel-fired power in the whole incremental installed capacity.

where, n is fixed by:

Starting from y year, the differences of installed capacity between y year and $y-1$ year, y year and $y-2$ year, ..., y year and $y-n$ year, y year and $y-n-1$ year, ... are calculated respectively, and then divided by the installed capacity of y year. The year that can make the left-hand side of the following formula greater than 20% will be regarded as n . The formula is as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \quad (10)$$

$EF_{BTCA_fire,y}$ is the emission factor of fuel-fired power with best technology commercially available (BTCA). It represents the trend of decreased coal consumption in the fuel-fired power generation brought by technology advancement in the coming years. Compared with the method for $EF_{BM,y}$ provided by

³² <http://cdm.unfccc.int/Projects/Deviations>



ACM0002 Methodology, the value of $EF_{BTCA_fire,y}$ is lower than that of other types of fuel-fired power plants to be built in the grid, because the emission factor of the alternative method reflects the fuel efficiency of the fuel-fired power plants which use the best technology commercially available. Therefore, the building margin factor through this method is conservative.

The following section describes the process of calculating $EF_{BTCA_fire,y}$ for the East China Grid. According to the data from *China Power Yearbook 1999-2005*, and with the year 2004 regarded as the most recent year of y , the incremental installed capacity between year 2001 and year 2004 are used for $EF_{BM,y}$ calculation.

The calculation for value of $EF_{BTCA_fire,y}$ is based on the 320g/kWh of standard coal consumption for fuel-fired power generation. This is conservative compared with the coal consumption efficiency of 336.66 g SCE/kWh which is defined as the best technology commercially available in China (<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf>)

Strictly speaking, fossil-fuel fired power plants other than coal fired such as oil-fired and gas-fired plant should be included when calculating the emission factor of fuel-fired power with best technology commercially; However, the respective capacity for fossil-fuel fired power plants other than coal fired ones in China is not publicly available, therefore, it is impossible to calculate BM using this weighted average Carbon Emission Factor method³³.

As far as East China Power Grid is concerned, there is little oil and gas consumption for fuel-fired power plant, e.g., CO₂ emission from the oil (Percentage:3.39%) and gas (Percentage:0.53%) in East China Power Grid account for 3.92% in total emission of the grid in 2004³⁴. Therefore, to neglect the impact of other types of fossil fuelled power plants on BM calculation is acceptable. It must also be noted that the standard coal consumption of 320g/kWh applied to determine the BM emission factor is conservative compared with the fuel consumption of the best available coal plant 336.66g/kWh determined by the DNA of China³⁴), therefore, the value of 320g/kWh both reflects the best available technology (with lowest carbon emission level) in China and is very conservative, thus compensating for not all fossil fuelled consumed for power generation being coal.

Therefore, by multiplying the value of $[CAP_{fire,y-n,y}]/[\sum_j CAP_{j,y-n,y}]$ with the value 0.886 of $EF_{BTCA_fire,y}$, the value of $EF_{BM,y}$ is 0.770. (See Annex 3 for details)

Step3. Calculate the combined margin emission factor EF_y

Based on ACM0002, the baseline emission factor EF_y should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$),

³³ DNV's response to requests review of "Saihanba East 45.05MW Windfarm project", which can be found at the website:<http://cdm.unfccc.int/Projects/DB/DNV-CUK1155680126.47/ReviewInitialComments/ERTROU4VJT56H2K8RIBISF5BYZ0NWF>; The 28th meeting of CDM-Executive Board agreed with DNV's response and agreed to register this project, which can be found in the meeting report of EB's 28th meeting: <http://cdm.unfccc.int/EB/028/eb28rep.pdf>

³⁴ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf>,



where the weights w_{OM} is 0.50 and w_{BM} is 0.50 by default, and $(EF_{OM,y})$ and $(EF_{BM,y})$ are calculated as described in Step 1 and 2.

$$EF_y = 0.917 \times 0.50 + 0.770 \times 0.50 = 0.844 \text{ (tCO}_2\text{e/MWh)}$$

The calculation of $EF_{BL,CO2,option3}$ is as follows:

$$EF_{BL,CO2,option3} = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6 \text{ GJ / MWh}$$

Where,

$COEF_{BL}$	The fuel emission coefficient (tCO ₂ e/GJ), based on national average fuel data, if available, otherwise IPCC defaults can be used. The value of 0.0946 tCO ₂ e/GJ is applied in this PDD based on <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> .
η_{BL}	The energy efficiency of the technology, as estimated in the baseline scenario analysis in section B.4 of this PDD. Its value is 36.53% which is taken from the <i>Notification on Determining Baseline Emission Factor of China's Grid</i> issued by China's DNA on Dec 15 th , 2006 on http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf .

Step 3: Leakage (LE_y)

Because the project plant doesn't take use of liquid natural gas (LNG), the leakage of the project activity is calculated as follows:

$$LE_y = [FC_y \times NCV_y \times EF_{NG,upstream,CH4} - EG_y \times EF_{BL,upstream,CH4}] \times GWP_{CH4}$$

Where:

LE_y	Leakage emissions during the year y in tCO ₂ e
FC_y	Quantity of nature gas combusted in the project plant during the year y in m ³ . This parameter will be monitored during the crediting period. Its value for <i>ex-ante</i> assessment is $5.3354 \times 10^8 \text{ Nm}^3/\text{a}$, which is taken from the FSR of the project.
NCV_y	Average net calorific value of the nature gas combusted during the year y in TJ/m ³ . This parameter will be monitored during the crediting period. Its value for <i>ex-ante</i> assessment is 33.656 MJ/m ³ . The data is provided by the natural gas supplier - Zhejiang Provincial Natural Gas Development Corporation, as indicated in the FSR of the project.
$EF_{NG,upstream,CH4}$	Emission factor for upstream fugitive methane emissions of natural gas from production, transportation and distribution in t CH ₄ per GJ fuel supplied to final consumers. This parameter's value is 296 tCH ₄ /PJ which taken the IPCC default value.
EG_y	Electricity generation in the project plant during the year y in GWh. This parameter will be monitored during the crediting period and its value for ex ante assessment is 2525.25 GWh which taken from the FSR of the project.



GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period. This parameter's value is taken 21 tCO ₂ e/tCH ₄ .
$EF_{BL, upstream, CH4}$	Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH ₄ per MWh electricity generation in the project plant.

$EF_{BL, upstream, CH4}$ should be calculated consistent with the baseline emission factor ($EF_{BL, CO2}$) used above, as follows:

- Option 1 Build Margin:

$$EF_{BL, upstream, CH4} = \frac{\sum_j FF_{j,k} \cdot EF_{k, upstream, CH4}}{\sum_j EG_j}$$

- Option 2 Combined Margin:

$$EF_{BL, upstream, CH4} = 0.5 \frac{\sum_j FF_{j,k} \cdot EF_{k, upstream, CH4}}{\sum_j EG_j} + 0.5 \frac{\sum_i FF_{i,k} \cdot EF_{k, upstream, CH4}}{\sum_i EG_i}$$

- Option 3 Baseline technology:

$$EF_{BL, upstream, CH4} = \frac{EF_{k, upstream, CH4}}{\eta_{BL}} * 3.6GJ / MWh$$

Where,

$FF_{j,k}$: quantity of fuel type k (a coal or oil type) combusted in power plant j included in the build margin.
 $EF_{k, upstream, CH4}$: Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in t CH₄ per MJ fuel produced.

EG_j : Electricity generation in the plant j included in the build margin in MWh/a

i : Plants included in the operating margin.

$FF_{i,k}$: quantity of fuel type k (a coal or oil type) combusted in power plant i included in the operating margin.

EG_i : Electricity generation in the plant i included in the operating margin in MWh/a

η_{BL} : Energy efficiency of the most likely baseline technology

Since the underground mines account about 97% of total coal production capacity in China³⁵, which are obviously the predominant source, the default of $EF_{k, upstream, CH4} = 13.4$ t CH₄/kt coal is chosen from table 2 of the methodology. If $EF_{BL, upstream, CH4}$ is determined based on the build margin or the combined margin, the calculation should be consistent with the calculation of CO₂ emissions in the build margin and the combined margin, therefore, $FF_{i,k}$ can be calculated by multiplying EG_j with CEF . Where total net leakage effects are negative ($LE_y < 0$), project participants should assume $LE_y = 0$

Step 4: Emission Reductions (ER_y)

³⁵ <http://info.bosslink.com/htmlnews/2005/09/06/620498.htm>



The emission reductions of the project activity (ER_y) is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where,

BE_y	Emissions in the baseline scenario in year y (t CO ₂)
PE_y	Emissions in the project scenario in year y (t CO ₂)
LE_y	Leakage in year y (t CO ₂)

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	T or m ³
Description:	Amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	$GEN_{i,y}$
Data unit:	MWh
Description:	Electricity delivered to the grid by relevant power sources j excluding low operating cost/must run power plants in year y
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/t(m ³)
Description:	Net calorific value (energy content) per mass or volume unit of fuel i
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice	According to ACM0002, the national specific value shall be used



of data or description of measurement methods and procedures actually applied :	preferentially.
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	
Description:	Oxidation factor of the fuel i
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of oxidation factors in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tCO ₂ /TJ
Description:	CO ₂ emission factor per unit of energy of the fuel i
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of fuel carbon emission factor in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Installed capacity of relevant power source j connected to the grid in year y
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the EB guidance regarding application of AM0005 in China, the capacity weighted is used instead of generation weighted in calculation of BM emission factor.
Any comment:	

Data / Parameter:	$FC_{Adv, coal}$
Data unit:	gce/kWh
Description:	The coal consumption of power supply with the best thermal power technology commercially available.



Source of data used:	<i>Fuel-fired Power Generation.</i> http://www.ccchina.gov.cn/source/fa/fa2002082803.htm
Value applied:	320g/kWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is conservative compared with the data defined by the DNA of China http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf
Any comment:	

Data / Parameter:	η_{BL}
Data unit:	
Description:	Energy efficiency of the technology
Source of data used:	Chinese DNA
Value applied:	36.53%
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is recommended by Chinese DNA
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global Warming Potential for CH ₄
Source of data used:	IPCC default value
Value applied:	21 for the first commitment period.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Shall be updated according to any future COP/MOP decisions.

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

Based on the procedures and data mentioned in sections B 6.1, B 6.2 and B7.1 of this PDD, the ex-ante calculation of emission reductions of the project activity is presented as follows:

Ex-ante calculation of project emission (PE_v)

Item	FC_y (m ³ /a)	NCV_v (MJ/m ³)	$EF_{CO_2,v}$ (tCO ₂ /TJ)	$OXID_{NG}$	PE_v (tCO ₂ e/a)
	A	B	C	D	E
Data	533,540,000	33.656	56.1	1	1,007,377



Data source	FSR of the project	Natural gas supplier	IPCC 2006	IPCC 2006	$E=A*B*C*D/10^9$
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Ex-ante calculation of baseline emission (BE_y)

Item	$COEF_{BL}$ (tCO ₂ /GJ)	η_{BL}	$EF_{BL,CO_2,option3}$ (tCO ₂ /MWh)	EG_y (MWh)
	F	G	H	I
Data	0.0946	36.53%	0.9323	2525250
Data source	25.8 tC/TJ * (44/12)/1000	DNA of China	$H=(F/G)*3.6\text{GJ/MWh}$	FSR of project

Item	$EF_{BM,y}$ (tCO ₂ /MWh)	$EF_{OM,y}$ (tCO ₂ /MWh)	$EF_{CM,y}$ (tCO ₂ /MWh)	$EF_{BL,co2,y}$ (tCO ₂ /MWh)	BE_y (tCO ₂ e/a)
	J	K	L	M	N
Data	0.770	0.917	0.844	0.770	1,944,445
Data source	China's DNA	China's DNA	$L=0.5*J+0.5*K$	$E= \min(J,L,H)$	$N= I*M$

Ex-ante calculation of leakage (LE_y)

Item	$EF_{NG,upstream,CH_4}$ (tCH ₄ /PJ)	$EF_{BL,upstream,CH_4}$ (tCH ₄ /MWh)	GWP_{CH_4} (tCO ₂ /tCH ₄)	LE_y (tCO ₂ e/a)
	P	Q	R	S
Data	296	0.003726	21	$-85989 < 0$, so $LE_y = 0$
Data source	AM0029	Annex 3 of the PDD	IPCC	$S=[A*B*P/10^9-I*Q]*R$

Ex-ante calculation of emission reductions (ER_y)

$$ER_y = BE_y - PE_y - LE_y = 1944445 - 1007377 - 0 = 937067 \text{ tCO}_2\text{e/a}$$

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

Year	Estimation of project activity emissions (tons of CO ₂ e)	Estimation of baseline emissions (tons of CO ₂ e)	Estimation of leakage (tons of CO ₂ e)	Estimation of overall emission reductions (tons of CO ₂ e)
------	---	---	--	--



2008 ³⁶	1,007,377	1,944,445	0	937,067
2009	1,007,377	1,944,445	0	937,067
2010	1,007,377	1,944,445	0	937,067
2011	1,007,377	1,944,445	0	937,067
2012	1,007,377	1,944,445	0	937,067
2013	1,007,377	1,944,445	0	937,067
2014	1,007,377	1,944,445	0	937,067
Total (tons of CO₂e)	7,051,644	13,611,113	0	6559469

B.7. Application of the monitoring methodology and description of the monitoring plan:
B.7.1. Data and parameters monitored:

The primary parameters to be monitored for the project emissions during the crediting period are listed below:

Data / Parameter:	$FC_{Natural\ gas}$
Data unit:	m ³ /a
Description:	Net quantity of nature gas consumed in project activity in year 'y'.
Source of data to be used:	Fuel flow meter reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	533540000
Description of measurement methods and procedures to be applied:	The total fuel consumption will be monitored both at supplier and project end for cross-verification. The accuracy of the natural gas flow meter at the plant is 0.5% and the accuracy of the natural gas flow meter at the supplier's station is 1%. The measurement will be taken online continuously by the flow meter and the data will be recorded daily. All the measurement instruments and procedure adopted shall be as per the industry practice.
QA/QC procedures to be applied:	Nature gas metering to the project will be subject to regular maintenance and testing in accordance with stipulation of the meter supplier, applicable industry and national standards and relevant agreements to ensure accuracy. The readings will be double checked (cross-verified) by the gas supply company.
Any comment:	Data will be archived by electronic/paper as available.

Data / Parameter:	$NCV_{Natural\ gas}$
Data unit:	GJ/m ³
Description:	Net calorific value of nature gas consumed in the project plant in year

³⁶ The first crediting period is expected to be from 1 January 2008 to 31 December 2014.



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	'y'. The values will be recorded fortnightly.
Source of data to be used:	Natural gas supplier
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.033656
Description of measurement methods and procedures to be applied:	The value is according to the report from supplier and the details are based on the relevant terms in the Purchase Agreement. Alternative data sources are local authority and country specific values.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	$EF_{CO_2, natural\ gas}$
Data unit:	tCO ₂ /TJ
Description:	The CO ₂ emission factor per unit of energy of nature gas in year 'y'
Source of data to be used:	Local/Regional/Global (IPCC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	56.1
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, that order of preference. The data will be recorded annually.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	$OXID_{Natural\ gas}$
Data unit:	%
Description:	Oxidation factor of nature gas used by the project plant
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	Use IPCC current default The data will be recorded annually.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	FC_v
Data unit:	m ³
Description:	Net quantity of fuel other than consumed in project activity in year 'y'.
Source of data to be used:	Fuel flow meter reading at project boundary
Value of data applied for the	0



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purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	According to the feasibility study report, the only type of fuel used in the project is natural gas. There is no other fuel used. This data is monitored in case of emergency.
QA/QC procedures to be applied:	
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	NCV_y
Data unit:	GJ/m ³
Description:	Net calorific value of fuel other than nature gas consumed in the project plant in year 'y'. The values will be recorded fortnightly.
Source of data to be used:	Fuel Supplier, Local Authority, Country specific, IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, that order of preference. IPCC values can be used for startup fuel. According to the feasibility study report, the only type of fuel used in the project is natural gas. There is no other fuel used. This data is monitored in case that fuel other than natural gas is used.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	$EF_{CO_2,y}$
Data unit:	tCO ₂ /TJ
Description:	The CO ₂ emission factor of the fuel other than nature gas in year 'y'
Source of data to be used:	Local/Regional/Global (IPCC)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, that order of preference. IPCC values can be used for startup fuel. According to the feasibility study report, the only type of fuel used in the project is natural gas. There is no other fuel used. This data is monitored in case that fuel other than natural gas is used.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	$OXID_y$
Data unit:	%
Description:	Oxidation factor of the fuel other than nature gas used by the project



	plant
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A
Description of measurement methods and procedures to be applied:	Use IPCC current default According to the feasibility study report, the only type of fuel used in the project is natural gas. There is no other fuel used. This data is monitored in case that fuel other than natural gas is used.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	GWP_{CH_4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global Warming Potential for CH ₄
Source of data to be used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21 for the first commitment period.
Description of measurement methods and procedures to be applied:	Applying the up-to-date data recommended by COP/MOP decisions.
QA/QC procedures to be applied:	
Any comment:	

The primary parameters to be monitored for baseline emissions as per ACM0002 during the crediting period are listed below:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity delivered to the grid by the project activity in year 'y'.
Source of data to be used:	Electricity meters reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2525250
Description of measurement methods and procedures to be applied:	The readings of electricity meters will be continuously measured and monthly recorded. The accuracy of the electricity meters is 0.2S level. The measurement will be taken online and the data is recorded in the control system. All the measurement instruments and procedure adopted will be as per the industry practice.
QA/QC procedures to be applied:	The electricity meters will be subject to regular maintenance and testing in accordance with stipulation of the applicable industry, national standards and relevant agreements to ensure accuracy.



	The electricity meters will be calibrated at least once a year. Double check by receipt of sales.
Any comment:	Data will be archived by electronic/paper.

Data / Parameter:	$EF_{BM,y}$
Data unit:	t CO ₂ e/MWh
Description:	Build Margin emission factor
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.770
Description of measurement methods and procedures to be applied:	Data will be yearly recorded and will be archived by electronic/paper.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	BTCA
Data unit:	g/kWh
Description:	fuel consumption for best technology commercially available
Source of data to be used:	DNA of China
Value of data applied for the purpose of calculating expected emission reductions in section B.5	320
Description of measurement methods and procedures to be applied:	Applying the most conservative value from the DNA of China
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	

Data / Parameter:	CAP_{fire-y}
Data unit:	MW
Description:	installed capacity of fuel-fired power in year y within the east china grid
Source of data to be used:	China Electric Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in China Electric Power Yearbook
QA/QC procedures to be	



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applied:	
Any comment:	

Data / Parameter:	CAP _y
Data unit:	MW
Description:	Total installed capacity of various power in year y within the east china grid
Source of data to be used:	China Electric Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in China Electric Power Yearbook
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	Fuel Energy Value
Data unit:	GJ/tSCE
Description:	Fuel energy value of Standard Coal Equivalent
Source of data to be used:	Chinese National Standard
Value of data applied for the purpose of calculating expected emission reductions in section B.5	29.27
Description of measurement methods and procedures to be applied:	Applying the value of national standard
QA/QC procedures to be applied:	
Any comment:	

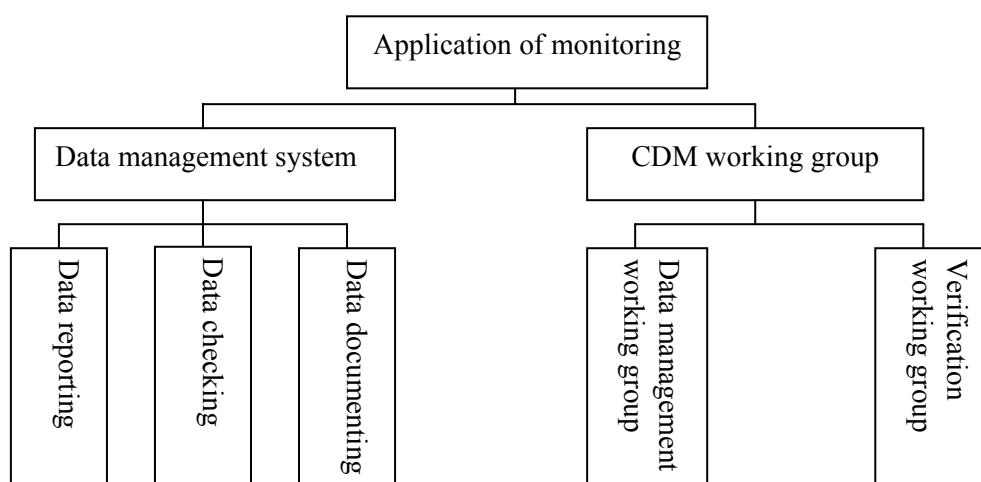
Data / Parameter:	η_{BL}
Data unit:	%
Description:	Energy efficiency of the technology
Source of data to be used:	Chinese DNA
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36.53
Description of measurement methods and procedures to be applied:	Applying the up-to-date data recommended by DNA of China
QA/QC procedures to be applied:	



Any comment:	
Data / Parameter:	OXIDf
Data unit:	
Description:	Oxidation rate of the fuel y
Source of data to be used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	Applying the up-to-date value of IPCC
QA/QC procedures to be applied:	
Any comment:	

B.7.2. Description of the monitoring plan:

Monitoring plan for the project activity includes the details of the operation and management of the project activity during the crediting period and the measurement of the parameters in baseline and project emission scenarios that will be used to calculate actual emission reductions. The main framework is shown in the below figure. The monitoring plan of the project activity is organized as per the statement presented below. The further background information include under Annex 4.

**Introduction**

The Xiaoshan Power Plant's NG Power Generation Project of Zhejiang Southeast Electric Power Co., Ltd. adopts the approved monitoring methodology AM0029 (version 01, 19 May 2006) "Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel." to determine the



emission reductions from the net electricity generation from the project.

Organizational structure & procedures during project implementation

The host entity of this project is Zhejiang Southeast Electric Power Co., Ltd. An independent institution of operation and management for CDM project will be formed, and directed by the general manager of Zhejiang Southeast Electric Power Co., Ltd. Its operation and management framework is described below:

CDM Project Director:

Part-time by the General Director or Deputy General Director of ZheJiang Southeast Electric Power Co., Ltd, who will take charge of the management of the CDM project, take responsibility for Chinese DNA and stakeholders, meanwhile, take charge of the coordination with buyer countries and DOE;

CDM Manager:

He/she will take charge of the operation and management of CDM project, monitoring and statistics of material supply and utilization, project production, and cooperate with validation and verification, etc;

CDM Operation Team:

They will take charge of the regular monitor works, including monitoring of raw data, data aggregation and processing, statistic and storage of the processed data, calibration and maintenance of the measurement equipments, and cooperate with validation and certification, etc.

Training

All staff involved in any of the procedures related with the CDM project activity will be trained before the start of the crediting period in order to perform the tasks specified in the monitoring plan.

Calibration, testing and maintenance for measurement equipments

The detailed calibration, testing and maintenance procedure for the measurement equipments used to monitor data of the project activity shall be prepared by the CDM Manager based on the agreements with the nature gas supplier, equipment manufacturer's recommendations and the industry and national standards as applicable.

Data monitoring

The main data monitoring of the CDM project activity within the crediting period include:

Monitoring of net electricity generated by the project activity:

The net electricity generated by the project will be monitored through the electric meters within the project boundary. This data should be monitored and recorded daily by the computer system. There should be main and backup metering system in the control centre. The recorded readings should be readily accessible for DOE in verification. The records for calibration, testing and maintenance of the electric meters should be also readily accessible for DOE in verification.

Monitoring of quantity of nature gas combusted by the project activity:

Quantity of nature gas combusted will be monitored through the gas flow meters both at the project end and nature gas supplier for cross-verification. This data should be monitored and recorded daily by the computer system. The detailed monitoring procedure of this data should be established in accordance with the agreements with the nature gas supplier. The recorded readings should be readily accessible for DOE in verification. The records for calibration, testing and maintenance of the gas flow meters should be also readily accessible for DOE in verification.

*Monitoring of NCV of natural gas combusted by the project activity:*

The detailed monitoring procedure of NCV of nature gas combusted by the project activity should be established in accordance with the agreements with the nature gas supplier. This data should be monitored and recorded fortnightly by the computer system. The recorded readings should be readily accessible for DOE in verification. The records for calibration, testing and maintenance of the gas flow meters should be also readily accessible for DOE in verification. $OXID_f$ and $EF_{CO_2f,y}$ will also be monitored.

Monitoring of relevant data used to calculate the baseline emission factor of BM:

According the approved monitoring methodology AM0029, the relevant baseline emission parameters will be monitored per ACM0002. In this PDD, the baseline emission factor has been selected to BM, so the relevant parameters used to calculate BM should be publicly available (e.g. raw data of *China Electric Power Yearbook*, IPCC, etc.) in china and monitored and recorded annually by the computer system. The recorded data and revised ex-post calculation should be readily accessible for DOE in verification.

Recording and archiving of data

The on-site control centre will be established from where all electronic data will be remotely monitored and recorded. Staff working at the control centre will prepare a daily report on the operations of the CDM project activity and this daily report will record data readings and equipment defects, outages, repairs and maintenance activities. All relevant information, notes of meetings, data files, maintenance records, defect reports, hard copy and computerised records of monitoring will be kept at the control centre or other designated location, and arranged in an orderly and transparent manner to facilitate audit as and when required. All monitored data required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later.

Meters failure

Should any reading of the main meters be inaccurate by more than the allowable error, or otherwise functioned improperly, the monitored parameters will be determined by:

- (a) First, by reading backup meter installed, unless a test by either party reveals it is inaccurate;
- (b) If the backup system is not within acceptable limits of accuracy or is otherwise performing improperly, the developer, the Grid Company and the natural gas supply company will jointly prepare an estimate of the correct reading;
- (c) If the developer, the Grid Company and the natural gas supply company fail to agree then the matter will be referred for arbitration according to agreed procedures.

Emergency preparedness

Disposal of Emergency will be implemented according to the stipulations in the Management Regulations of the Xiaoshan Power Plant of Zhejiang Southeast Electric Power Co., Ltd.

Review of monitored data

Monitored data will be reviewed by responsible personnel. This audit will check compliance with operational procedures in this monitoring plan.

This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. If such improvements are proposed these will be reported to the DOE and only operated after approval from the DOE.

Verification of monitoring results



The verification of the monitoring results of the project activity is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

The responsibilities for verification of the projects are as follows:

- CDM Manager will take charge of the arrangements for the verification and will prepare for the audit and verification process to the best of his/her abilities.
- CDM Manager will provide the DOE with all required necessary information, before, during and, in the event of queries, after the verification due to facilitate verification.
- CDM Manager will fully cooperate with the DOE, instruct other relevant staff, management to be available for interviews and respond honestly to all questions from the DOE.

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

The study of the baseline and the monitoring methodology was completed on July 19th, 2007.

The key individuals involved in the baseline study include:

Dr. Zhan Ying Yu, Ya Qin Chen and Da Fei Huang of EEA Clean Energy China Ltd, email: china@eeafm.com; and:

1. Mr. Ding Zhaoming, edding@china-carbon.cn, China Carbon Technology Co., Ltd.
2. Mr. Zhang Yanlong, yanlong@china-carbon.cn, China Carbon Technology Co., Ltd.
3. Cao Kun, EEDT@163.com, Beijing EEDT Kemao Ltd.

The above individuals or organizations are not the project participants.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

The project activity started construction on 28 December 2005.

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

21 years

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

**C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

01/01/2008, or the official registration date in UNFCCC, whichever is later

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

No applicable

C.2.2.2. Length:

No applicable

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

The Environmental Impact Assessment (EIA) of the project has been approved by the State Environmental Protection Administration of China.

Based on the EIA report, the project activity will benefit the local and regional environment in various ways. It may be noted that there are no trans-boundary impacts due to the project activity. A summary the findings from the EIA report for mitigation of negative environmental impact are provided as follows:

Construction periodImpact on plants and animals

According to the characteristics of the proposed project, the possible impacts on plants and animals during the construction period will mainly concentrate in the plant area. The area is the first stage engineer of Xiaoshan Power Plant. At present, there are many rank grasses in this area, so the project construction may lead to little impacts on this area's plants and animals.

Waste water impact

The waste water during the project construction period mainly includes the waste water discharge, such as the washing water of constructing machines and the living waste water of the construction workers. The waste water during the construction period will be disposed by the existing waste water disposing facilities.

Noise and vibration impact



Noises during the construction period will mainly come from the constructing machines such as tamping machine and the test on boiler relief valves. The vibration during the construction period will mainly come from the constructing machines such as tamping machine.

Management will be strengthened during the construction period, and the requirements of GB12523-90 *Noise Standard at the Boundary of Construction Site* will be strictly executed. The impact on Linpu Junior Middle School will be mitigated as possible. The working time of high noises machines such as tamping machine and mixing machine will be avoid the sleeping time and the school time as possible. When testing on pipeline cleaning and boiler relief valves, silencers will be installed to debase the noise impact into base line.

Dust Impact

Transportation, handwork and mechanical digging during the construction period will produce some dust. In order to keep out the dust, road and constructing area will often be watered and sprinkled.

Water and soil erosion

For the road digging and pipeline construction during the construction period, vegetation and top soil will be spoiled, which will lead the stable balance of the soil body under the natural situation and the soil structure to be destroyed. The loosening earth body will lead to the decrease of anti-erosion capability of soil body and the increase of water and soil erosion. During the construction period, maintenance and protection of surface land will be considered. Soil will be reduced to be bare, and surface vegetation will be appropriately developed to decrease soil erosion; during the construction of gas pipe, at the site with a lot of digging, the discard soil and stone will be arranged to be stored at a special place, and corresponding measures for debris retaining will also be taken. Some unstable slopes formed during the course of pipe construction should be constructed with vegetation slope protection or stone pitching. After the construction period, the area will be resumed to be the primary landscape.

Commission period

Air impact

The fuel of the proposed project is natural gas, whose main component is methane. The smoke after burning almost not includes soot, the emission of SO₂ is very little, and the emission of NO_x is also much lower than the emission level of coal fired generating units. So the natural gas is a kind of clean fuel with high thermal value and low pollution. Besides, the gas-steam combined cycle technique taken by the proposed project has the merits of complete burning and minimal pollution emission.

Therefore, the project will not install dust catcher or desulfurizer. The gas turbine will take low-NO_x burner to control the emission of NO_x, and the emission concentration of NO_x will be controlled at 86mg/m³, which will be much lower than the requirement of 650mg/m³ of III period of time in the GB13223-1996 *Emission Standard of Air Pollutants for Thermal Power Plants*. Waste heating boiler's emission will be through 2 single-pipe chimneys with 60m diameter. According to the estimating result of the model, after the construction of the proposed project, it contributes very little to the NO₂ consistency indicator of the local area air (including max subsided consistency of one hour average value under the normal condition, one hour average value under calm wind condition, daily average value and annual average value). According to the impact analysis of daily average consistency, after the construction of the proposed project, the local environmental air pollution factor NO₂ will meet the requirements of the second standard in GB3095-1996 *The Standard Environmental Air Quality*.

Water Impact



The waste water of the proposed project could be divided into production waste water and living waste water. Production waste water mainly comprises of the acidic/basic regeneration waste water, polluted water discharged from cooling tower, cooling water and acidic waste water from waste heating boiler. Waste water from cooling tower occupies the largest proportion. Its water quality is similar with the primary water, and the main pollution factor is salt content. The living waste water will mainly come from the workers in the plant area, and the main pollutants are SS and COD. The living waste water occupies a small portion, and its polluting consistency is comparatively low.

Except for disposing the waste water, the proposed project will recycle to utilize the waste water as possible. Under the normal situation, only recirculation water, blow-down water and boiler blow-down water are discharged outside, and the part of waste water could meet the requirement of first class standard in GB9878-1996, so it will affect little on the water quality of nearby water system; acidic/basic regeneration waste water produced by boiler makeup treatment system and the boiler acidic waste water are conveyed to the first stage engineering recirculation water system after counteract disposal. The proposed project set up underground living waste water disposal facilities (A/O Type). The living waste water will be conveyed to the first stage recirculation water system after it reaches the standard.

Noise Impact

The noises of gas-steam combined cycle units mainly come from the running of facilities such as gas turbine, steam turbine, generating units, water-feeding pump, cycle water pump and cooling tower. According to the estimating result of the model, during the project's operation period, the noises will be concentrated at the neighbourhood of the plants and the cooling tower. The noises within the plant boundary could almost meet the requirement of III class standard in GB12348-90 *Standard of Noise at Boundary of Industrial Enterprises*. Noises surpassed standard within the plant boundary will be far from sensitive place, and the induced effect will be little.

In order to mitigate the impact of noises, facilities with less noise will be possible selected to take into use. Requirement to the facility maker for avoiding noises will be launched when taking order of the facilities. The main facilities with noises will be concentrated in the main plant. A part of workshop with lots of noises will take use of sound absorption materials or set up sound insulation workroom. Doors and windows of controlling room of the plant area and office buildings will be avoided to face strong sound source and will be utilized sound absorption materials as possible. Appropriate virescence in the plant area will also be utilized to debase the noises' effect on environment.

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

According to the EIA report of the project, the impacts on the environment are not significant. Multiple measurement, such as environmental monitoring and mitigation measures to deal with various environmental impacts during the construction and operation phase of the project activity will be carried out strictly by the project owner.

SECTION E. Stakeholders' comments

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



During the Environmental Impact Analysis period, a stakeholder consultation has been carried out. Totally 34 questionnaires including the project instruction and comments inviting were sent out to the residents in nearby towns and villages. 34 questionnaires were returned back. 100% of the respondents thought the project would promote the local economic development and 100% of the respondents supported the construction of the project. The detailed information is included in the EIA.

In July, 2006, the project owner carried out another stakeholder consultation. The investigation has been done in the doorway of Xiaoshan Power Plant on July 31st, 2006³⁷. The summary of the comments from the local residents are presented in E.2. The initial questionnaires of the local residents' investigation could be rechecked by DOE.

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

E.2. Summary of the comments received:

Totally 34 pieces of questionnaires paper have been handed out and taken back, and the summary of the comments received is presented as follows:

- ◆ 76.5% of the respondents are males, and the rest are females;
- ◆ 5.9% of the respondents are younger than 30 years old, 32.4% are 30~40 years old, 35.3% are 40~50 years old, 26.5% are older than 50 years old;
- ◆ 8.8% of the respondents are the education degree of primary school, 44.1% are the education degree of junior middle school, 38.2% are the education degree of senior middle school, 8.8% are the education degree of above senior high school;
- ◆ 100% of the respondents are satisfied with current living environment.
- ◆ 100% of the respondents know the technical of natural gas power generation.
- ◆ 97.1% of the respondents know about the project activity, and the rest didn't.
- ◆ 100% of the respondents consider that the project activity will promote the development of local economy, 73.5% consider that the project activity will increase the living level, 52.9% consider that the project activity will expansion the job opportunity, 82.4% consider that the project activity will increase the individual income.
- ◆ 100% of the respondents consider that the negative impact of the project activity is occupied too much land, 6.7%, and other negative impacts are not mentioned;
- ◆ 90% of the respondents consider that the project activity will make more benefits than its absence, the rest consider no comments.

³⁷ See also on the bulletin about public investigation of Xiaoshan Power Plant and the return receipt



- ♦ 73.5 of the respondents consider that the construction of the project will lead partial impact, but the environmental protection measures could be taken to eliminate it; other investigators consider that the proposed project has no negative impact
- ♦ 44.1% of respondents consider that the positive aspects are much more than the negative aspects; other investigators consider that the proposed project has no negative impact.
- ♦ 100% of the respondents support the construction and operation of the project.

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

Based on the above summary of the comments received from the local residents, the project owner, Zhejiang Southeast Electric Power Co., Ltd, held a meeting to discuss the relevant enhanced measures on 15th December, 2006 at the board meeting room of Zhejiang Southeast Electric Power Co., Ltd.

The executive manager conducted this meeting and all managers of the project plant took part in the meeting. The relevant cooperation partners were also invited to attend the meeting.

The decision was made in this meeting, which include the follow measures:

- Carry out strictly environmental monitoring and mitigation measures during the construction and operation phase as per the EIA report of the project activity;
- Enhance the performance ability of the Environmental Protection Department and implement stricter Environmental Management Plan.
- Further take more attention to the comments of local residents nearby the project plant.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY.**

Project Owner

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CERs Buyer

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project activity.

**Annex 3****BASELINE INFORMATION**

According to AM0029, the baseline emission factor ($EF_{BL, CO_2, y}$) is the lowest one among the build margin emission factor (BM), the combined margin emission factor (CM) and the emission factor of the technology identified as the most likely baseline scenario ($EF_{BL, CO_2, option3}$). The operating margin emission factor ($EF_{OM, y}$) and the build margin emission factor ($EF_{BM, y}$) are calculated, according to ACM0002. The emission factor for upstream fugitive CH_4 emissions occurring in the absence of the project activity ($EF_{BL, upstream, CH_4}$) should be calculated consistent with the baseline emission factor ($EF_{BL, CO_2, y}$) used in equation as follow step 3.

Table A3-1 Installed capacities of 5 provinces (2001)

		Installed Capacity(2001)			
2001	Hydro	Coal	Nuclear	Other	Total
JiangSu	33.7	19667.8	0	0	19701.5
Shanghai	0	11232.7	0	0	11232.7
Anhui	608.8	8960.3	0	0	9569.1
Zhejiang	5732.5	12736.2	300	0	18768.7
Fujian	6180	6424	0	0	12604
Total	12555	59021	300	0	71876
%	0.175	0.821	0.004	0.000	1.000

Source: China Electric Power Yearbook 2002, page 616

Table A3-2 Installed capacities of 5 provinces (2002)

		Installed Capacity(2002)			
2002	Hydro	Coal	Nuclear	Other	Total
JiangSu	137.2	20599	0	0	20736.2
Shanghai	0	11382.6	0	0	11382.6
Anhui	649.1	9056.3	0	0	9705.4
Zhejiang	5866.8	13082.4	1678	50.2	20677.4
Fujian	6394.2	6999.9	0	12	13406.1
Total	13047.3	61120.2	1678	62.2	75907.7
%	0.172	0.805	0.022	0.001	1.000

Source: China Electric Power Yearbook 2003, page 593

Table A3-3 Installed capacities of 5 provinces (2003)

		Installed Capacity(2003)			
2003	Hydro	Coal	Nuclear	Other	Total
JiangSu	137.8	22245	0	0	22382.8
Shanghai	0	11092.6	0	0	11092.6
Anhui	649.1	9284.9	0	0	9934
Zhejiang	6054.5	15321.2	2406	39.7	23821.4



Fujian	6761.1	7092.8	0	12	13865.9
Total	13602.5	65036.5	2406	51.7	81096.7
%	0.168	0.802	0.030	0.001	1.000

Source: China Electric Power Yearbook 2004, page 708

Table A3-4 Installed capacities of 5 provinces (2004)

		Installed Capacity(2004)			
2003	Hydro	Coal	Nuclear	Other	Total
JiangSu	126.5	28289.5	0	17.5	28433.5
Shanghai	0	12014.9	0	3.4	12018.3
Anhui	692.8	9364.5	0	0	10057.3
Zhejiang	6418.4	21439.8	3056	39.7	30953.9
Fujian	7180.1	8315.4	0	12	15507.5
Total	14417.8	79424.1	3056	72.6	96970.5
%	0.149	0.819	0.032	0.001	1.000

Data source: China Electric Power Yearbook 2005, page 473



Table A3-5 Calculation of simple OM emission factor of the East China Power Grid (in 2002)

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective CO2 Emission Factor (tCO2/TJ)	average low Caloric value (MJ/t,m ³ ,tce)	CO ₂ emission (tCO ₂ e) =F*G*H
		Jiangsu	Shanghai	Anhui	Zhejiang	Fujian				
		A	B	C	D	E	F	G	H	
Raw coal	Mtons	56.7469	23.86	20.2505	29.2366	13.3649	143.4589	94.6	20908	283746899.2
Cleaned coal	Mtons	0	0	0	0	0	0	94.6	26344	0
Other washed coal	Mtons	0	0	0	0	0	0	94.6	8363	0
Coke	Mtons	0	0	0	0	0	0	94.6	28435	0
Coke oven gas	10 ¹⁰ m ³	0.0002	0.0223	0	0	0	0.0225	44.4	16726	16709.274
Other coal gas	10 ¹⁰ m ³	0	0.6682	0	0	0	0.6682	44.4	5227	155075.0542
Crude oil	Mtons	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0.0007	0	0	0	0	0.0007	69.3	43070	2089.3257
Kerosene	Mtons	0	0	0	0	0	0	71.5	43070	0
Diesel oil	Mtons	0.1345	0.0121	0	0.3	0	0.4466	74.1	42652	1411485.195
Fuel oil	Mtons	0.0119	0.532	0.0109	0.9138	0.126	1.5946	77.4	41816	5161016.025
LPG	Mtons	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0.0084	0	0	0	0.0084	57.6	46055	22283.2512
Natural gas	10 ¹⁰ m ³	0	0	0	0	0	0	56.1	38931	0
Other petroleum products	Mtons	0.0347	0.1	0	0	0	0.1347	73.3	41816	412870.6942
Other Coking Products	Mtons	0	0	0	0	0	0	107	29271.2	
Fired electricity generated	TWh	109.607996	58.2943488	42.7962892	65.1644235	28.78922	304.652277			
Electricity imported	TWh						7.38		Total tCO ₂ e Emission	290928428.1
Result	a. Total CO2 emission in East China Grid(tCO ₂ e)							290928428.1		
	b. Total generation in East China Grid(TWh)							312.0322771		
	c. OM emission factor (tCO ₂ /MWh) (a/b/10 ⁶)							0.932366455		



Table A3-6 Calculation of simple OM emission factor of the East China Power Grid (in 2003)

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective CO ₂ Emission Factor (tCO ₂ /TJ)	average low Caloric value (MJ/t,m ³ ,tce)	CO ₂ emission (tCO ₂ e)
		Jiangsu	Shanghai	Anhui	Zhejiang	Fujian				
		A	B	C	D	E				
							F	G	H	=F*G*H
Raw coal	Mtons	64.1774	26.18	26.6967	34.424	17.54	169.0181	94.6	20908	334300359.1
Cleaned coal	Mtons	0	0	0	0	0	0	94.6	26344	0
Other washed coal	Mtons	0	0	0	0	0	0	94.6	8363	0
Coke	Mtons	0	0	0	0	0	0	94.6	28435	0
Coke oven gas	10 ¹⁰ m ³	0.0006	0.0199	0	0	0	0.0205	44.4	16726	15224.0052
Other coal gas	10 ¹⁰ m ³	0	0.6634	0	0	0	0.6634	44.4	5227	153961.0759
Crude oil	Mtons	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0	0	0	0	0	0	69.3	43070	0
Kerosene	Mtons	0	0	0	0	0	0	71.5	43070	0
Diesel oil	Mtons	0.1471	0.0126	0	0.1399	0	0.2996	74.1	42652	946889.7547
Fuel oil	Mtons	0.0076	0.9549	0	1.7448	0.1889	2.8962	77.4	41816	9373720.438
LPG	Mtons	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0.0096	0.0049	0	0	0	0.0145	57.6	46055	38465.136
Natural gas	10 ¹⁰ m ³	0	0	0	0	0	0	56.1	38931	0
Other petroleum products	Mtons	0.053	0.1891	0	0.1504	0	0.3925	73.3	41816	1203056.774
Other Coking Products	Mtons	0	0	0	0	0	0	107	29271.2	0
Fired electricity generated	TWh	125.413657	65.8745784	50.8741464	78.6769741	40.0091978	360.8485537		Total	346031676.3
Electricity imported	TWh						16.2			
	a. Total CO ₂ emission in East China Grid(tCO ₂ e)							346031676		
Result	b. Total generation in East China Grid(TWh)							377.048554		
	c. OM emission factor (tCO ₂ /MWh) (a/b/10 ⁶)							0.91773771		



Table A3-8 Calculation of generation-weighted average simple OM emission factor of the East China Power Grid

OM 2002	0.932 tCO ₂ /MWh	312 TWh
OM 2003	0.918 tCO ₂ /MWh	377 TWh
OM2004	0.906 tCO ₂ /MWh	440 TWh
		0.917

Table A3-9 Calculation of emission rate

A	B	C	D	E	F
CO ₂ Emission Factor tCO ₂ /GJ	Fuel Energy Value GJ/tSCE	CO ₂ Emission Factor tCO ₂ /tSCE	Coservative efficiency factor (gce/kWh)	Coservative efficiency factor (tce/MWh)	Emissions Rate tCO ₂ /MWh
2006 IPCC GuideDlines for National Greenhouse Gas Inventories	The General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-81)	A x B	Average fuel consumption for best technology commercially available for coal fired power plants in the system	=D/1000; g->ton; kWh->MWh;	=C*E
0.094600	29.270000	2.768942	320.000000	0.320000	0.886061



Table A3-10 Calculation of BM emission factor of the East China Grid

A	B	C	D	E	F	G	H	I	J	K	L
Installed Capacity 2001	Installed Capacity 2002	Installed Capacity 2003	Installed Capacity 2004	New Capacity Additions 2004-2003	Split of New Capacity	New Capacity Additions 2004-2002	Split of New Capacity	New Capacity Additions 2004-2001	Split of New Capacity	Emissions Factor	Weighted Average Build Margin Emissions Factor
MW	MW	MW	MW	MW	%	MW	%	MW	%	tCO ₂ /MWh	tCO ₂ /MWh
				=D-C		=D-B		=D-A		From Table A3-9	=H *K
12555.0	13047.3	13,602.5	14,417.8	815.3	5.14%	1,370.5	6.51%	1,862.8	7.42%	0.000	0.000
59021.0	61120.2	65,036.5	79,424.1	14,387.6	90.64%	18,303.9	86.90%	20,403.1	81.31%	0.886	0.770
300.0	1678.0	2,406.0	3,056.0	650.0	4.09%	1,378.0	6.54%	2,756.0	10.98%	0.000	0.000
0.0	62.2	51.7	72.6	20.9	0.13%	10.4	0.05%	72.6	0.29%	0.000	0.000
71876.0	75907.7	81096.7	96970.5	15,873.8	16.4%	21,062.8	21.7%	25,094.5	25.9%		0.770

Table A3-11 Calculation of Baseline emission factor of the East China Grid

		Units	Equation or Source	
A	Operating Margin emissions factor	tCO ₂ /MWh	Table A3-8	0.917
B	Build Margin emissions factor	tCO ₂ /MWh	Table A3-10	0.770
C	Baseline emissions factor	tCO ₂ /MWh	0.5*A+0.5*B	0.844



Table A3-12 Calculation of emission factor for option 3

COEF_{BL}	Energy Efficiency of Technology	EF_{BL, CO2} (tCO2/Mwh)
0.0946	36.53%	0.932274843

Table A3-13 Calculation of COEF_{f,y}

EF	NCV _{f,y}	COEF _{f,y}
(tCO ₂ /GJ)	GJ/m ³	tCO ₂ /m ³
0.0561	0.033656	0.001888102

Table A3-14 Fire Electricity Generated in East China Power Grid (TWh)

	Jiangsu	Shanghai	Anhui	Zhejiang	Fujian	Total
2002	116.716	61.648	45.703	69.287	30.85	324.204
2003	133.277	69.444	54.156	83.089	42.146	382.112
2004	163.545	71.134	59.988	95.255	50.49	440.412

Data Source : China Electric Power Yearbook 2005 , P585

Data Source : China Electric Power Yearbook 2005 , P709

Data Source : China Electric Power Yearbook 2005 , P474

Table A3-15 Calculation of EF_{BL, upstream,CH4}

ΣFF _{j,k}	EF _{k, upstream,CH4}	ΣEG _j	EF _{BL, upstream,CH4}
Kt	tCH ₄ /kt coal or tCH ₄ /PJ	TWh	tCH ₄ /MWh
32315.69761	13.4	116.208	0.003726339



Table A3-16 Calculation Sheet of Levelised Cost for 300MW Coal-fired

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Capital expenditure(RMB)		764280000	1273800000	509520000												
Operation and maintenance expenditure (RMB)	Material	0	3750156	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655
	Manpower	0	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000
	Water	0	625026	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109
	Desulfidation	0	732580	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838
	Fee for Discharging Waste	0	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000
	Repair	0	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207
	Insurance	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300
	Others	0	7500312	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310
Fuel expenditure		0	86541100	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620
Total		764492300	1400337681	953335040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040
NPV of Cost		7609306527														
Electricity generation(MWh)		0	625026	2625109	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125
NPV of generation(MWh)		35521369														
LCOE(RMB/kWh)	0.214															

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655	15750655
18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000	18720000
2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109	2625109
3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838	3076838
6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000	6260000
2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207	2196207
212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300	212300
31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310	31501310
363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620	363472620
443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040	443815040
3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125	3000125

Unit: RMB Yuan

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Table A3-17 Calculation Sheet of Levelised Cost for 600MW Coal-fired

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Capital expenditure(RMB)		1284300000	1798020000	1284300000	770580000											
Operation and maintenance expenditure (RMB)	Material	0	0	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208
	Manpower	0	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000
	Water	0	0	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042
	Desulfidation	0	0	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008
	Fee for Discharging Waste	0	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000
	Repair	0	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621
	Insurance	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100
	Others	0	0	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416
Fuel expenditure		0	0	135025617	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467
Total		1284728100	1833996721	1472446011	1363802861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861
NPV of Cost		11158566895														
Electricity generation(MWh)		0	0	1000042	4000166	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250
NPV of generation(MWh)		64799173														
LCOE(RMB/kWh)	0.172															
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208	5000208
19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000	19760000
1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042	1000042
1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008	1143008
11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000	11360000
4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621	4428621
428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100	428100
10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416	10000416
540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467	540102467
593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861	593222861
6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250	6000250

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Unit: RMB Yuan

Table A3-18 Calculation Sheet of Levelised Cost for the proposed project

		1	2	3	4	5	6	7	8	9	10	11
Capital expenditure(RMB)		75423887	818625115	1081426115	652272082							
Operation and maintenance expenditure (RMB)	Material	0	0	2751994	19263244	22012610	22012610	22012610	22012610	22012610	22012610	22012610
	Manpower	0	0	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520
	Water	0	0	9713	67988	77692	77692	77692	77692	77692	77692	77692
	Repair	0	0	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583
	Insurance	0	0	285653	285653	285653	285653	285653	285653	285653	285653	285653
	Others	0	0	4856460	33993960	38845782	38845782	38845782	38845782	38845782	38845782	38845782
Fuel expenditure		0	0	87370953	611574003	698861515	698861515	698861515	698861515	698861515	698861515	698861515
Total		75423887	818625115	1190352992	1331109034	773735355	773735355	773735355	773735355	773735355	773735355	773735355
NPV of Cost		9773834252										
Electricity generation(MWh)		0	0	323764	2266264	2589719	2589719	2589719	2589719	2589719	2589719	2589719
NPV of generation(MWh)		25253438										
LCOE(RMB/kWh)	0.387											



12	13	14	15	16	17	18	19	20	21	22	23	24
22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610	22012610
10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520	10523520
77692	77692	77692	77692	77692	77692	77692	77692	77692	77692	77692	77692	77692
3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583	3128583
285653	285653	285653	285653	285653	285653	285653	285653	285653	285653	285653	285653	285653
38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782	38845782
698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515	698861515
773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355	773735355
2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719	2589719

Unit: RMB Yuan



Annex 4

MONITORING PLAN

Calculation of ERs is carried out by CDM Manager annually by utilization of an excel-based workbook which functions are explained in detail below. CDM Manager must retain a copy of every month's workbook. Each month's workbook must be saved on the specific computer under a unique name reflecting the month for which monitoring has been carried out and hard copies of the workbook shall be printed out, signed by CDM Manager in accordance with company procedures, and stored in the archive room.

In addition, after each data entry and/or modification of the workbook, electronic copies of the workbook shall be saved under a new name, and hard copies shall be signed and stored safely. Yearly summaries are calculated based on the monthly results.

The workbooks serve as a database for the periodic reporting of ERs to be verified by DOE and CDM Manager. The ER results are reviewed according to the procedures laid out in the data review protocol after completion of the workbooks.

Before start of the crediting period, CDM Manager will develop the following protocols which functions are described below, based on the organizational structures & procedures described in the Monitoring Plan.

Data handling protocol

The establishment of a transparent system for the collection, computation and storage of data, including adequate record keeping and data monitoring systems is required. It is the CDM Manager's responsibility with the assistance of CDM operation team to ensure implementation of a protocol that provides for these critical functions and processes. For electronic -based and paper-based data entry and recording systems, there must be clarity in terms of the procedures and protocols for collection and entry of data, usage of the spreadsheets and any assumptions made, so that compliance with requirements can be assessed by the DOE. Stand-by processes and systems, e.g. paper-based systems, must be outlined and used in the event of, and to provide for, the possibility of systems failures.

Training protocol

It is the CDM Manager's responsibility to ensure that the required capacity and internal training is made available to assigned staff, to enable them to undertake the tasks required by the Monitoring Plan. All staff involved in any of the procedures will be trained before the start of the crediting period in order to perform the tasks specified in the Monitoring Plan. For this purpose a training protocol will be prepared.

Calibration and maintenance protocol

It is CDM Manager's responsibility to ensure that the calibration and maintenance procedures for all measurement instruments relevant for monitoring the parameters included in the Monitoring Plan are followed. A calibration and maintenance protocol will be established for this purpose which will be prepared by the CDM manager based on the agreements with the fuel supplier(s), fuel transporter(s) etc, equipment manufacturer's recommendations and the applicable industry / national standards.



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Data review protocol

It is CDM Manager's responsibility to prepare a data review protocol that in case of failure of an instrument, or inconsistency of the data, enables staff to adjust the data according to the procedures outlined in this protocol. The data review protocol shall also include procedures for emergency preparedness for cases where emergencies can cause unintended emissions.

**Annex 5****IRR Analysis of the Proposed Project**

	unit	Value
Project IRR(Without CERs)	%	6.34%
IRR (including sales revenue of CERs)	%	10.32

Table A5-1

Series	Account Title	Total	1	2	3	4	5	6	7	8	9
1	Net cash inflow	2033781			12592.80	88071.87	103228.67	102667.67	102038.67	101334.67	100664.67
1.1	Sales revenue	2013279			12592.80	88071.87	100664.67	100664.67	100664.67	100664.67	100664.67
1.2	Disposal of assets	12616									
1.3	Return of floating capital	1275									
1.4	Short term loan	6611					2564.00	2003.00	1374.00	670.00	
2	Net cash outflow	1842126	7512.00	80970.00	114663.23	130606.82	76738.41	76698.41	76658.41	76618.41	76578.41
2.1	Investment on construction	250391	7512.00	80125.00	100156.00	62598.00					
2.2	floating capital	1271		845.00	3842.00	654.00	-7.00	-7.00	-7.00	-7.00	-7.00
2.3	Operating Costs	1505886			10554.41	66468.97	75859.57	75819.57	75779.57	75739.57	75699.57
2.7	Additional tax on city building and education	17828			110.82	885.85	885.85	885.85	885.85	885.85	885.85
2.8	Income tax	51168			0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.9	Legal reserve	15583			0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Net cash flow(Without CERs revenue)	191655	-	-	-	-42534.95	26490.25	25969.25	25380.25	24716.25	24086.25
4	Net cash flow(With CERs revenue)		-	-	-	-36975.18	32844.98	32323.98	31734.98	31070.98	30440.98



10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	88057.91	26483.80
100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	100664.67	88057.91	12592.80
														12616.00
														1275.00
76538.41	76498.41	76458.41	76418.41	76378.41	77522.07	78859.57	79304.31	79783.74	86663.13	86663.13	86663.13	86104.18	65223.88	16002.79
-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00	-7.00					-568.00	-3411.00	
75659.57	75619.57	75579.57	75539.57	75499.57	75459.57	75419.57	75379.57	75340.57	75340.57	75340.57	75340.57	75340.57	53213.12	15891.97
885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	885.85	774.91	110.82
0.00	0.00	0.00	0.00	0.00	907.33	1963.25	2334.83	2726.87	8000.27	8000.27	8000.27	8007.20	11227.55	0.00
0.00	0.00	0.00	0.00	0.00	276.32	597.90	711.06	830.46	2436.45	2436.45	2436.45	2438.56	3419.30	0.00
24126.25	24166.25	24206.25	24246.25	24286.25	23142.60	21805.10	21360.36	20880.92	14001.53	14001.53	14001.53	14560.49	22834.03	10481.01
30480.98	30520.98	30560.98	30600.98	30640.98	29497.33	28159.83	27715.08	27235.65	20356.26	20356.26	20356.26	20915.22	28392.92	11275.96

Unit: 10000RMB Yuan