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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the proposed project activity:

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Name of the proposed project: Zhangjiagang Nature Gas Power Generation Project

Version of Document: 05 (revised as per AM0029/version03)

Date of Document: 12/02/2009

A.2. Description of the proposed project activity:

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Zhangjiagang Natural Gas Power Generation Project (hereinafter called as "the proposed project") is to construct a greenfield natural gas fired grid-connected power plant in Zhangjiagang City in East China's Jiangsu Province, and be invested, constructed and operated by Zhangjiagang Huaxing Power Co., Ltd. (hereinafter called as "Huaxing").

The scenario existing prior the start of the implementation of the proposed project is that the electricity supply can not meet the electricity demand in Jiangsu province and meanwhile the peak regulation capacity of Jiangsu Power Grid (hereinafter called as "JPG", JPG is the integral part of East China Power Grid, hereinafter called as "ECPG") is insufficient.

The purpose of the proposed project is to construct a new thermal power plant using natural gas as fuel in order to supply electricity to JPG and increase the peak regulation capacity of JPG as well as lead to reduce the green house gas emissions. According to the FSR of the proposed project, the power generation technology is 9F-level gas-steam combined cycle, the rated total installation capacity is 780MW (2×390MW), the annual operation hours is 3500 hours, the annual natural gas consumption is estimated to be 576 million m^3, the annual power generation is 2730 GWh and the annual net electricity output sent to the grid is 2675.4GWh.

According to the baseline scenario analysis described under section B.4 in this PDD, in the absence of the proposed project, the baseline scenario is to construct a new 600MW sub-critical coal fired power generation units. In comparison with the baseline coal-fired plant, the proposed project will lead to substantial greenhouse gas emissions reductions due to using the low-carbon intensive fuel and adopting the much higher efficient power generation technology. According to the ex-ante calculation in this PDD, the annual emission reductions of the proposed project are estimated to be 1,231,243 tCO_2e, and the total emission reductions over the first crediting period are 8,618,701 tCO_2e.

The proposed project will not only meet the increase electricity demand of Jiangsu Province, but also improve the peak load regulating capability of JPG. Furthermore, the proposed project will also contribute to the sustainable development to local, global and the host country in a number of ways:

- Lead to greenhouse gas emission reductions compared to a business as usual approach, thereby benefit the global climate change;
- Reduce other pollutants (e.g. SO_2, NO_x , dust, etc) compared to a business as usual approach, thereby improve the local environment quality;
- Enhance the ability of peak regulation to the local grid and improve the electric supply quality of the local grid;

– Promote the application of gas-fired combined cycle power generation technology widely in the East China Region.

– Create the employment opportunities for the local residents.

A.3. Project participants:

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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
People's Republic of China (host)	Zhangjiagang Huaxing Power Co., Ltd. (The proposed project owner)	No
The United Kingdom of Great Britain and Northern Ireland	Arreon Carbon UK Ltd.	No
The United Kingdom of Great Britain and Northern Ireland	Credit Suisse International	No

A.4. Technical description of the proposed project activity:

A.4.1. Location of the proposed project activity:

A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Jiangsu Province

A.4.1.3. City/Town/Community etc:

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Zhangjiagang City/Donglai Town

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

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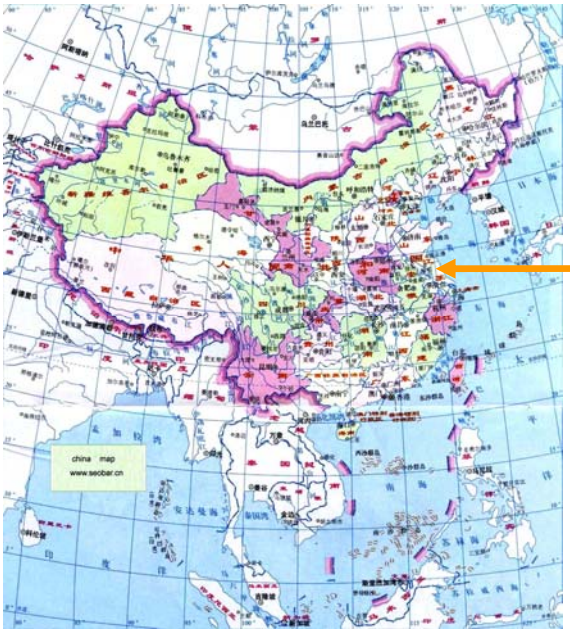
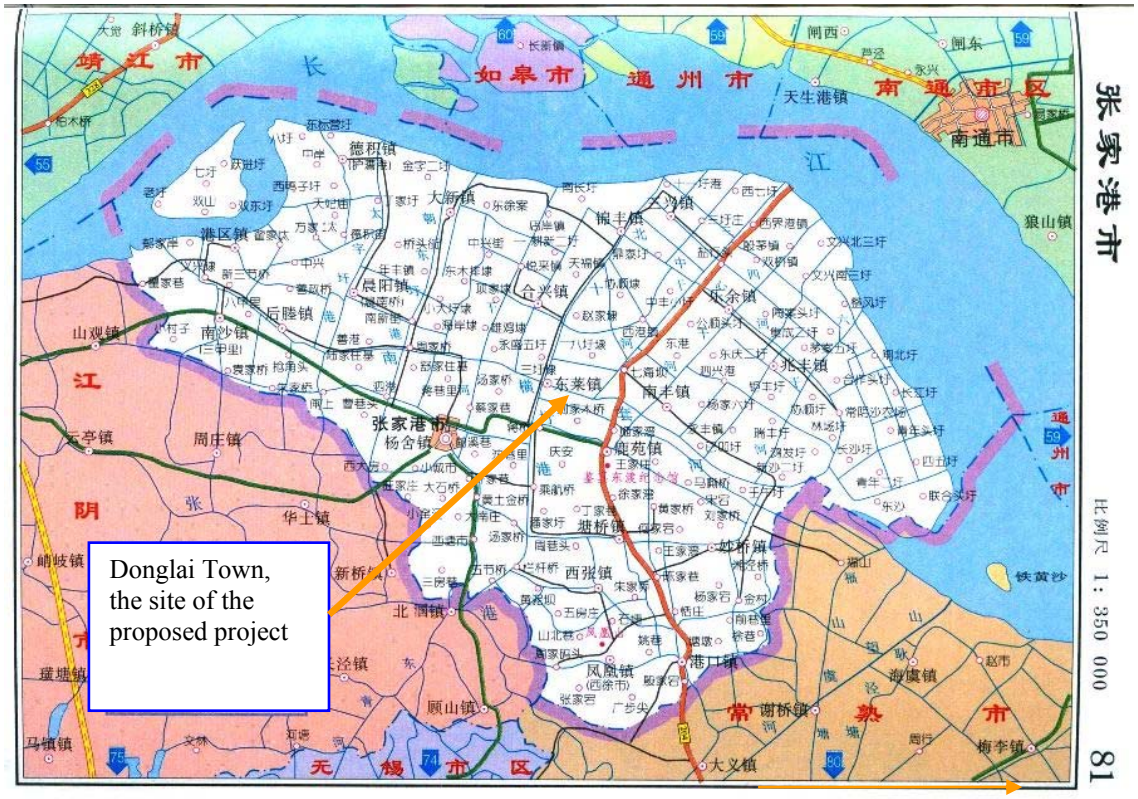
The site of the proposed project locates in the southern of Donglai Town, with about 6.5km northeast from the urban of Zhangjiagang City, with about 12km south from the bank of the Changjiang River. The geographical coordinates is at longitude 120° 39′E and latitude 31° 53′ N[1]. More detailed information is shown in the following maps.

[1] Page 13 of the EIA report of the proposed project



Jiangsu Province in Chinese Map

Zhangjiagang City in Jiangsu Provincial Map



The site of the proposed project and Donglai Town in Zhangjiagang's Map

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

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

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

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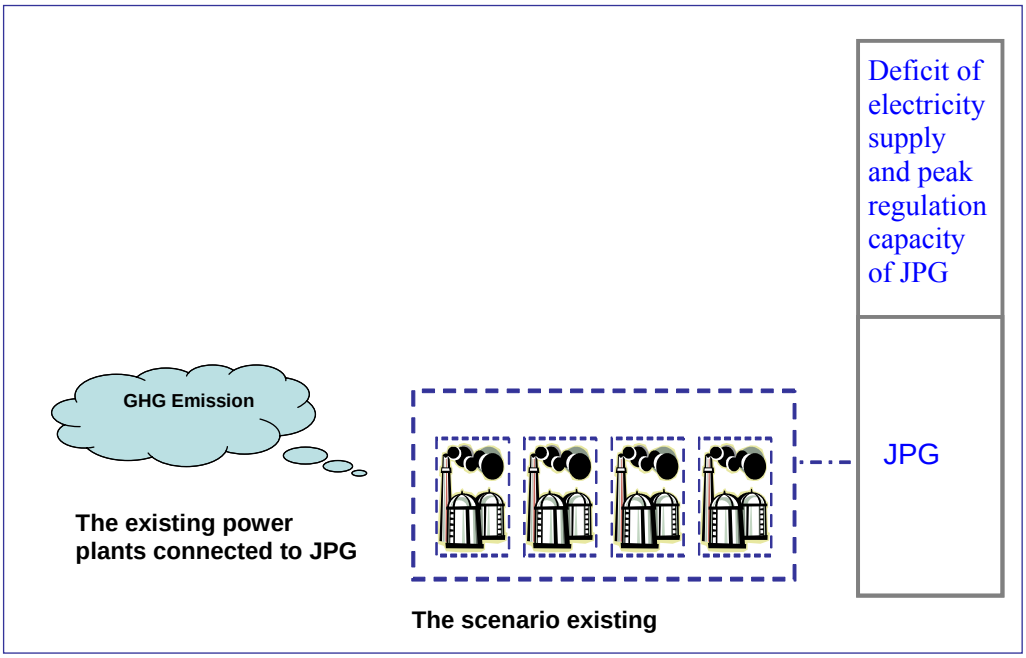
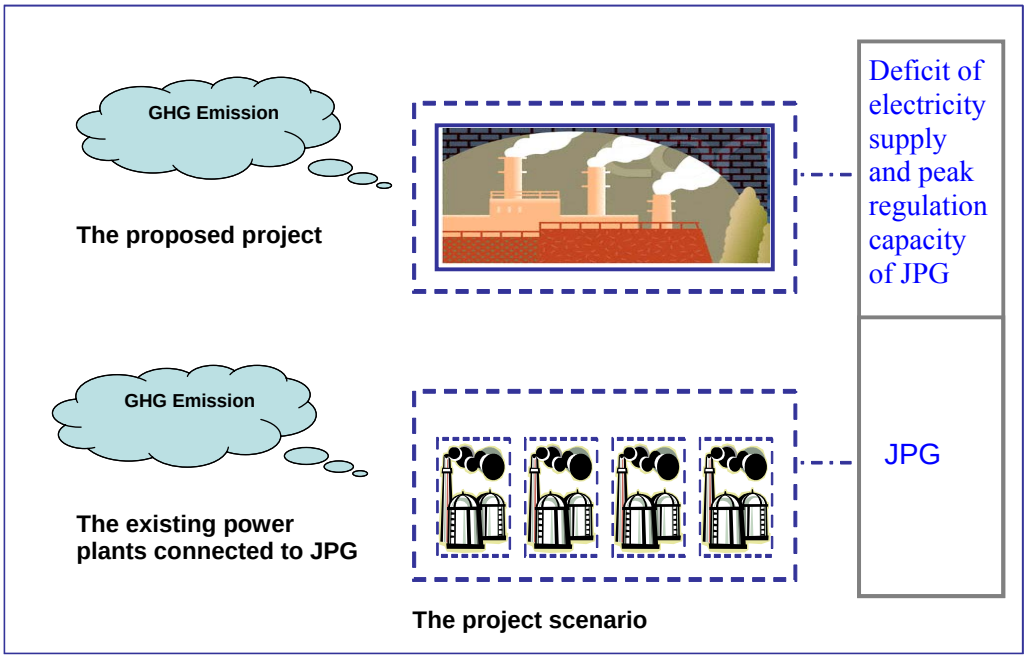
The scenario existing prior the start of the implementation of the proposed project is that the electricity supply can not meet the electricity demand in Jiangsu province as of the end of 2004 due to its rapid economic growth[2]. Meanwhile, the peak regulation capacity of JPG is also insufficient according to the FSR of the proposed project published by Jiangsu Electric Power Design Institute[3]. This scenario can be illustrated as below:



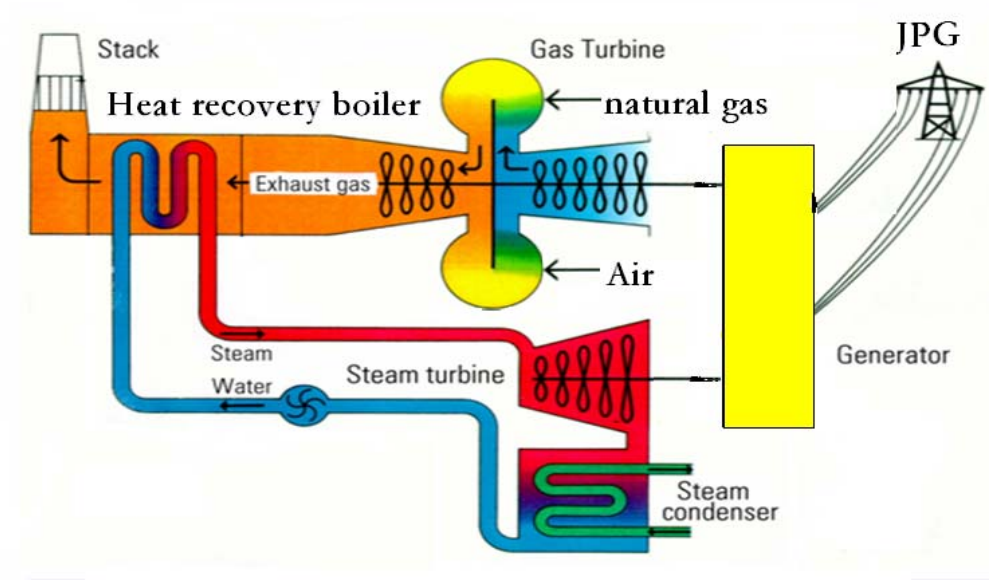
The purpose of the proposed project is using natural gas as fuel for power generation to meet the deficit of electricity supply and the peak regulation capacity of JPG so as to reducing green house gas emissions. The project scenario can be illustrated as below:

[2] http://fgw.ningbo.gov.cn/jjyx_view.aspx?CategoryId=4&ContentId=13483

[3] http://www.jspdi.com.cn/



In order to achieve this purpose, the proposed project will install two sets of gas-fired combined cycle power generation units. Each unit consist of a gas turbine, a heat recovery boiler, a steam turbine and a generator, its working principle can be illustrated as below:



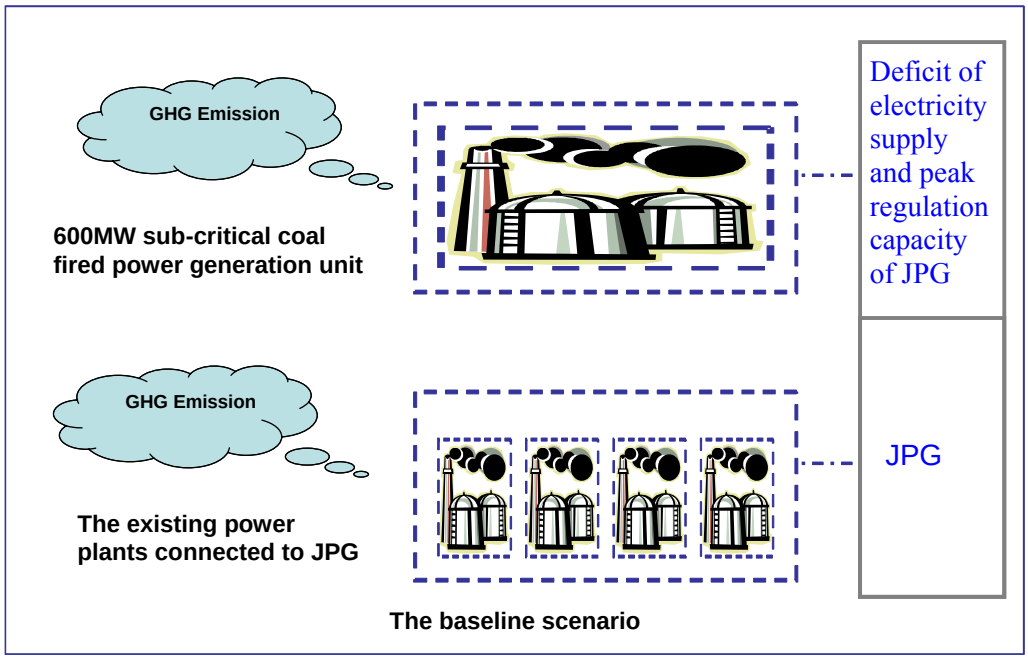
The power generation unit adopted by the proposed project is 9F-level gas-steam combined cycle. The detailed information of the units and the main equipments are tabulated below:

Equipment	manufacturer	Specification
Gas-steam combined cycle unit		Rated installed capacity: 390MW Annual operational hours: 3500 hours

Gas turbine	Harbin PRC	Serial No.: 298433 Model: MS9001FA Fuel type: natural gas Firing temperature: 1326.7 ^{0}C Ambient air pressure: 101.3
Steam turbine	Co-manufactured in Schenectady, NY, USA and Harbin PRC	Serial No.: 270T574 Steam pressure: 9566 kPa Steam temperature: 566 ^{0}C Exhaust pressure: 5.859 kPa
Generator	Schenectady, NY, USA	Serial No.: 290T574 Hydrogen-cooled 2 poles, 3 phase, 50 Hertz, 98% Purity, 60 PSIG

Due to the main equipments are imported from the developed countries in the Annex 1, and as per the relevant contracts, the equipments suppliers should provide the consultation services for installation, test run and formal operation of the power unit, the training services for relevant staff and the technical support for subsequent maintenance and repair, so the technology to be employed and the know-how to be used by the proposed project will be transferred form the parties in the Annex 1 to the hosting party

The baseline scenario is to construct a new 600MW sub-critical coal fired power generation units according to the analysis in B.4 of this PDD. This scenario can be illustrated as below:



In comparison with the baseline scenario, the proposed project will lead to substantial greenhouse gas emissions reductions due to using the low-carbon intensive fuel and adopting the much higher efficiency power generation technology.

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

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The crediting period of the proposed project activity is chosen to be 7*3 years (The first crediting period is June 1st 2009-May 31st 2016). The detailed information of estimated reductions over the first crediting

period is listed below:

Years	Annual estimation of emission reductions in tons of CO_2e
2009 (01 June – 31 December)	718,225
2010	1,231,243
2011	1,231,243
2012	1,231,243
2013	1,231,243
2014	1,231,243
2015	1,231,243
2016 (01 January – 31 May)	513,018
Total estimated reductions(tons of CO_2e)	8,618,701
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	1,231,243

A.4.5. Public funding of the proposed project activity:

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

SECTION B. Application of a baseline and monitoring methodology:

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

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Title of the approved baseline and monitoring methodology:

Version 03 of AM0029: "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".

Tools referenced in this methodology:

Version 01 of Tool to calculate the emission factor for an electricity system

Version 05 of Tool for the demonstration and assessment of additionality

The detailed information of the above please refer to: http://cdm.unfccc.int/methodologies/approved

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

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AM0029 is applicable to the proposed projects that can satisfy the following conditions:

(1) The proposed project activity is the construction and operation of a new natural gas fired grid-connected electricity generation plant. *(2) The geographical/physical boundaries of the baseline grid can be clearly identified and information pertaining to the grid and estimating baseline emissions is publicly available.* *(3) Natural gas is sufficiently available in the region or country, e.g. future natural gas based power capacity additions, comparable in size to the proposed project activity, are not constrained by the use of natural gas in the proposed project activity.*

The proposed project is been applicable for AM0029 due to the following three conditions.

- ✧ The proposed project is the construction and operation of a new natural gas fired grid-connected power generation plant[4]. According to the FSR of the proposed project, there no any auxiliary fuel involved.

- ✧ The proposed project provides its generated electricity to JPG, and JPG is part of the East China Power Grid (hereinafter called as "ECPG", which includes Jiangsu, Zhejiang, Fujian, Anhui and Shanghai Power Grids). The geographical/physical boundaries of ECPG can be clearly identified and the information pertaining to SCPG and estimated baseline emissions is publicly available.[5]

- ✧ The project owner, Huaxing signed a long-term Take or Pay (ToP) contract on December 29th 2004 with PetroChina[6] which is the owner of the "West to East Gas Pipeline". The main natural gas source of this pipeline is Tarim Basin Gas Field of which the explored reserve of the natural gas is 7960 billions m^3, and the stable supply of natural gas will be lasted for 30 years.[7] So the natural gas supply of the proposed project is sufficiently available within the crediting period.

  In the project's region, i.e., the Jiangsu province, the natural gas supply projects that have been constructed and are under construction and are being planned so far are as below:

  (1). The West to East pipeline Project[8]
  This project has been constructed. The annual natural gas supply in the Jiangsu Province from this project is 5.7 billion cubic meters.[9]

  (2). The Second West to East pipeline Project[10]
  This project is under construction and expected to be commissioned in 2010. The annual natural gas supply to the Jiangsu Province from this project is 1.6 billion cubic meters. [8]

  (3). The Sichuan to East Gas Pipeline Project
  This project is under construction and expected to be in commission by end of 2008 or beginning of 2009[11]. The annual natural gas supply to the Jiangsu Province from this project is 1.8 billion cubic meters. [8]

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[4] The approval of the proposed project issued by the NDRC on October 20th 2003, Fagaishenpi [2003], No. 1525

[5] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

[6] http://www.ndrc.gov.cn/xwfb/t20050628_27553.htm

[7] http://news.xinhuanet.com/newscenter/2004-12/30/content_2393788.htm

[8] http://www.gov.cn/ztzl/2006-01/02/content_145307.htm

[9] http://www.gcjxlm.com/ztb/View/35/6437.htm

[10] http://news.xinhuanet.com/fortune/2008-01/18/content_7442708.htm

[11] http://news.qq.com/a/20070412/001401.htm

(4). The Jiangsu Rudong LNG Project
This project is under construction and will be associated with construction of 8 sets of gas-steam combined cycle units (the total rated installed capacity is 8*390MW)[12]. The first phase of this project is expected to be commissioned in 2011 and the annual natural gas supply to the Jiangsu Province is 4.8 billion cubic meters. The whole project is expected to be commissioned in 2014 and its annual natural gas supply to the Jiangsu Province is 13.5 billion cubic meters.[13]

(5). The Jiangsu Yancheng LNG Project
This project has been planned and is under approval by the NDRC. Its affiliated power generation project includes constructing 8 set of gas-steam combined cycle units (the total rated installed capacity is 8*300MW).

(6). The Jiangsu Lianyungang LNG Project
This project has been planned and is under approval by the NDRC, and includes an affiliated power generation project.

(7). The Third West to East pipeline Project
This project is being planned.

Based on the data provided in the above projects, the total natural gas supply in the Jiangsu Province in the future can be estimated as below:

Unit: billion cubic meters

Annual natural gas supply	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
West to East pipeline Project	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Second West to East pipeline Project	0	0.8	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Sichuan to East Gas Pipeline Project	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Jiangsu Rudong LNG Project	0	0	2.4	4.8	4.8	4.8	13.5	13.5	13.5	13.5
Jiangsu Yancheng LNG Project	0	0	0	0	0	0	0	0	0	0
Jiangsu Lianyungang LNG Project	0	0	0	0	0	0	0	0	0	0
Third West to East pipeline Project	0	0	0	0	0	0	0	0	0	0
Total	7.5	8.3	11.5	13.9	13.9	13.9	22.6	22.6	22.6	22.6

As for the total natural gas demand in Jiangsu Province, it is 5.98 billion cubic meters and 6.40 billion cubic meters in 2007 and 2008, respectively[14], which creates an increase in natural gas demand in Jiangsu Province by 7% from 2007 to 2008. According to *2007 Report for Energy Development of China*[15], the annual growth rate for natural gas demand in China in the future is 13%, so it is conservative to choose 13% as the annual growth rate for natural gas demand in Jiangsu Province.

Based on the actual total natural gas demand in Jiangsu Province in 2008 (6.40 billion cubic meters) and the annual growth rate for natural gas demand in Jiangsu Province (13%), the total natural gas demand in the Jiangsu Province in the future can be estimated as below:

[12] http://www.ccgas.net/page/lng.htm

[13] http://news2.eastmoney.com/080415,1104,818304.html

[14] http://www.gcjxlm.com/ztb/View/35/6437.htm

[15] http://www.china.com.cn/economic/zhuanti/2007nyfz/2007-05/24/content_8302554.htm

Unit: billion cubic meters

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Annual total natural gas demand	7.2	8.2	9.2	10.4	11.8	13.3	15.1	17.0	19.2	21.7

Base on the above analysis, the total natural gas demand will always be lower than the total natural gas supply in the Jiangsu Province in the future. So it could be concluded that the natural gas is sufficiently available in the region, i.e., the Jiangsu province.

Meanwhile, the annual consumption of natural gas of the proposed project is only 0.576 billion cubic meters. Even if the existing capacity of the proposed project is expanded doubly, it could only reach 1.152 billion cubic meters, which is small compared with the total natural gas supply for power generation in Jiangsu Province in the future, and thus the expansion will not be constrained by the proposed project activity.

Furthermore, a number of new natural gas fired power generation projects in Jiangsu Province have been planned and under approval by the NDRC (the affiliated projects of the above-mentioned three LNG projects) [11], which also demonstrates that the proposed project does not constrain future development of the natural gas fired power generation capacity additions.

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

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The spatial extent of the proposed project boundary includes the project site and all power plants connected physically to the baseline grid as defined in "Tool to calculate emission factor for an electricity system". According to the definition of the regional power grid of China issued by the DNA of China[16], the baseline grid is ECPG (because JPG is the integrate part of ECPG).

In the calculation of project emissions, only CO_2 emissions from natural gas combustion at the project plant are considered. In the calculation of baseline emissions, only CO_2 emissions from fossil fuel combustion in power plant(s) in the baseline are considered.

The greenhouse gases sources included in or excluded from the proposed project boundary are shown in the following table:

	Souce	**GHGs**	**Include?**	**Justification/explanation**
Baseline emissions	Fossil fuel combustion in power plants within ECPG	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project emissions	On-site natural gas combustion	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

[16] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

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

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According to AM0029, two steps involved in identifying and describing baseline scenario are showing as the following:

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 step1.

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

Step 1: Identify plausible baseline scenarios

In accordance with AM0029, the identification of alternative baseline scenarios of the proposed project activity should include all possible realistic and credible alternatives that provide outputs or services comparable with the proposed project, inter alia:

The proposed project activity not implemented as a CDM project;
Power generation using natural gas, but technologies other than the proposed project activity;
Power generation technologies using energy sources other than natural gas;
Import of electricity from connected grids, including the possibility of new interconnections.

And alternatives should meet the following conditions:

1) Outputs or services provided should be comparable with the proposed CDM project activity (e.g. peak vs. base load power);
2) They should include technologies adopted by existing, under-construction and to-be-constructed power plants;
3) They should be in compliance with all applicable legal and regulatory requirements.

According to FSR of the proposed project, it was designed to mainly provide peak load regulation service. Based on the above criterion, the alternatives which can't provide peak power and are incompliance with all applicable legal and regulatory requirements will be excluded.

The project activity will increase the installed capacity of the JPG and is characterized by rapid startup/shutdown speed and flexible operation, suitable to serve as a regulating power source and

therefore improves the operation quality of the power grid. Based on the above analysis, the plausible baseline scenarios are identified as follows:

The proposed project activity not implemented as a CDM project

Obviously, this alternative can provide the same outputs and services as the CDM project activity, so this alternative is the plausible baseline scenario.

Power generation using natural gas, but technologies other than the proposed project activity

Power generation using natural gas includes single cycle power generation technology and gas-steam combined cycle power generation technology. Single cycle gas turbines have recently achieved commercialization of units with a rated capacity of 100-300MW and have a thermal efficiency of 38%~39.5%; whereas combined cycle units have reached capacities greater than 300MW and have a thermal efficiency of 55% and above.[17] Hence, this alternative is not the plausible baseline scenario.

Power generation technologies using energy sources other than natural gas

Hydro Power Generation

Due to the lack of hydro energy source, there is hardly any hydro power station within the JPG.[18] In order to meet the demand of peak regulation of JPG, the pumped storage hydro power stations have been constructed or being constructed in Jiangsu Province[19], but these stations can not create the original electricity to supply the JPG. Hence, this alternative is not the plausible baseline scenario.

Wind Power Generation

Due to the instability of wind energy source, wind power generation doesn't provide peak load electricity to the grid.[20] Hence, this alternative is not the plausible baseline scenario.

Nuclear Power Generation

The nuclear power generation can only provide base load electricity and cannot provide peak load electricity to the grid in China.[21] Hence, this alternative is not the plausible scenario alternative.

Oil-fired Power Generation

There are no oil-fired power plants that have recently been constructed or are under construction or are being planned within ECPG.[22] Hence, this alternative is not the plausible scenario alternative.

Coal-fired Power Generation

Except the pumped storage power stations, the peak regulation of JPG mainly depends on the coal-fired power plants in Jiangsu Province[23]. Currently, the coal-fired power generation technology[24] based on best

[17] http://www.chinapower.com.cn/article/1025/art1025680.asp

[18] http://www.stats.gov.cn/tjfx/dfxx/t20070816_402426725.htm

[19] http://www.jspc.net.cn/ws6.htm

[20] http://co.163.com/forum/content/878_160062_1.htm

[21] http://np.chinapower.com.cn/article/1000/art1000062.asp

[22] http://www.in-en.com/article/news/china/2007/06/19/20070619104058.html

[23] http://www.jspc.net.cn/ws6.htm

[24] http://www.p5w.net/news/cjxw/200703/t810531.htm

technology commercially available in China is 600MW sub-critical[25], so to construct a 2*600MW sub-critical coal-fired power generation plant is the plausible baseline scenario.

Import of electricity from connected grids, including the possibility of new interconnections

The grid connected to the baseline grid (ECPG) is the Central China Power Grid (CCPG), and ECPG imports the electricity from CCPG in recent years.[26] Due to the electricity transferred between grids generally provides base load other than peak load[27], so the electricity imported from CCPG can not provide peak regulation to ECPG， this alternative is not the plausible baseline scenario.

In the context of the above analysis, the plausible baseline scenarios are listed as below:

	Baseline scenario alternatives	Technologies of power generation
1	The proposed project activity not implemented as a CDM project	gas-steam combined cycle
2	600MW sub-critical coal-fired power plant	Sub-critical

Step 2: Identify the Most Attractive Baseline Scenario Alternative

Sub-step 1: Calculating levelized cost of electricity production for identified plausible baseline scenarios

The remaining baseline scenario alternative is identified using investment analysis for economically most attractive, and chosen the levelized cost of electricity Generation in Yuan/kWh as financial indicator for investment analysis.

The calculation formula of the levelized cost of electricity generation (LCEG) which based on Appendix 5 of *Projected Costs of Generating Electricity* published by IEA[28] is as follows:

$$LCEG = \frac{\sum_t [(I_t + M_t + F_t)(1+r)^{-t}]}{\sum_t [E_t (1+r)^{-t}]} \quad (1)$$

Where,

It	Capital expenditures in year t
Mt	Operation and maintenance expenditures in year t
Ft	Fuel expenditures in year y

[25] Page 3 of Annex 2 of the Bulletin regarding to determine the baseline emission factor of China's Grids, sourced from is the official website of China's DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

[26] Annex 1 of the Bulletin regarding to determine the baseline emission factor of China's Grids, sourced from is the official website of China's DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf

[27] http://203.208.37.104/search?q=cache:t13Fovwc5EcJ:www.zjwater.gov.cn/pages/attachment/10/attachment_827.doc+%E5%9F%BA%E8%8D%B7%EF%BC%8C%E7%94%B5%E7%BD%91&hl=zh-CN&ct=clnk&cd=18&gl=cn&st_usg=ALhdy29dKudygO6kODyoXi0kOkAa4PoB1w

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

Et	Electricity generation in year y
r	Discount rate
Σt	The summation over the period including construction, operation during the economic lifetime and decommissioning of the plant as applicable

The relevant data for calculation of the remaining alternatives are tabulated below:

Item	600MW sub-critical coal-fired power plant[29]	The proposed project activity not implemented as a CDM project[30]
Total installed capacity	2*600MW	2*390MW
Annual operation hours	5500 hours	3500 hours
Construction and trial production period	6 years	3 years
Lifetimes	20 years	20 years
Depreciation period	15 years	15years
Discount rate	6.12%	6.12%
Auxiliary electricity consumption	5.8%	2%
Maintenance costs	2.5%	1.5%
Insurance costs	0.25%	0.25%
Fuel type	Coal	Natural gas
Capital costs	4307.3yuan/kW	2863.29million Yuan/Total[31]
Material costs	10yuan/MWh	8.5yuan/MWh
Water costs	0.14yuan/MWh	0.2yuan/MWh
Employee costs	40000 Yuan/year/person	48000 Yuan/year/person
welfare costs	60.4%	14%
Quantity of employees	100 persons	80 persons
Other expenditure	17yuan/MWh	15yuan/MWh

[29] Except for specific explanation, all data in this column come from Page 9 of the economic assessment fascicule of the feasibility study report of Second Phase of Coal Fired Power Generation Project of Zhejiang Changxing Power Generation Co., Ltd completed by Zhejiang Provincial Electric Power Design Institute on April 2003, its index number is 33－F0915G－E01

[30]Except for specific explanation, all data in this column come from the calculation paper provided by Jiangsu Provincial Electric Power Design Institute, which is the annex of the economic assessment fascicule of the feasibility study report of the proposed project approved by the NDRC on October 20th 2003, its serial number is F1274KU－EB－01 and its index number is 32－F1274KU－EB.

[31] According to the FSR of the proposed project, the investment without consideration of the specialized pipeline is 2449.54 million Yuan; according to the FSR of for constructing the specialized pipeline, the investment of the specialized pipeline is 413.75 million Yuan, so the total investment of the proposed project is 2863.29 million Yuan.

Fuel price	0.504Yuan/kg[32]	1.10yuan/m^3
Fuel consumption per unit electricity	300g/kWh	0.211m^3/kWh

According to the methodology, "a clear description of each baseline scenario alternative, including information on the technology, such as the efficiency and technical lifetime, shall be provided in the CDM-PDD", in order to provide a better understanding of the two alternatives, the relevant descriptions are listed in the following table:

Technology parameters	Formula*	Alternative scenario 1	Alternative scenario 2
Technical lifetime (Years)		20	20
Efficiency	$= \frac{3.6\times10^6}{\text{Unit\_fuel\_consumption}\times \text{NCV}_i}\times 100\%$	51%	40.99%
Load factor	$= \frac{\text{plant's rating capacity}\times\text{annual operational hours}}{\text{plant's maximum capacity}\times\text{hours in whole year}}$	0.40	0.63
Emission rate ((tCO2/MWh)	$= \text{Energy\_consumption}\times \text{NCV}_i \times \text{EF}_{co2,i}\times \text{OXID}$	0.399	0.831
* Where: *NCVi* is the net calorific value of fuel type *i*; *EFCO2,i* is the emission coefficient of fuel type *i* ; *OXIDCoal* is the oxidation factor of fuel type *i*			

According to the methodology, "these alternatives need not consist solely of power plants of the same capacity, load factor and operational characteristics (i.e. several smaller plants, or the share of a larger plant may be a reasonable alternative to the project activity), however they should deliver similar services (e.g. peak vs. baseload power)", the two alternatives all meet this requirement, because:

1) The proposed project without considering CDM benefits can provide the same peak power to the grid as the proposed project;
2) 43% share of 2*600MW coal-fired power plants can provide the similar peak power to the grid as the proposed project (2673.4GWh of the annual power to the gird of 43% share of the 2*600MW coal-fired power plant vs. 2675.4GWh of the proposed project. The total annual power to grid of the 2*600MW coal-fired power plant is calculated as 6217.2GWh according the above-mentioned data: the installed capacity is 1200MW, the annual operational hours is 5500 and the electricity consumption rate is 5.8%).

In terms of levelized cost of electricity production (LCEG), the LCEG of 43% share of 2*600MW coal-fired power plant is the same as the 100% of the one. Based on the above relevant data, LCEG of the remaining alternatives could be calculated, and the calculation results are presented as below:

[32] The price of raw coal is 0.36 yuan/kg in Jiangsu Province in 2005 according to the actual purchase invoice. In accordance with P365 of *China Energy Statistical Yearbook* 2005, the net caloric value of raw coal is 5000 kcal/kg and the net caloric value of standard coal is 7000 kcal/kg, so the price of standard coal is calculated to be 0.504 yuan/kg.

	Plausible Baseline Scenarios	LCEG in Yuan/kWh
1	The proposed project activity not implemented as a CDM project	0.292
2	600MW sub-critical coal-fired power plant	0.199

The calculation results of LCEG showcase that: to construct a new 600MW sub-critical coal-fired power plant is economically most attractive among the plausible baseline scenarios.

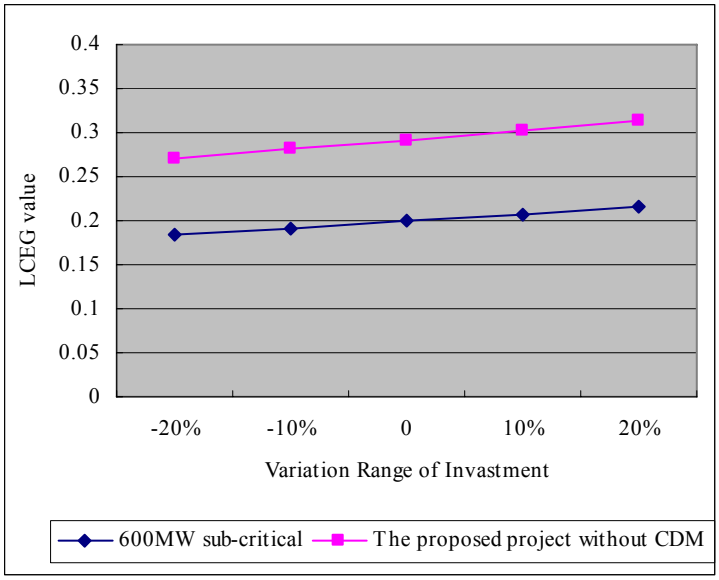
Sub-step 2: Sensitivity analysis of identified plausible scenarios

According to the calculation formula of LCEG, the parameters used for calculating LCEG are I_t M_t F_t E_t and r, and the corresponding critical assumptions are the total investment capital, the O&M expenditure, the fuel price, the annual operation hours and the discount rate.

Firstly assume the vibration range of the above-mentioned critical assumptions as -20%--+20%, then implement the curve analyse, if the curves are almost in parallel, which means the conclusion regarding the financial attractiveness is robust ; if the curves are intercrossed, which means the conclusion is not robust. If the curves are neither in parallel but nor intercrossed, expand the vibration range of the above-mentioned critical assumptions such as -30%--+30%, and then implement the curve analysis again, in the same way, if the curves are almost in parallel, which means the conclusion is robust; if the curves are intercrossed, which means the conclusion is not robust. Repeat by analogy until the conclusion can be realizing.

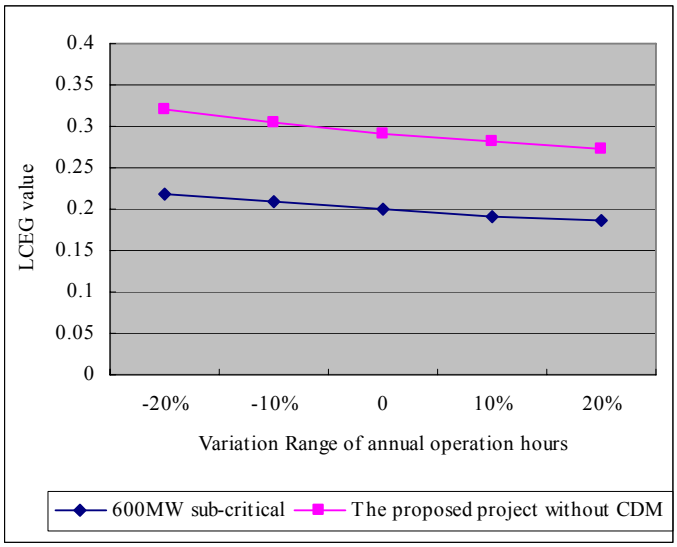
The sensitivity analysis and the curve chart for the plausible baseline alternatives are stated as below:

Baseline scenario alternatives	LCEG in Yuan/kWh	Based on total Investment vibration			
		-20%	-10%	+10%	+20%
600MW sub-critical	0.199	0.183	0.191	0.207	0.215
The proposed project activity without CDM	0.292	0.270	0.283	0.303	0.314



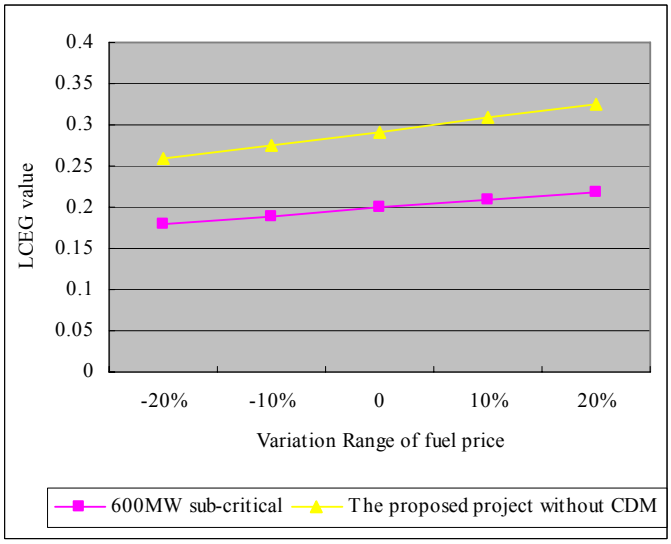
Based the above chart, the two curves are almost in parallel, so the conclusion is robust.

Baseline scenario alternatives	LCEG in Yuan/kWh	Based on annual operation hours vibration			
		-20%	-10%	+10%	+20%
600MW sub-critical	0.199	0.219	0.208	0.192	0.186
The proposed project activity without CDM	0.292	0.320	0.304	0.282	0.273



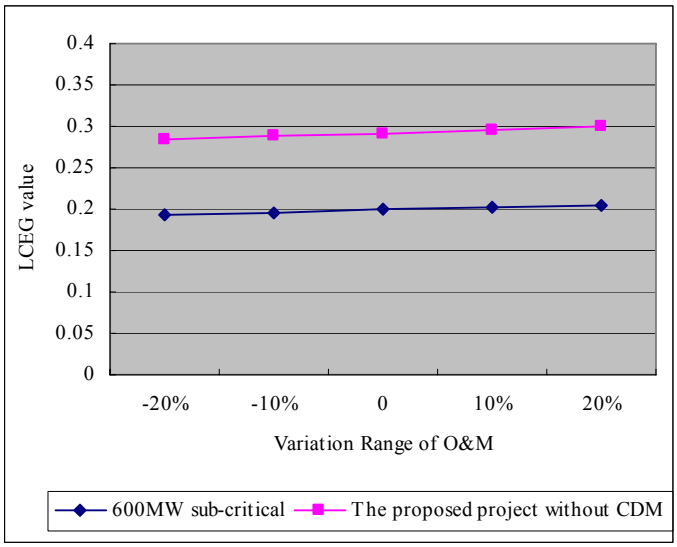
Based the above chart, the two curves are almost in parallel, so the conclusion is robust.

Baseline scenario alternatives	LCEG in Yuan/kWh	LCEG based on fuel price vibration			
		-20%	-10%	+10%	+20%
600MW sub-critical	0.199	0.179	0.189	0.209	0.219
The proposed project activity without CDM	0.292	0.260	0.276	0.308	0.324



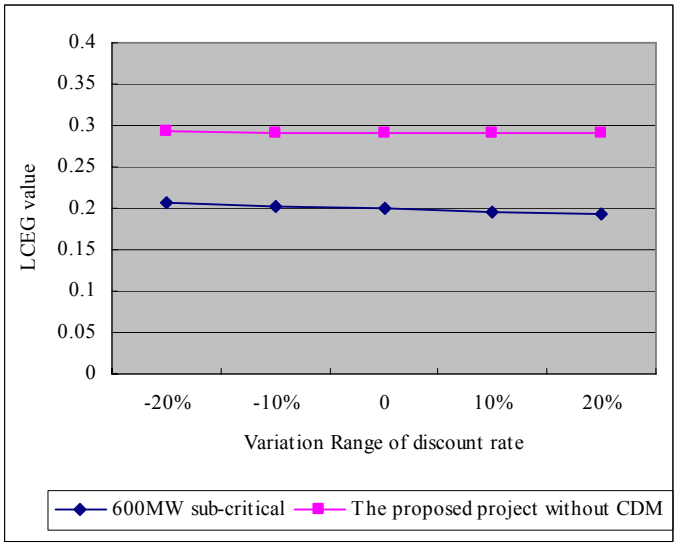
Based the above chart, the two curves are almost in parallel, so the conclusion is robust.

Baseline scenario alternatives	LCEG in Yuan/kWh	LCEG based on O&M cost vibration			
		-20%	-10%	+10%	+20%
600MW sub-critical	0.199	0.193	0.196	0.202	0.205
The proposed project activity without CDM	0.292	0.284	0.288	0.296	0.300



Based the above chart, the two curves are almost in parallel, so the conclusion is robust.

Baseline scenario alternatives	LCEG in Yuan/kWh	LCEG based on discount rate vibration			
		-20%	-10%	+10%	+20%
600MW sub-critical	0.199	0.206	0.200	0.196	0.193
The proposed project activity without CDM	0.292	0.293	0.292	0.292	0.292



Based the above chart, the two curves are almost in parallel, so the conclusion is robust.

Sum up the above sensitivity analysis, the following conclusion is confirmed to be robust:

The economically most attractive baseline scenario is to construct a new 600MW sub-critical coal-fired power plant, and this is the baseline scenario of the proposed project.

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

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For the sake of conservativeness, the starting date of the proposed project is December 29th 2004 of signing date of the long-term Take or Pay (ToP) contract of natural gas supply, because this date is the earliest one among the following dates:

1. Zhangjiagang Huaxing Electric Power Co., Ltd (hereinafter called as "Huaxing") signed the purchase contract of the main equipments used for the proposed project with GE on March 6th 2003 prior the proposed project was approved by the NDRC on October 20th 2003, and the effective terms of this contract are stated as:

   " 21.1 The Contract shall become effective upon fulfillment of the following conditions,
   1) Signing of Contract by the authorized representatives of both parties;
   2) The Buyer's receipt of Performance Security furnished by the Seller according to the Contract;
   3) Obtaining approval and/or registration from the relevant authorities of both countries;
   4) Signing of Long-term Service Agreement"

   Among the above-mentioned four conditions, the issuance date of the Buyer's receipt of Performance Security was November 26th 2003, the date for obtaining approval from the relevant authority of China was October 20th 2003[33], and the date for signing of Long-term Service Agreement wais October 18th 2005[34], so the purchase contract of the main equipments of the proposed project was officially effective on October 18th 2005.

2. Huaxing signed a long-term Take or Pay (ToP) contract of natural gas supply with PetroChina on December 29th 2004.

3. The construction supervisor of the proposed project: Jiangsu Xingyuan Electric Construction Supervision Co., Ltd issued the construction permission was officially issued on January 5th 2005.

4. Huaxing signed the agreement for construction of the proposed project with the First Electric Power Construction Company of Jiangsu Province on January 9th 2005.

Prior the starting date of the proposed project, Huaxing seriously considered the incentive of CDM, and the detailed evidences are listed as below:

1. The FSR of the proposed project was approved by the NDRC on Oct 20th 2003. According to this FSR, the total investment is 2449.54 million Yuan (exclude the investment for constructing the specialized pipeline), and the investment for constructing the specialized gas pipeline was responsible by the PetroChina. But after Huaxing obtained this approval, the situation had been

[33] The approval of the proposed project was issued by the NDRC on October 20th 2003

[34] The Long-term Service Agreement signed on October 18th 2005 between GE and Shanghai Tonghua Turbine Services Co., Ltd which on behalf of four natural gas fired power plants contracted with GE (including Huaxing). This can be crosscheck by the following website: http://news.e-works.net.cn/category8/news17438.htm

changed, the PetroChina transferred this duty to the Jiangsu Provincial Natural Gas Investment and Development Co., Ltd (JSGAS), and JSGAS didn't agree to construct this specialized pipeline.[35]

2. As a result, Huaxing faced two options on February 23rd 2004: one option was to cancel the proposed project, and another option to start the proposed project with taking the investment for constructing the specialized pipeline into account. That is to say, whether to construct the specialized pipeline was the premise for starting the proposed project, if the local government didn't agree Huaxing to construct the specialized pipeline, the proposed project would be cancelled.[36]

3. Up to November 5th 2004, the provincial government agreed to construct the specialized pipeline by Huaxing,[37] which means the proposed project could be considered to start. According to the FSR for constructing the specialized pipeline completed by Changqing Exploration Design Institute, the investment for constructing the specialized pipeline is 413.75 million Yuan, which means the total investment of the proposed project with taking the investment for constructing the specialized pipeline into account would be up to 2863.29 million Yuan (2449.54+413.75). In that case, the IRR of the proposed project without consideration of CDM revenue is 5.02%, which means the propose project is financial unattractive; and the IRR of the proposed project with consideration of CDM revenue is 12.60%, which means the propose project is financial attractive.

4. Under serious consideration of CDM, Huaxing submitted an application to its headquarters (Beijing Sajili Energy Co., Ltd) on December 21st 2004 for starting the construction of the proposed project with taking the additional investment of the specialized pipeline into account.[38] The detail of the application submitted by Huaxing to its headquarters on December 21st 2004 is elaborated as below:

   - According to the FSR for constructing the specialized pipeline completed by Changqing Exploration Design Institute in November 2004, the IRR of the proposed project with taking the additional investment of the specialized pipeline into account was below the benchmark of 8%, which means the proposed project was economically unattractive;
   - According to the report completed on November 17th 2003 regarding the study of CDM to Beijing No. 3 Thermal Power Plant[39] on November 11th 2003, it is feasible to apply CDM for natural gas combined cycle power generation project;

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[35] The application for constructing the specialized natural gas pipeline of Zhangjiagang gas-steam combined cycle generation project issued by Zhangjiagang Government on March 3rd 2004, No. 24 of Zhangzhenfa [2004]

[36] The application for constructing the specialized pipeline of the propsoed project by the project's owner issued by Beijing Sanjili Energy Co., Ltd on February 23rd 2004, No 009 of Jingnengzi[2004]

[37] The approval for constructing the specialized pipeline by Huaxing was issued by Jiangsu Provincial Development and Reform Committee on November 5th 2004, No. 800 of Sufagaiban[2004]

[38] The application for start-up construction of the proposed project issued by Zhangjiagang Huaxing Power Co., Ltd on December 21st 2004, No. 042 of Zhanghuaxingdian[2004]

[39] Its natural gas combined cycle power generation project was selected as a CDM study case in mid 2003 which stated in Page 55 of *Clean Development Mechanism in China Taking a Proactive and Sustainable Approach* published by The International Bank for Reconstruction and Development / THE WORLD BANK on June 2004, refer to:

http://www.worldbank.org.cn/English/content/cdm-china.pdf

And this project had been approved for registration by EB on Feb 15th 2008, refer to:

http://cdm.unfccc.int/Projects/DB/TUEV-SUED1191500853.33/view

- According to *The management methods regarding CDM projects* jointly issued by the NDRC, the Ministry of Science and Technology and the Ministry of Foreign Affairs on May 31st 2004, the Chinese enterprises can officially begin to apply the LoA to the Chinese DNA since June 30th 2004;
- According to the presentation of Beijing No. 3 Thermal Power Plant, the CDM project for natural gas combined cycle power generation similar with the proposed project can lead to the additional revenue of about ten million dollars except for the revenue of electricity sales. This additional revenue can overcome the barrier due to the construction of the specialized gas pipeline;
- Based on the above-mentioned reason, Huaxing apply its headquarters to approve the start-up of the proposed CDM project.

5. Afer receiving this application submitted by Huaxing, the headquarters immediately held a executive meeting to debate this issue and finally approved this application on Dec 26 2004.[40] The detail of the minute of the executive meeting of Beijing Sajili Energy Co., Ltd on December 26th, 2004 is elaborated as below:
   - Agree to the conclusion made by Huaxing in the application letter;
   - Agree to the start-up of the proposed CDM project since the date of the meeting.

6. After recieving the offical approval letter issued by Beijing Sajili Energy Co., Ltd on Jan 4th 2005, the construction supervisor of the proposed project issued the construction permission on January 5th 2005.

The detailed timeline for the CDM status and the implementation of the proposed project prior the publicity of the PDD are tabulated as below:

Timeline	CDM activities	Implementation of the project
Oct 20th 2003		Huaxing obtained the approval of the NDRC
Nov 11th 2003	Huaxing appointed its employee to Beijing No. 3 Thermal Power Plant to learn the CDM know how about natural gas combined cycle	
Feb 23rd 2004		JSGAS didn't agree to construct the specialized pipeline planned to constructed by the PetroChina previously. Huaxing submitted an application to the government of Zhangjiagang City whether to construct the specialized pipeline by itself.
Mar 3rd 2004		The government of Zhangjiagang City agree Huaxing to construct the specialized pipeline by itself
Mar 28th 2004		The government of Suzhou City agree Huaxing to construct the specialized pipeline by itself
May 31st 2004	*The management regulations regard ing CDM projects* jointly issued by t he NDRC, the Ministry of Science a nd Technology and the Ministry of Foreign Affairs	

[40] The minute of the General Manager's meeting of Beijing Sajili Energy Co., Ltd on December 26th, 2004.

June 30th 2004	Enterprises in China can officially b egin to apply the LoA to the Chines e DNA according to the above regul ation	
Nov 5th 2004		The government of Jiangsu Province agree Huaxing to construct the specialized pipeline by itself
Nov 17th 2004	The relevant methodology (NM0080) was publicity on EB's web site	
Dec 21st 2004	Huaxing submitted an application to its headquarters for starting the proposed project under consideration of CDM	
Dec 26th 2004	The headquarters agree the above application	
Dec 28th 2004	Huaxing began to negotiate the CDM Consultancy Agreement with Beijing Orient Fortune Invetment Co., Ltd (hereinafter refered to as BOFI)	
Dec 29th 2004	The starting date of the proposed CDM project	Huaxing signed the contract of natural gas supply with the PetroChina.
Jan 5th 2005		The construction supervisor issued the construction permission
Jan 9th 2005		Huaxing signed the agreement for construction with the First Electric Power Construction Company of Jiangsu Province
Oct 18th 2005		Huaxing signed Long-term Service Agreement, which means the contract for purchasing main equipment effectiveness
Oct 11th 2005	Huaxing signed the CDM Consultancy Agreement with BOFI	
May 19th 2006	AM0029 was approved by EB	
May 25th 2006	Huaxing held a meeting with BOFI for starting to develop the PDD	
Aug 16th 2006	Huaxing held a meeting with Arreon Carbon recommended by BOFI for discussing the issue regarding the CER Purchase Termsheet	
Dec 3th 2006	Huaxing held a meeting with Arreon Carbon for discussing the technical issue of the CER Purchase Termsheet	
Jan 12th 2007		The proposed project obtained the certificate for Acceptance test, which means it was officially commissioned
Apr 19th 2007	Huaxing signed CER Purchase Termsheet with Arreon Carbon	

Apr 30th 2007		Jiangsu Tianhua Dapeng Certified Public Accountants Co., Ltd issued the final accounting of expenditure of the proposed project
Sept 21st 2007	The proposed CDM project approved by the Chinese DNA	
Nov 24th 2007	The initial PDD of the proposed project was publicity at EB's website for validation	

According to AM0029, the additionality of the proposed project activity will be assessed and demonstrated as the following three steps:

Step 1: Benchmark Investment Analysis

Benchmark Analysis Method

Within the power industry sector in China, the financial benchmark rate of return (after tax) is selected IRR of total investment as 8% since 2003.[41] Hence, the IRR of the total investment will be chosen as financial indicator for the benchmark investment analysis in this PDD.

Calculation and comparison of financial indicators

The data for IRR calculation are sourced from the calculation paper provided by Jiangsu Electric Power Design Institute[42]:

Basic parameters	Unit	Value
Static investment capital	Million yuan	2863.29[43]
Construction period	Year	2
Trial production period	Year	1
Lifetime of the combined cycle power generation units	Year	20
Rated total installation capacity	MW	780
Annual operation hours	Hour	3500
Natural gas consumption per unit electricity	m^3/MWh	211
Depreciation period	Year	15
Auxiliary electricity consumption by the power plant	%	2

[41] *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* published by China Electric Power Press, Beijing, 2003

[42] The economic assessment fascicule of the feasibility study report of the proposed project approved by the NDRC on October 20th 2003, its serial number is F1274KU－EB－01 and its index number is 32－F1274KU－EB.

[43]The total invsetment of the proposed project without consideration of the construction of the specilized gas pipeline is 2449540 Thousand Yuan in this FSR. In the feasibility study report of construction of the specilized gas pipeline competed by the Changqing Exploration Design Institute on November 2004, the total investment of construction of the specilized gas pipeline is 413750 Thousand Yuan, so the final total investment of the proposed project is 2863290 Thousand Yuan.

Maintenance expenditure	%	2.5
Insurance expenditure	%	0.25
Material expenditure	yuan /MWh	8.5
Water expenditure	yuan/MWh	0.2
Employee expenditure	Yuan/year/person	40000
welfare expenditure	%	14
Quantity of employee	person	80
Other operation expenditure	yuan/MWh	15
Expected electricity tariff	Yuan/kWh	0.422
Natural gas price	Yuan/m^3	1.10
Statutory surplus reserve	%	10
Statutory welfare fund	%	5
Value added tax(VAT)	%	17
Tax for urban and rural construction	%	7
Tax for education	%	4
Income tax	%	33

According to Page 55 of *Clean Development Mechanism in China Taking a Proactive and Sustainable Approach* published by The International Bank for Reconstruction and Development/ THE WORLD BANK on June 2004[44]:

Basic parameters	Unit	Value
CO2 emission reductions per kWh of electricity generation	kg CO2/kWh	0.46
CO2 emission reductions costs as the CER price	Yuan/t CO2	124.08

Based on the above data, The IRR of total investment (after tax) of the proposed project can be calculated, the calculation results are listed below:

	IRR of the total investment (after tax)
The proposed project without CDM revenue	5.02%
The proposed project with CDM revenue	12.60%

That means the proposed project without CDM revenue is considered to be financially unattractive due to its IRR is 5.02%, and the proposed project without CDM revenue is considered to be financially unattractive since its IRR is 12.60%.

Sensitivity analysis

[44] http://www.worldbank.org.cn/English/content/cdm-china.pdf

For the proposed project, the following financial parameters were taken as critical techno-economic parameters for sensitive analysis of financial attractiveness:

- Total Investment
- Electricity tariff
- Annual Operation Hours
- O&M expenditure
- Natural gas price

Assume other parameters remaining unchanged, if the IRR of the total investment of the proposed project without CDM revenue can be reached 8%, the above mentioned critical techno-economic parameters can be calculated, and the calculation results are listed below:

Critical techno-economic parameters	Calculation result	Original value	Change rate
Total Investment	2161.78 Million RMB	2863.29 Million RMB	−24.5%
Electricity tariff	0.472 Yuan /MWh	0.422 Yuan/kWh	+11.85%
Annual Operation Hours	4616.5Hours	3500 Hours	+31.9%
O&M expenditure	25808ThousandYuan	146636Thousand Yuan	−82.4%
Natural gas price	0.8679 Yuan/m^3	1.1 Yuan/m^3	−21.1%

Based on the above calculation results, the sensitivity analysis are as below:

If the IRR reach to the benchmark, the total investment would drop by 24.5%. Due to the total investment is mainly used for the main equipments[45] which imported from GE, a company based in USA, and the price of the main equipments is contracted in the purchase agreement, so the vibration of the total investment would lies on exchange rate for US Dollar an RMB. The exchange rate for US Dollar and RMB is 8.3 and 7.4 in 2005 and 2007 respectively, it that means that from 2005 to 2007, the exchange rate for US Dollar and RMB rose about 10.8%. That is to say, the total investment could be declined about to 10.8%, but to be declined to 24.5% is impossible[46].

If the IRR reach to the benchmark, the electricity tariff would rise by 11.85%. Due to natural gas combined cycle belong to thermal power, so the electricity tariff of the proposed project would be based on the electricity tariff of thermal power in Jiangsu Province. The basis electricity tariff of thermal power with desulfurizing in Jiangsu Province is 0.37 Yuan/kWh in 2004[47], 0.386 Yuan/kWh in 2005[48], 0.39

[45] The investment for tha main equipments accounts for 82.9% in the total investment, please refer to the total budgetary estimate in the economic assessment fascicule of the feasibility study report of the proposed project

[46] The actual situation is that the accumulative total investment of the project activity is 3000 million RMB till the end of 2006, please see the validation for commission of the proposed project.

[47] The urgent notification for further standardizing electricity price management and adjusting the electricity tariff of grid-connected power plants issued by Jiangsu Provincial Price Bureau on June 23th 2004, No.219 of Sujiagong [2004]

[48] The urgent notification for adjusting the electricty tariff of thermal power issued by by Jiangsu Provincial Price Bureau on April 24th 2005, No.97 of Sujiagong [2005]

Yuan/kWh in 2006[49] and 0.39 Yuan/kWh in 2007[50] respectively. From 2004 to 2007, the basis electricity tariff of thermal power with desulfurizing in Jiangsu Province increased by only 5.4%. Moreover, it should be noted that the increase in electricity tariff is strictly regulated by the government in China, and it is generally associated with the increase on price of fuels, as demonstrated later in the section. Therefore, it is not quite likely that the project IRR will be over the benchmark rate when the electricity varies within reasonable ranges.

If the IRR reach to the benchmark, the annual operation hours would rise by 31.9%. According to the *Rules of Dispatch and Management of the Power Grid* issued by the State Council of the People's Republic of China, the annual operation hours are limited by the design value and controlled by the power grid, not vibrated by the power plants. Furthermore, according to *the Analysis Report for National Electric Power Market in 2007*, the national average annual operation hours is predicted a decline trend in China, in particular in Jiangsu Province, the decline trend is further obvious.[51] In this case, the annual operation hours can not rise by 31.9%.

If the IRR reach to the benchmark, the operation and maintenance expenditure would drop by 82.4%. Huaxing has signed a long term maintenance agreement with GE, which means the maintenance expenditures are contracted to be a fixed value. Furthermore, the employee's wage payment and administration fee are rising continuously due to the rising inflation in the recent years and the future, so the O&M expenditure is impossible to drop by 82.4%.

If the IRR reach to the benchmark, the natural gas price would drop by 21.1%. The natural gas price is rising continuously worldwide in recent years, and furthermore, the actual natural gas price for power generation in Jiangsu Province in 2004, 2005, 2006 and 2007 are 1.10[52], 1.14[53], 1.18[54] and 1.58[55] Yuan/m^3 respectively, which means the natural gas price is rising continuously, and impossible to drop to 0.8679 Yuan/m^3.

Based on the above analysis, there are no means to reach 8% for the IRR of the total investment of the proposed project without CDM revenue, that is to say, the conclusion is robust that the proposed project without CDM revenue is unlikely to be financially attractive.

Step 2: Common practice analysis

[49] The urgent notification for adjusting the electricty tariff of thermal power issued by by Jiangsu Provincial Price Bureau on June 29th 2006, No.223 of Sujiagong [2006]

[50] The invoice for electricity sales to JPG issued by Zhangjiagang Huaxing Power Co., Ltd on December 24th 2007

[51] http://www.hapin.org.cn/html/jiagejiancefenxi/jiagefenxi/20071016/983.htmlhttp://www.hapin.org.cn/html/jiagejiancefenxi/jiagefenxi/20071016/983.html

[52] The notification for adjusting base factory price of natural gas of "West to East Gas Pipeline" issued by the NDRC on September 28th 2003, No.1323 of Fagaijiage[2003]

[53] The notification for adjusting base factory price of natural gas of "West to East Gas Pipeline" issued by the NDRC on March 18th 2005, No.439 of Fagaijiage[2005]

[54] The notification for adjusting base factory price of natural gas of "West to East Gas Pipeline" issued by the NDRC on January 24th 2006, No.141 of Fagaijiage[2006]

[55] The notification for adjusting base factory price of natural gas of "West to East Gas Pipeline" issued by the NDRC on November 8th 2007, No.301 of Fagaidian[2007]

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

In terms of similar outputs, services and technology (electricity supply and peak regulation to JPG, using gas-fired combined cycle), there are three other natural gas-fired power plants previously or simultaneously in Jiangsu Province[56]. The information of these activities is listed as follows:

The activity similar to the proposed project activity	Information of the similar activities	Notes
Jiangsu Qishuyan Natural Gas Based Power Generation Project	Located in Zhangjiagang City of Jiangsu Province, its total rated installation capacity is 2×390MW	Under validation
Jiangsu Wangting Natural Gas Based Power Generation Project	Located in Suzhou City of Jiangsu Province, its total rated installation capacity is 2×390MW	Under validation
Nanjing Grid Connected Natural Gas Combined Cycle Power Plant	Located in Nanjing City of Jiangsu Province, its total rated installation capacity is 2×390MW	Under validation

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

Excluding the above project activities which have been under development as CDM projects[57], there are no other project activities similar to the proposed project activities, so the proposed project is not the common practice

Step 3: Impact of CDM Registration

If the proposed project activity can be registered as a CDM activity, the IRR of the total investment of the proposed project activity will be more than 8%, the proposed project activity will be financially attractive and be commission normally, so the GHG emission reductions from the proposed project activity will be occurring. Meanwhile, the successfully registration of the proposed project will further promote the popularization of the gas-fired combined cycle power technology, and then lead to further GHG emission reductions in China.

If the proposed project activity can not be registered as a CDM activity, it will be considered as financially unattractive, and the alternative is to construct a 600MW sub-critical coal-fired power plant. Therefore, the GHG emission reductions from the proposed project activity will be not occurring.

Based on the analysis of all the above steps, the proposed CDM project is additional.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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[56] http://www.china5e.com/power/powernews.aspx?newsid=dac24d56-8118-4738-9637-0c58634a3d29&classid=%u7535%u529b

[57] http://cdm.unfccc.int/Projects/Validation/index.html

According to AM0029, the explanation regarding to estimating the emission reductions of the proposed project activity are stated as follows:**Baseline Emission (BE_y)**

Baseline emissions are calculated by multiply the electricity generated in the proposed project plant (EG_y) with a baseline emission factor ($EF_{BL.CO2.y}$), as the following formula (2):

$$BE_y = EG_y \times EF_{BL,CO2,y} \quad (2)$$

Where,

$EG_{,y}$	Net electricity generation in the proposed project plant in year '*y*'. This parameter will be monitored during the crediting period, and its value for ex-ante assessment is 2675.40 GWh cited from the FSR of the proposed project.
$EF_{BL,co2,y}$	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 ex-ante 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 in tool to calculate the emission factor for an electricity system. This parameter is calculated as the following formula (3).

$$EF_{BL.CO2.y} = \min(EF_{BL.BM.y}, EF_{BL.CM.y}, EF_{BL.CO2.option3}) \quad (3)$$

Where,

$EF_{BM,y}$	The build margin of ECPG (tCO_2e/MWh). Its value is 0.8672 tCO_2e/MWh calculated in terms of tool to calculate the emission factor for an electricity system.
$EF_{C\,M,y}$	The combined margin of ECPG (tCO_2e/MWh). Its value is 0.90465 tCO_2e/MWh calculated in terms of tool to calculate the emission factor for an electricity system.
$EF_{BL,CO2,option3}$	The emission factor (tCO_2e/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. Its value is 0.9508 tCO2/MWh, and calculated as the following formula (4):

$$EF_{BL,CO2.option3} = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh \quad (4)$$

Where**,**

$COEF_{BL}$	The coal emission coefficient (tCO_2e/GJ), due to national average fuel data is not available, so the IPCC defaults value is used. This parameter is as: 25.8 tC/TJ * (44/12) /1000 = 0.0946 tCO_2/GJ.
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 35.82%, cited from the *Notification for Determining Baseline Emission Factor of Regional Grid of China* issued by China's DNA on Aug 9th, 2007.

The operating margin, build margin and combined margin emission factor of ECPG should be calculated in accordance with the consecutive six steps in the tool to calculate the emission factor for an electricity system.

Step 1: Identity the proposed project electric system

Because the DNA of China has published the delineation of the proposed project electricity system and connected electricity systems, the delineations should be used. As per the delineation of the DNA of China, the proposed project electricity system is ECPG[58].

Step 2: Select an operating margin method (OM)

The calculation of the operating margin emission factor ($EF_{OM,y}$) is based on one of the following methods:

(A) Simple OM, or
(B)Simple adjusted OM, or
(C)Dispatch data analysis OM, or
(D)Average OM

(A)Simple OM method is applicable to this project activity because that in the last five years the low-cost/must run resources constituted less than 50% of generation in ECPG. The data in the table below illustrates this point.

Energy Source	2001	2002	2003	2004	2005
Total Power Generation (GWh)	327015	367813	429127	487986	572332
Total Low-cost/must run resources (Hydro)	34999	37835	31982	25556	44237
Total Low-cost/must run resources (Nuclear)	2472	5612	14924	21988	22102
Total Low-cost/must run resources (Others)	0	163	109	150	311
Percentage of Low-cost/must run resources % in the total grid generation	11.49	11.86	10.96	9.77	11.65

Data Sources:
2006 China Electric Power Yearbook, p.568
2005 China Electric Power Yearbook, p.474
2004 China Electric Power Yearbook, p.671
2003 China Electric Power Yearbook, p.585
2002 China Electric Power Yearbook, p.617

For the simple OM, the ex-ante option A should be chosen.

ex-ante option A: 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

Step 3: Calculate the operating margin emission factor according to the selected method.

[58] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

• Option A- Based on data on fuel consumption and net electricity generation of each power plant / unit , or

• Option B- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, or

• Option C- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the proposed project electricity system.

Because data of each power plant/unit is not available in ECPG, Option C is chosen.

Where Option C is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the proposed project electricity system, calculated as the following formula:

$$EF_{grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{total,y}} \quad (5)$$

Where:

$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh), Its value is calculated to be 0.9421 tCO2e/MWh (see Annex 3 for detailed information)
$FC_{i\ y}$	Amount of fossil fuel type *i* consumed in the proposed project electricity system in year *y* (mass or volume unit), cited from the *China Energy Statistics Yearbook (2004-2006)*. (see Annex 3 for detailed information)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel *i* in year *y* (GJ/mass or volume unit), cited from *China Energy Statistics Yearbook 2006*. (see Annex 3 for detailed information)
$EF_{CO2,y}$	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ), cited from IPCC default values of IPCC 2006. (see Annex 3 for detailed information)
$EG_{total,y}$	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh), cited from the *China Electric Power Yearbook (2004-2006)*. (see Annex 3 for detailed information)
i	All fossil fuel types combusted in power sources in the proposed project electricity system in year *y*. (see Annex 3 for detailed information)
y	Three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option). The year of this PDD submitted to DOE for validation is 2007, at this time the data stated in the Yearbook 2004, 2005, 2006 is available..

Step 4: Identity the cohort of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consist of ether:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

In ECPG, the information of the five power plants built most recently is not available, so the sample group of power units *m* used to calculate the build margin is chosen (b).

In terms of vintage of data, Option 1 is chosen:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Step 5: Calculate the build margin (BM) emission factor:

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as the following formula (6):

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (6)$$

Where,

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

As above-mentioned in step 4, the sample group of power units *m* used to calculate the build margin is chosen (b), 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

deviation[59]:

- 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, $EF_{grid,BM,y}$ should be calculated by the above method, the calculation formula is:

$$EF_{grid,BM,y} = \frac{\sum CAP_{fossil,y-s}}{\sum CAP_{y-s}} \times EF_{EL,fossil,y} \quad (7)$$

Where,

$EF_{grid,BME,y}$	Build margin CO_2 emission factor in year *y* (tCO_2/MWh), Its value is calculated to be 0.8672 tCO2e/MWh (see Annex 3 for detailed information)
$\Sigma CAP_{fossil,y-s}$	Total capacity additions of fossil fuel fired power of ECPG from year *s* to year *y,* (see Annex 3 for detailed information)
ΣCAP_{y-s}	Total capacity additions of ECPG from year *s* to year *y,* (see Annex 3 for detailed information)
$EF_{EL,fossil,Adv,y}$	The emission factor for fossil fuel fired power of ECPG with the efficiency level of the best technology commercially available. Its value is 0.9465 tCO2/MWh, calculated as the following formula (9):
y	Mostly recent year that the relevant data can be obtained publicly. The year of this PDD submitted to DOE for validation is 2007, at this time the data stated in the Yearbook 2004, 2005, 2006 is available.
s	This parameter is determined by: Starting from year *y*, the differences of total installed capacity of the grid between year *y* and year *y*-1, year *y* and year *y*-2, …year *y* and year *y*-*s*, year *y* and year *y*-*s*-1, …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 *s*. The formula is as follows: $\frac{\sum CAP_{y-s}}{\sum CAP_{y}} \geq 20\%$ (8) (see Annex 3 for detailed information)

The types of fossil fired power include coal-fired, oil-fired and gas-fired power, so the emission factor for fossil fuel fired power with the efficiency level of the best technology commercially available is calculated as follows:

$$EF_{BL,fossil,Adv,y} = \lambda_{coal} \times EF_{coal,Adv,y} + \lambda_{oil} \times EF_{oil,Adv,y} + \lambda_{gas} \times EF_{gas,Adv,y} \quad (9)$$

Where,

λ_{coal}	Solid fuel emission share of total Emissions in ECPG, calculated as the following

[59] http://cdm.unfccc.int/Projects/Deviations

	equation (10).
$EF_{coal,Adv,y}$	The efficiency of the coal-fired power unit based on the best technology level as commercial, seen from Annex 3 for the detailed calculation information.
λ_{oil}	Liquid fuel emission share of total Emissions in ECPG, calculated as the following equation (11).
$EF_{oil,Adv,y}$	The efficiency of the oil-fired power unit based on the best technology level as commercial, seen from Annex 3 for the detailed calculation information.
λ_{gas}	Gas fuel emission share of total Emissions in ECPG, calculated as the following equation (12).
$EF_{gas,Adv,y}$	The efficiency of the gas-fired power unit based on the best technology level as commercial, seen from Annex 3 for the detailed calculation information.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (10)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (11)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (12)$$

Where:

$F_{i,j,y}$	The amount of fuel i (in a mass or volume unit) consumed by province *j* in year(s) *y*, (see Annex 3 for detailed information)
$COEF_{i,j}$	The fuels (coal, oil and gas) used by province *j* and the percent oxidation of the fuel in year(s) y, and *COAL*, *OIL* and *GAS* are footnote group for solid fuels, liquid fuels and gas fuels. (see Annex 3 for detailed information)

Step 6: Calculate the combined margin (CM) emission factor:

The combined emission factor $EF_{gridC,M,y}$ is calculated as follows:

$$EF_{\text{grid,CM},y} = \omega_{OM} \cdot EF_{\text{grid},OM,\text{simple},y} + \omega_{BM} \cdot EF_{\text{grid},BM,y} \quad (13)$$

Where,

$EF_{grid,CM,y}$	The combined margin of ECPG in year y (tCO_2e/MWh). This value is 0.90465 tCO_2e/MWh and calculated as the above formula (13).
$EF_{grid,OM,simple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh). This value is 0.9421 tCO_2e/MWh and calculated as the above equation (5).
$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y* (tCO_2/MWh). This value is 0.8672 tCO_2e/MWh and calculated as the above equation (7).
ω_{OM} and ω_{BM}	Weighting of operating and build margin emission factor (%). Using the default values

	provided by the tool, 50 and 50 for the first crediting period, and 25 and 75 for the second and third crediting period.

Project Emissions (PE_y)

The proposed project activity is on-site combustion of natural gas to generate electricity. According to the proposed project's FSR, natural gas is the only type of fuel consumed in the proposed project activity. The CO_2 emissions from electricity generation (PE_y) are calculated as follows:

$$PE_y = \sum FC_y \times COEF_y \quad (14)$$

Where,

$FC_{,y}$	Quantity of natural gas combusted in the proposed project plant in year '*y'*. This parameter will be monitored during the crediting period, and its value for ex-ante assessment is 576.03 million Nm^3/a cited from the FSR of the proposed project.
$COEF_{,y}$	The CO_2 emission coefficient for natural gas (tCO_2/m^3) in year '*y'*. This parameter is calculated as the following equation:

$$COEF_y = NCV_y \cdot EF_{CO_2,y} \cdot OXID_{\mathrm{NG}} \quad (15)$$

Where,

NCV_y	The net calorific value per volume unit of natural gas in year '*y*' (MJ/m^3) as determined by the natural gas supplier. This parameter will be monitored during the crediting period, and its value for ex-ante assessment is 33.695 MJ/m^3 cited from the FSR of the proposed project.
$OXID_{NG}$	The oxidation factor of natural gas. This parameter will be monitored during the crediting period, and its value is 1, cited from the default value of IPCC 2006.
$EF_{CO2,y}$	The CO_2 emission factor per unit of energy of natural gas in year '*y*' (tCO_2/TJ) as determined by the natural gas supplier, wherever possible, otherwise from local or national data. This parameter will be monitored during the crediting period, and its value is 56.1 tCO_2/TJ which converted from 15.3 tC/TJ cited from the default value of IPCC 2006.

Leakage (LE_y)

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

$$LE_y = \left\lfloor FC_y \times NCV_y \times EF_{NG,upstream,CH4} - EG_y \times EF_{BL,upstream,CH4} \right\rfloor \times GWP_{CH4} \quad (16)$$

Where:

LE_y	Leakage emissions during the year *y* in tCO_2e
FC_y	Quantity of natural gas combusted in the proposed project plant during the year *y* in m^3. This parameter will be monitored during the crediting period. Its value for ex ante assessment is 576.03 million m^3 which is cited from the FSR of the proposed project.
NCV_y	Average net calorific value of the natural gas combusted during the year y in TJ/m^3.

	This parameter will be monitored during the crediting period. Its value for ex ante assessment is 33.695 MJ/m^3 which cited from the FSR of the proposed project.
$EF_{NG,upstream,CH4}$	Emission factor for upstream fugitive methane emissions of natural gas from production, transportation and distribution in t CH 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 proposed 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 2675.40 GWh which cited from the FSR of the proposed project.
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period. This parameter's value is taken 21 tCO_2e/tCH4.
$EF_{BL,upstream,CH4}$	Emission factor for upstream fugitive methane emissions occurring in the absence of the proposed project activity in t CH4 per MWh electricity generation in the proposed project plant. This parameter's value is calculated to be 0.005764 tCH_4/MWh, calculated as the following formula (20):

According to AM0029, $EF_{BL,upstream,CH4}$ should be calculated consistent with the baseline emission factor ($EF_{BL,co2,y}$) used in the similar equation. In this PDD, the baseline emission factor of the proposed project activity is selected BM, so $EF_{BL,upstream,CH4}$ should be calculated as follows:

$$EF_{BL,upstream,CH4} = \frac{\sum_j FF_{j,k} \times EF_{k,uptream,CH4}}{\sum_j EG_j} \quad (20)$$

Where,

j	Power plant included in the build margin.
$FF_{j.k}$	Quantity of fuel type k (a coal or oil type) combusted in power plant j included in the build margin.
$EF_{k,upstream,CH_4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in t CH_4 per MJ fuel produced.
EG_j	Electricity generation in the plant j included in the build margin in MWh/a.

Based on the above calculation method of BM, the calculation formula for $EF_{BL,upstream,CH4}$ could be converted to:

$$\mathrm{EF_{BL,upstream,CH4}} = \frac{\sum \mathrm{CAP_{fossil,y\text{-}s}}}{\sum \mathrm{CAP_{y\text{-}s}}} \times \mathrm{EF_{fossil,upstream,CH4}} \quad (21)$$

$$\mathrm{EF_{fossil,upstream,CH4}} = \lambda_{\mathrm{coal}} \times \mathrm{EF_{coal,Adv,upstream,CH4}} + \lambda_{\mathrm{oil}} \times \mathrm{EF_{oil,Adv,upstream,CH4}} + \lambda_{\mathrm{Gas}} \times \mathrm{EF_{Gas,Adv,upstream,CH4}} \quad (22)$$

According to formula (21) and (22), $EF_{BL,upstream,CH4}$ could be calculated as:

$$EF_{BL,upstream,CH4} = \frac{CAP_{fossil,y-s}}{CAP_{y-s}} \times \left(\lambda_{coal} \times EF_{coal,Adv,upstream,CH4} + \lambda_{oil} \times EF_{oil,Adv,upstream,CH4} + \lambda_{Gas} \times EF_{Gas,Adv,upstream,CH4}\right) \quad (23)$$

The calculation value of $EF_{BL,upstream,CH4}$ is more small, it is more conservative, so the above formula (23) can be simplified as follows:

$$EF_{BL,upstream,CH4} = \frac{\sum CAP_{fossil,y-s}}{\sum CAP_{y-s}} \times \lambda_{coal} \times EF_{Coal,Adv,upstream,CH4} \quad (24)$$

$$EF_{Coal,Adv,upstream,CH4} = CC_{Coal,best} \times EF_{Coal,upstream,CH4} \times \frac{NCV_{Standard,coal}}{NCV_{Raw,coal}} \quad (25)$$

Based on the formula (24) and (25), $EF_{BL,upstream,CH4}$ could be calculated as:

$$EF_{BL,upstream,CH4} = \frac{\sum CAP_{fossil,y-s}}{\sum CAP_{y-s}} \times \lambda_{coal} \times CC_{coal,Adv} \times EF_{Coal,upstream,CH4} \times \frac{NCV_{coal}}{NCV_{Raw\ coal}} \quad (26)$$

Where,

$\frac{\sum CAP_{fossil,y-s}}{\sum CAP_{y-s}}$	The share of the incremental installed capacity of coal-fired power in the recent 20% incremental installed capacity of all type powers in ECPG. This value is calculated to be 92.53%, see Annex 3 of this PDD.
λ_{coal}	Solid fuel emission share of total Emissions in ECPG. This value is calculated to be 96.71%, see Annex 3 of this PDD.
$CC_{coal\ Adv}$	The standard coal consumption of the best technology commercially available of coal-fired power generation within the grid boundary (gce/kWh). Its value is 343.33 gce/kWh and cited from the *Notification for Determining Baseline Emission Factor of Regional Grid of China* issued by China's DNA on Aug 9th, 2007.
$EF_{coal,upstream,CH4}$	The emission factor for fugitive upstream emissions for raw coal underground mining. Its value is 13.4 tCH4/kt based on *underground coal production* in Table 2 of AM0029.
$\frac{NCV_{coal}}{NCV_{rawcoal}}$	The net caloric value of standard coal/ the net caloric value of raw coal. In accordance with P365 of *China Energy Statistics Yearbook* 2006, the net caloric value of raw coal is 5000 kcal/kg and the net caloric value of standard coal is 7000 kcal/kg, so its value is 1.4

According to AM0029, if total net leakage effects are negative (LE_y<0), then should be assumed LE_y = 0.

Emission Reductions (ER_y)

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

$$ER_y = BE_y - PE_y - LE_y \quad (27)$$

Where,

BE_y	Emissions in the baseline scenario in year *y* (t CO_2)
PE_y	Emissions in the proposed project scenario in year *y* (t CO_2)
LEy	Leakage in year *y* (t CO_2)

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

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Data/parameter:	*FC i,y*
Data unit:	ton or m^3
description:	Amount of fossil fuel type *i* consumed in the proposed project electricity system in year *y* within ECPG
Source of data used:	*China Energy Statistics Yearbook 2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	Due to the detailed power generation data of the power plants are not publicly available, the aggregated data by fuel types are used instead.
Any comment:	Nil

Data/parameter:	*EGy*
Data unit:	MWh
description:	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* within ECPG
Source of data used:	*China Electric Power Yearbook2004-2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	Due to the detailed power generation data of the power plants are not publicly available, the aggregated data by fuel types are used instead.
Any comment:	Nil

Data/parameter:	$EF_{CO2\,i,y}$
Data unit:	tC/TJ
description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	Table 1.3-1.4 ,P1.21-1.24, Chapter 1 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume2 Energy*
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, so the IPCC default values are used instead.
Any comment:	Nil

Data/parameter:	$NCV_{i,y}$

Data unit:	MJ/t, or tce or MJ/m^3
description:	Net calorific value (energy content) of fossil fuel *i* in year *y*
Source of data used:	*China Energy Statistical Yearbook 2006*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	The national specific value shall be used preferentially.
Any comment:	Nil

Data/parameter:	$COEF_{BL}$
Data unit:	tCO_2e/GJ
description:	The coal emission coefficient
Source of data used:	IPCC default values
Value applied:	0.0946
Justification of the choice of data or description of measurement methods and procedures actually applied:	25.8 tC/TJ * (44/12)/1000 = 0.0946 tCO_2/GJ.
Any comment:	Nil

Data/parameter:	η_{BL}
Data unit:	Nil
description:	The energy efficiency of the technology of the most likely baseline scenario.
Source of data used:	Annex 2 of the *Notification on Determining Baseline Emission Factor of China's Grid* issued by China's DNA on Aug 9th, 2007. (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf)
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied:	This data is recommended by Chinese DNA
Any comment:	Nil

Data/parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
description:	Global Warming Potential for CH4
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:

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Based on B 6.2 and B7.1of the PDD, the data values used for ex-ante calculation of emission reductions s are presented as follows:

Parameters	Unit	Value	Data source
data of the ex-ante calculation available for validation			
$COEF_{BL}$	tCO_2e/GJ	0.0946	25.8 tC/TJ * (44/12) /1000 = 0.0946 tCO_2/GJ, 25.8 tC/TJ is the IPCC default value of coal.
η_{BL}		35.82%	The DNA of China
ω_{OM} and ω_{BM}		0.5 : 0.5	AM0029
$EF_{OM,y}$	tCO_2e/MWh	0.9421	The DNA of China
$EF_{BM,y}$	tCO_2e/MWh	0.8672	The DNA of China
$\frac{\sum \text{CAP}_{\text{fossil, y-s}}}{\sum \text{CAP}_{\text{y-s}}}$		92.53%	The DNA of China
λ_{coal}		96.71%	The DNA of China
$CC_{coal\ Adv}$	gce/kWh	343.33	The DNA of China
$EF_{coal,upstream,CH4}$	tCH_4/kt	13.4	Table 2 of AM0029
NCV_{coal}	kcal/kg	7000	*China Energy Statistical Yearbook 2006*
$NCV_{Raw,coal}$	kcal/kg	5000	*China Energy Statistical Yearbook 2006*
$EF_{NG,upstream,CH4}$	tCH_4/PJ	296	IPCC default value
GWP_{CH4}	$tCO_2e/tCH4$	21	IPCC default value
data of the ex-ante calculation for monitoring			
FC_y	km^3	576030	According to the FSR of the project activity, natural gas consumption per unit electricity is 0.211 m3/kWh
NCV_y	MJ/m^3	33.695	The FSR of the proposed project
$OXID_{NG}$		1	IPCC default value
$EF_{CO2,y}$	tCO2/TJ	56.1	15.3 tC/TJ * (44/12) = 56.1 tCO2/TJ, 15.3 tC/TJ is the IPCC default value of natural gas.
EG_y	MWh	2675400	According to the FSR of the project activity, the total rated installation capacity is 780 MW, the annual operation hours is 3500 hours and the rate of auxiliary electricity cosumed by the power plant is 2%.

Based on the calculation formulas in B 6.1 of the PDD, the ex-ante calculation of emission reductions is presented as follows:

Ex-ante calculation of baseline emission (BE_y)

$$EF_{BL,CO2.option3} = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh = \frac{0.0946}{35.82\%} \times 3.6 = 0.9508 \text{ tCO}_2\text{e/MWh}$$

$$EF_{\text{grid,CM}.y} = \omega_{OM} \cdot EF_{\text{grid},OM,\text{simple},y} + \omega_{BM} \cdot EF_{\text{grid},BM,y} = 0.5 \times 0.9421 + 0.5 \times 0.8672 = 0.90465$$
$\text{tCO}_2\text{e/MWh}$

$$\text{EF}_{\text{BL.CO2}.y} = \min(\text{EF}_{\text{BL.BM}.y}, \text{EF}_{\text{BL.CM}.y}, \text{EF}_{\text{BL.CO2.option3}}) = \min(0.8672, 0.90465, 0.9508) = 0.8672$$
$\text{tCO}_2\text{e/MWh}$

$$BE_y = EG_y \times EF_{BL,CO2,y} = 2675400 \times 0.8672 = 2320107 \text{ tCO}_2\text{e}$$

Ex-ante calculation of project emission (PE_y)

$$COEF_y = NCV_y \times EF_{CO_2,y} \times OXID_{\text{NG}} = 33.695 \times 56.1 \times 1 \div 1000 = 1.89 \text{ tCO}_2/\text{km}^3$$

$$PE_y = \sum FC_y \times COEF_y = 576030 \times 1.89 = 1088863 \quad \text{tCO}_2\text{e}$$

Ex-ante calculation of leakage (LE_y)

$$\text{EF}_{\text{BL,upstream,CH4}} = \frac{\sum \text{CAP}_{\text{fossil,y-s}}}{\sum \text{CAP}_{\text{y-s}}} \times \lambda_{\text{coal}} \times \text{CC}_{\text{coal,Adv}} \times \text{EF}_{\text{Coal,upstream,CH4}} \times \frac{\text{NCV}_{\text{coal}}}{\text{NCV}_{\text{Raw coal}}}$$
$$= 92.53\% \times 96.71\% \times 343.33 \times 13.4 \times \frac{7000}{5000} \times 10^{-6} = 0.005764 \text{ tCH}_4/\text{MWh}$$

$$LE_y = \left[FC_y \times NCV_y \times EF_{NG,upstream,CH4} - EG_y \times EF_{BL,upstream,CH4}\right] \times GWP_{CH4}$$
$$= (576030 \times 33.695 \times 296 \times 10^{-6} - 2675400 \times 0.005764) \times 21 = -203174 \text{ tCO}_2\text{e}$$

According to AM0029, if LE_y<0, then should be assumed $LE_y = 0$

Ex-ante calculation of emission reductions (ER_y)

$$ER_y = BE_y - PE_y - LE_y = 2320107 - 1088863 - 0 = 1231243 \text{ tCO}_2\text{e}$$

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

>>

Year	Estimation of project activity emissions (tons of CO_2e)	Estimation of baseline emissions (tons of CO_2e)	Estimation of leakage (tons of CO_2e)	Estimation of overall emission reductions (tons of CO_2e)
2009 (01 June –	1,353,396	635,170	0	718,225

31 December)				
2010	2,320,107	1,088,863	0	1,231,243
2011	2,320,107	1,088,863	0	1,231,243
2012	2,320,107	1,088,863	0	1,231,243
2013	2,320,107	1,088,863	0	1,231,243
2014	2,320,107	1,088,863	0	1,231,243
2015	2,320,107	1,088,863	0	1,231,243
2016 (01 January – 31 May)	966,711	453,693	0	513,018
Total (tons of CO_2e)	16,240,749	7,622,041	0	8,618,701

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	FC_y
Data unit:	m^3
Description:	Net quantity of natural gas consumed in project activity in year '*y'*.
Source of data to be used:	Fuel flow meter reading at project boundary The consumption of natural gas will be metered daily using the flow meter within the proposed project boundary. The metering records will be maintained electronically. The metered readings will be cross-verified with the natural gas supplier's bills. In case of any significant difference in the monthly consumption figures, the higher of the two readings (project-end and natural gas supplier's end) would be used.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	576,030,000 According to the FSR of the proposed project.
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 and the gas supplier are all 0.2%. The measurement will be taken online continuously by the flow meter and the data will be recorded daily. The meter will be calibrated every year.
QA/QC procedures to be applied:	These readings will be double checked (cross-verified) with the measurement provided by the gas supplier.
Any comment:	Data will be archived by electronic/paper as available.

Data / Parameter:	NCV_y
Data unit:	GJ/m^3
Description:	Net calorific value of natural gas consumed in the proposed project plant in year '*y'*. The values will be obtained 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	0.033695 According to FSR of the proposed project
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.
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 as available.

Data / Parameter:	$EF_{CO2,y}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of energy of natural 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	15.3 tC/TJ * (44/12) = 56.1 tCO_2/TJ 15.3 tC/TJ is from Table 1.3-1.4 ,P1.21-1.24, Chapter 1 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume2 Energy*, based on availability of data.
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, IPCC default 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 as available.

Data / Parameter:	$OXID_{NG}$
Data unit:	%
Description:	Oxidation factor of natural gas used by the proposed project plant
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	100 This value is from Table 1.3-1.4, P1.21-1.24, Chapter 1 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume2 Energy*, based on availability of data.
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, IPCC default 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 as available.

Data / Parameter:	$EG_{,y}$
Data unit:	MWh
Description:	Net electricity delivered to the grid by 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	2,675,400 According to the FSR of the proposed project.
Description of measurement methods and procedures to be	The readings of electricity meters will be continuously measured and monthly recorded. The accuracy of the electricity meters is 0.2S level. The

applied:	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 as available.

Data / Parameter:	$CAP_{fossil,y}$
Data unit:	MW
Description:	The installed capacity of fossil fuel fired power in year y within ECPG
Source of data to be used:	*China Electricity Power Yearbook*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in the latest version of *China Electric Power Yearbook*.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	

Data / Parameter:	CAP_y
Data unit:	MW
Description:	The installed capacity of all types power in year y within ECPG
Source of data to be used:	*China Electricity Power Yearbook*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3.
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in the latest version of *China Electric Power Yearbook*.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	ton or m^3
Description:	The amount of fuel i (in a mass or volume unit) consumed by province *j* in year(s) *y*,
Source of data to be used:	*China Energy Statistics Yearbook*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see Annex 3 for detailed information
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in the latest version of *China Energy Statistics Yearbook*.

QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	

Data / Parameter:	$COEF_{i,j}$
Data unit:	tC/TJ
Description:	The fuels (coal, oil and gas) used by province *j* and the percent oxidation of the fuel in year(s) y
Source of data to be used:	*China Energy Statistics Yearbook*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see Annex 3 for detailed information
Description of measurement methods and procedures to be applied:	According to the requirements of methodology, Applying the data in the latest version of *China Energy Statistics Yearbook*.
QA/QC procedures to be applied:	No addition QA/AC procedures may need to be planned.
Any comment:	

Data / Parameter:	$EF_{coal\ co2\ y}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of energy of coal 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	25.8 tC/TJ * (44/12) = 94.6 tCO_2/TJ 25.8 tC/TJ is from Table 1.3-1.4, P1.21-1.24, Chapter 1 of *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume2 Energy*, based on availability of data.
Description of measurement methods and procedures to be applied:	Use supplier-provided data, local data, country-specific values, IPCC default 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:	

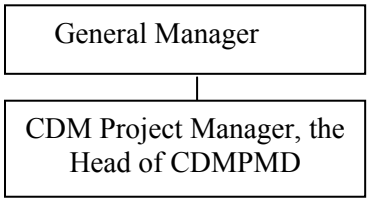
B.7.2. Description of the monitoring plan:

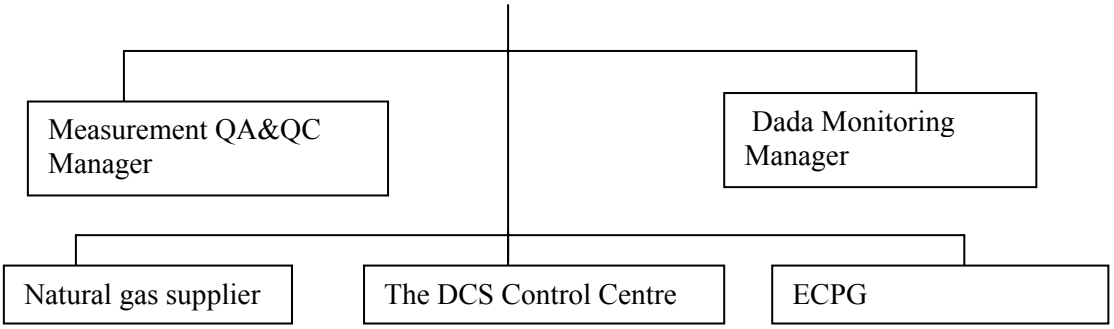
>>

Monitoring plan is to insure to implement the proposed project correctly and to achieve the emission reductions completely, it mainly includes the following contents:

1. Operation and Management Organization for the Monitoring Plan

An independent institution of operation and management for CDM project (CDMPMD, i.e. CDM Project Management Department) will be formed, and directed by the General Manager of Zhangjiagang Huaxing Power Co., Ltd. Its operation and management framework is shown in the following Figure:





CDM Project Manager

CDM Project Manager is responsible for all the routing monitoring work of the proposed project, including the data metering, reading, recording, and emission reductions calculating, and data internal verification and validation, and MP periodically reviewing and sustained improving.

Data Monitoring Manager

Data Monitoring Manager is responsible for the raw data metering, reading and recording, data reviewing and saving, emission reductions calculating, monitoring report concluding and MP periodically reviewing and sustained improving and supervising the DCS control center to work in accordance with the monitoring plan.

Measurement QA Manager

Measurement QA Manager is responsible for the calibration, testing, zero checking, routing maintaining and replacing of the measurement instruments, and insures the metering accuracy for the monitoring data.

2. Monitoring and Reporting Procedure

The monitoring parameters are classified into the following two types by data acquisition approach:

2.1 Automatic Transfer by DCS

The parameters transferred automatically by DCS include:

- ✓ FC_y
- ✓ $EG_{,y}$

They are monitored by the electronic metering instruments and the signal is sent automatically to the DCS control centre. DCS can automatically read, record and save these data timely, and produces a daily report. A procedure for archiving DCS data is in a secure and retrievable manner, e.g. regular data file backup and screen capture of monthly meter readings.

2.2 Manual Transfer

The parameters transferred manually include:

- ✓ NCV_y, provided from natural gas supplier;
- ✓ $EF_{CO2,y}$ cited from supplier-provided data, local data, country-specific values, IPCC default values, that order of preference. The data will be recorded annually;
- ✓ $OXID_{NG}$ cited from supplier-provided data, local data, country-specific values, IPCC default

values, that order of preference. The data will be recorded annually;

- ✓ $CAP_{fossil,y}$ cited from the latest version of *China Electric Power Yearbook*;
- ✓ CAP_y cited from the latest version of *China Electric Power Yearbook*;
- ✓ $F_{i,j,y}$ cited from the latest version of *China Energy Statistics Yearbook*;
- ✓ $COEF_{i,j}$ cited from the latest version of *China Energy Statistics Yearbook*;
- ✓ $EF_{coal\ co2\ y}$ cited from supplier-provided data, local data, country-specific values, IPCC default values, that order of preference. The data will be recorded annually

The daily report regarding these above data are produced manually, and integrated with the DCS data into the monthly report on the relevant parameters in determining the emission reduction.

3. Monitoring and Measuring Instruments

The monitoring and metering instruments include the electricity meters and the gas flow meters. The installation location, monitoring objective and precision of these instruments are presented in the following table:

Instruments	Location	Objective	Precision
Gas flow meter	On the pipe of natural gas on site	FC_y	±0.2%
Electricity meter	At the high-voltage line after the main transformer	EG_y	0.2S level

4. Calibration, testing, zero checking and maintenance for measuring instruments

The electricity meters should be calibrated according to the sector practice, and the calibration procedures will be implemented in accordance with "Verification Regulations of Electrical Energy Meters with Electrodes", as stipulated by the Nationa1 Monitoring Bureau of Technology (NMBT), which took effect on February 7th, 1990.

The gas flow meters should be calibrated once every year, and the calibration procedures will be implemented in accordance with the corresponding national technological standards.

The testing, zero checking and maintenance of these measuring instruments will be implemented in accordance with the corresponding national technological standards.

5. Staff Training

All staff involved in any procedures related with the CDM project activity will be trained prior the starting of the crediting period in order to insure fulfilling the emission reductions, and these staff training plan will submitted to DOE for validation.

The personnel that interact with monitoring will be trained to acquire comprehensive knowledge with regards to general and technical aspects of CDM project. And the suppliers of the measuring instruments will provide relevant instructions for installation, operation, testing, zero checking, maintenance and calibration.

6. Quality Control and Quality Assurance

Natural gas supply metering to the project will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the gas supply company.

All measuring instruments need full calibrated by the officially accredited entity.

7. Data Management and improvement

A computer system saves and archives all data collected during monitoring process, and makes the hard copies into another storage medium.

Paper information, for example, purchase invoice, raw production records, governmental approvals on environmental impact reports, and etc., will all be archived and copied into another storage medium. The information is used to enhance the verification credibility for DOE.

According to the DOE's comment, this computer system will be sustained improvement. Data records will be archived for a period of two years after the credit period to which the records pertain.

8. Monitoring Report

An annual or a periodic operation result and emission reduction result shall be summarized into a monitoring report, including the data of electricity generated and consumed by the Project Activity, the waste heat thermal energy used by the Project Activity as well as the records of calibration and maintenance of the meters, and a verification application shall be submitted to a DOE for CERs certification.

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)

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The study of the baseline and the monitoring methodology was completed on 28th August, 2007.

The key individuals involved in the baseline study include:

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The above individual and organization is not the proposed project participant.

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Zhangjiagang Huaxing Power Co. Ltd.
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The above individual and organization is the proposed project participant.

SECTION C. Duration of the proposed project activity / Crediting period

C.1. Duration of the proposed project activity:

C.1.1. Starting date of the proposed project activity:

>>

29/12/2004 (the signing date of the contract of natural gas supply of the proposed project)

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

>>
20 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:

>>

01/06/2009 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 proposed project has approved by the State Environmental Protection Administration of China.

Based on the EIA report, the proposed 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 proposed project activity. A summary the findings from the EIA report for mitigation of negative environmental impact are provided as follows:

Construction period

Air 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.

Waste water impact
The waste water during the construction period will be discharged as centrally as possible. The washing water for cleaning the constructing machines will be discharged to the existing sedimentary pond, and the

living waste water for the construction workers will be discharged to the existing biochemistry processing system.

Noise and vibration impact

Noise and vibration during the construction period will mainly come from the constructing machines such as tamping machines and other heavy-duty machines.

The construction requirements must be in compliance with GB12523-90 *Noise Standard at the Boundary of Construction Site*. The working hours of high noise machines such as tamping machines and mixing machines will be arranged in daytime as possible. The carrier vehicles will be forbidden running at night, and limited their speed.

Discard solid impact

The waste soil and construction trash produced during the construction period will be arranged to be stored at a special place, and the usable matter of which will be recovered. The living trash will be collected together and processed centrally.

Operation period

Air impact

According the FSR of the proposed project, the natural gas used for the proposed project doesn't contain ashes and sulfur, so the emissions of SO_2 and dust of the proposed project activity will be zero.

The dry low-NO_x burner will be installed, so the emission concentration of NO_x will be controlled lower than 51.25mg/m^3, which will be much lower than the requirement of 650mg/ m^3 of III period of time in the GB13223-1996 *Emission Standard of Air Pollutants for Thermal Power Plants*. The dust produced from waste heating boiler will be emission through two 60m-height single-pipe chimneys, according to the impact analysis of daily average consistency, the NO^2 emissions will meet the requirements of the second standard in GB3095-1996 *The Standard Environmental Air Quality*.

Water Impact

The waste water produced by the proposed project activity could be divided into the production waste water and the living waste water.

The production waste water will mainly be the acidic/basic regeneration waste water, and be discharged to the existing acid waste water processing system.

The living waste water will be discharged to the existing living water processing system.

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 proposed 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 manufacturers for avoiding noises will be launched when taking order of the facilities. The main facilities 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 the controlling rooms of the plant and the office buildings will be avoided to face strong sound source and be utilized sound absorption materials as possible.

D.2. If environmental impacts are considered significant by the proposed 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 proposed project, multiple measurement, such as environmental monitoring and mitigation measures to deal with various environmental impacts during the construction and operation phase of the proposed project activity will be carried out strictly by the proposed project owner. Therefore, it is necessary to make additional explanation here.

SECTION E. Stakeholders' comments

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

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During the Environmental Impact Analysis period, a stakeholder consultation has been carried out. Totally 60 questionnaires regarding to the comments of the proposed project construction and operation were sent out to the residents in nearby towns and villages which include government employee, company employee, teacher, hospital employee, worker, farmer, student and retiree. 60 questionnaires were returned back. The detailed information is included in the EIA.

E.2. Summary of the comments received:

>>

Totally 60 pieces of questionnaires have been handed out and 60 have been taken back. The summary of the comments received is presented as follows:

- 3.3% of the respondents are the education degree of elementary school, 31.7% are junior high school, 23.4% are senior high school, 3.3% are technical secondary school, 28.3% are junior college, 10% are undergraduate.
- 22% of the respondents considered that the local economic development is very well, 67% considered well, and 11% considered not bad.
- 45% of the respondents considered that the main issue regarding to the local economic development is electricity supply, 3% considered transportation, 30% considered natural resource, 19% considered others, and 3% considered un-knowing.
- 90% of the respondents considered that the construction of the proposed project would promote the local economic development, 10% considered not bad.
- 80% of the respondents considered that the construction of the proposed project is very necessary, 20% considered not bad.
- 19% of the respondents considered that the main issue of local environment is SO_2 pollution, 40% considered water pollution, 21% considered noise pollution, 20% considered dust pollution.
- 96% of the respondents considered that the operation of the proposed project would improve the quality of the local environment, and 4% considered no change.

- 58% of the respondents considered that the construction of the proposed project would greatly improve the quality of local resident's living, and 13% considered no change.

- 67% of the respondents considered that the construction of the proposed project will greatly increase the employment opportunities for the local residents, 33% considered no change.

In addition, the respondents also gave the proposal for the proposed project: enhance planting and saving watering.

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 proposed project owner, Zhangjiagang Huaxing Power Co., Ltd, held a meeting to discuss the relevant enhanced measures on 15th December, 2005 at the executive meeting room.

The executive manager, Mr Wang conducted this meeting and all managers took pant in the meeting and the relevant experts were also invited to attend the meeting.

The decision was be 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 proposed project activity;
- Enhance the performance ability of the Environmental Protection Department and implement the stricter Environmental Management Plan.
- Take more attention to the proposals and comments of local residents nearby the proposed project plant within the construction period.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROPOSED PROJECT ACTIVITY

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Middle Name:	
First Name:	Zheng
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the proposed project activity.

Annex 3

BASELINE INFORMATION

Table 1. Calculation of simple OM emission factor of ECPG in 2003

Fuel Type	Unit	The fuel consumption of province in ECPG: Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total F=sum(A:E)	$EF_{Fuel,co2}$ tc/TJ G	LCV MJ/t, m^3,tce H	$E_{Fuel,co2}$ tCO2 J=F*G*H
Raw Coal	10^6t	26.18	64.1774	34.424	26.6967	17.54	16.90181	94.6	20908	334300359.13
Cleaned Coal	10^6t						0	94.6	26344	0
Other Washed Coal	10^6t						0	94.6	8363	0
Coke	10^6t						0	94.6	28435	0
Coke Oven Gas	$10^{10}m^3$	0.0199	0.0006				0.0205	44.4	16726	152125.76
Other Gas	$10^{10}m^3$	0.6634					0.6634	44.4	5227	1538454.90
Crude Oil	10^6t						0	73.3	41816	0
Kerosene	10^6t						0	71.5	43070	0
Gasoline	10^6t						0	69.3	43070	0
Diesel	10^6t	0.0126	0.1471	0.1399			0.2996	74.1	42652	946463.80
Fuel Oil	10^6t	0.9549	0.0076	1.7448		0.1889	2.8962	77.2	41816	9369683.52
PLG	10^6t						0	63.1	50179	0
Refinery Gas	10^6t	0.0049	0.0096				0.0145	57.6	46055	44564.35
Natural Gas	$10^{10}m^3$						0	56.1	38931	0
Other Petroleum Products.	10^6t	0.1891	0.053	0.1504			0.3925	73.3	38369	1104387.72
Other Coking Products.	10^6t						0	107	28435	0
Thermal electricity	MWh	65874578	125413657	78676974	50874146	40009198			total	360848554
Imported electricity from CCPG			13,756,040 MWh			Emission factor of imported electricity			0.797442 tCO2/MWh	
Imported electricity from Yangcheng			10,705,870 MWh			Emission factor of imported electricity			0.949780 tCO2/MWh	
Total electricity									385,310,464 MWh	
Total CO2 emission									368,590,903 tCO2	
Simple OM emission factor of ECPG (tCO2/MWh)										0.956615

Data source: *China Energy Statistical Yearbook 2004*

Table 2. Calculation of simple OM emission factor of ECPG in 2004

Fuel Type	Unit	The fuel consumption of province in ECPG: Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total F=sum(A:E)	$EF_{Fuel,co2}$ tc/TJ G	LCV MJ/t, m^3,tce H	$E_{Fuel,co2}$ tCO2 J=F*G*H
Raw Coal	10^6t	2779.6	7601.9	4008.9	2906.2	2183.7	19480.3	94.6	20908	385300230.33
Cleaned Coal	10^6t						0	94.6	26344	0
Other Washed Coal	10^6t		5.46			4.63	10.09	94.6	8363	79826.01
Coke	10^6t						0	94.6	28435	0
Coke Oven Gas	$10^{10}m^3$	2.59					2.59	44.4	16726	192197.91
Other Gas	$10^{10}m^3$	72.46					72.46	44.4	5227	1680380.49
Crude Oil	10^6t						0	73.3	41816	0
Kerosene	10^6t						0	71.5	43070	0
Gasoline	10^6t	0	0	0	0	0	0	69.3	43070	0
Diesel	10^6t	2.69	27.17	6.23			36.09	74.1	42652	1140116.11
Fuel Oil	10^6t	58.52	55.07	202.89		23.26	339.74	77.2	41816	10991147.99
PLG	10^6t						0	63.1	50179	0
Refinery Gas	10^6t	0.77	0.55				1.32	57.6	46055	40568.93
Natural Gas	$10^{10}m^3$		0.14				0.14	56.1	38931	30576.41
Other Petroleum Products.	10^6t	21.22	1.37	24.89			47.48	73.3	38369	1335957.42
Other Coking Products.	10^6t						0	107	28435	0
Thermal electricity	MWh	67414171	153846782	89844516	56264538	47425257			total	414795263
Imported electricity from CCPG			26,933,850 MWh			Emission factor of imported electricity			0.826448 tCO2/MWh	
Imported electricity from Yangcheng			11,649,610 MWh			Emission factor of imported electricity			0.944221 tCO2/MWh	
Total electricity									453,378,723 MWh	
Total CO2 emission									434,050,485 tCO2	
Simple OM emission factor of ECPG (tCO2/MWh)										0.957368

Data source: *China Energy Statistical Yearbook 2005*

Table 3. Calculation of simple OM emission factor of ECPG in 2005

		The fuel consumption of province in ECPG						$EF_{Fuel,co2}$	LCV	$E_{Fuel,co2}$
Fuel Type	Unit	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total F=sum(A:E)	tc/TJ G	MJ/t, m^3,tce H	tCO2 J=F*G*H
Raw Coal	10^6t	2847.31	9888.06	4801.52	3082.9	2107.69	22727.48	94.6	20908	449526099.64
Cleaned Coal	10^6t						0	94.6	26344	0.00
Other Washed Coal	10^6t						0	94.6	8363	0.00
Coke	10^6t			0.03			0.03	94.6	28435	806.99
Coke Oven Gas	$10^{10}m^3$	1.68	1.38		1.71		4.77	44.4	16726	353970.67
Other Gas	$10^{10}m^3$	83.72	24.97	0.06	30		138.75	44.4	5227	3217675.86
Crude Oil	10^6t			27.01			27.01	73.3	41816	828263.45
Kerosene	10^6t						0	71.5	43070	0.00
Gasoline	10^6t	0	0	0	0	0	0	69.3	43070	0
Diesel	10^6t	1.25	16	4.52		1.67	23.44	74.1	42652	740491.04
Fuel Oil	10^6t	59.39	13.22	153.22		7.45	233.28	77.2	41816	7546991.82
PLG	10^6t						0	63.1	50179	0.00
Refinery Gas	10^6t	0.57	0.83				1.4	57.6	46055	43027.65
Natural Gas	$10^{10}m^3$	1.09	1.85	0.62			3.56	56.1	38931	777514.36
Other Petroleum Products.	10^6t	21	8.38	34.8			64.18	73.3	38369	1805849.77
Other Coking Products.	10^6t						0	107	28435	0.00
Thermal electricity	MWh	70,838,397	198,827,832	102,066,651	59,205,838	46,378,980			total	414795263
Imported electricity from CCPG			160,410,000 MWh			Emission factor of imported electricity			0.771225 tCO2/MWh	
Imported electricity from Yangcheng			77,244,000 MWh			Emission factor of imported electricity			0.938703 tCO2/MWh	
Total electricity									714,971,698 MWh	
Total CO2 emission									661,062,081 tCO2	
Simple OM emission factor of ECPG (tCO2/MWh)										0.924599

Data source: *China Energy Statistical Yearbook 2006*

Table 4. Calculation of generation-weighted average simple OM Emission factor of ECPG

year	Simple OM (tCO2/MWh)	Electricity (MWh)	Generation-weight	**Average OM (tCO2/MWh)**
2003	0.956615	385,310,464	24.8%	
2004	0.957367	453,378,723	29.2%	
2005	0.924599	714,971,698	46%	
Generation-weighted average OM				0.9421

Table 5. Calculation of emission coefficient of all types power of ECPG

The type of power generation	Parameter	Efficiency for the best technology commercially available	Emission coefficient of fuels (tC/TJ)	emission factor (tCO2/GJ)	Emission coefficient (tCO2/MWh)
		A	B	C=B*44/12/1000	D=3.6*C/A
Coal-fired	*EFCoal,Adv*	35.82%	25.8	0.0946	0.9508
Gas-fired	*EFGas,Adv*	47.67%	15.3	0.0561	0.4237
Oil-fired	*EFOil,Adv*	47.67%	21.1	0.0774	0.5843

Data source: the DNA of China, referred to: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf

Table 6. Calculation of emission factor of fossil fuel fired power of ECPG

Emission coefficient of coal-fired (tCO2/MWh)	λ_{coal}	Emission coefficient of oil-fired (tCO2/MWh)	λ_{coal}	Emission coefficient of gas-fired (tCO2/MWh)	λ_{coal}	Emission factor of fossil fuel fired power (tCO2/MWh)
A	B	C	D	E	F	G=A*B*C*D*E*F
0.9508	96.71%	0.4237	2.35%	0.5843	0.94%	0.9372

Table 7. Calculate the proportion of solid fuel, liquid fuel and gas fuel in the total emission.

Fuel types	Unit	Shanghai A	Jiangsu B	Jiangsu C	Anhui D	Fujian E	Total G=A+.+F	Caloric value (kJ/kg, m^3) H	Emission Factor(tc/TJ) I	Oxid J	Emission (tCO2) K=G*H*I*J*44 /12/100
Raw coal	10^4t	2847.31	4801.52	9888.06	3082.9	2107.69	22727.48	20908	25.8	1	449,526,100
Cleaned coal	10^4t	0	0	0	0	0	0	26344	25.8	1	0
Washed coal	10^4t	0	0	0	0	0	0	8363	25.8	1	0
Coke	10^4t	0	0.03	0	0	0	0.03	28435	25.8	1	807
Total											**449,526,907**
Crude oil	10^4t	0	27.01	0	0	0	27.01	41816	20	1	828,263
Gasoline	10^4t	0	0	0	0	0	0	43070	18.9	1	0
Kerosene	10^4t	0	0	0	0	0	0	43070	19.6	1	0
Diesel	10^4t	1.25	4.52	16	0	1.67	23.44	42652	20.2	1	740,491
Fuel oil	10^4t	59.39	153.22	13.22	0	7.45	233.28	41816	21.1	1	7,546,992
Other oil product	10^4t	21	34.8	8.38	0	0	64.18	38369	20	1	1,805,850
Total											**10,921,596**
Natural gas	10^7 m^3	10.9	6.2	18.5	0	0	35.6	38931	15.3	1	777,514
Coke oven gas	10^7 m^3	16.8	0	13.8	17.1	0	47.7	16726	12.1	1	353,971
Other gas	$10^7 m^3$	837.2	0.6	249.7	300	0	1387.5	5227	12.1	1	3,217,676
PLG	10^4t	0	0	0	0	0	0	50179	17.2	1	0
Refinery gas	10^4t	0.57	0	0.83	0	0	1.4	46055	18.2	1	43,028
Total											**4,392,189**
Total up											**464,840,691**
The proportion of solid fuel in the total emission.											96.71%
The proportion of liquid fuel in the total emission.											2.35%
The proportion of gas fuel in the total emission.											0.94%

Data source: *China Energy Statistical Yearbook 2006*

Table 8. Installed capacity of ECPG in 2005

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

Data: *China Electric Power Yearbook 2006*

Table 9. Installed capacity of ECPG in 2004

	Shanghai	Jiangsu	Jiangsu	Anhui	Fujian	**Total**
Thermal power (MW)	12014.9	28289.5	21439.8	9364.5	8315.4	79424.1
Hydro power (MW)	0	126.5	6418.4	692.8	7180.1	14417.8
Nuclear power(MW)	0	0	3056	0	0	3056
Wind power and Other (MW)	3.4	17.5	39.7	0	12	72.6
Total (MW)	12018.3	28433.5	30953.9	10057.3	15507.5	96970.5

Data source: *China Electric Power Yearbook 2005*

Table 10. Installed capacity of ECPG in 2003

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

Data source: *China Electric Power Yearbook 2004*

Table 11. Calculation of Share in total capacity additions in ECPG and calculation of BM

	Installed capacity in 2003 (MW)	Installed capacity in 2004 (MW)	Installed capacity in 2005 (MW)	Capacity additions from 2004 to 2005	Capacity additions from 2003 to 2005	Share in total capacity additions
	A	B	C	D=C-B	D=C-A	
Thermal power	65036.5	79424.1	104076.6	24652.5	39040. 1	92.53%
Hydro power	13602.5	14417.8	16069.4	1651.6	2466.9	6.20%
Nuclear power	2406	3056	3066	10	660	0.04%
Wind power and Other	51.7	72.6	401.3	328.7	349.6	1.23%
Total	81096.7	96970.5	123613.3	26642.8	42516.6	100.00%
Capacity additions account for total installed capacity of 2005				21.55%	34.39%	
Emission factor of fossil fuel fired power (tCO2/MWh)						0.9372
Weighted BM emission factor (tCO2/MWh)						0.8672

Table 12. Calculation of combined emission factor (CM) of ECPG

OM (tCO2/MWh)	ω_{OM}	BM (tCO2/MWh)	ω_{BM}	CM (tCO2/MWh)
A	B	C	D	E = A*B+C*D
0.9421	50%	0.8672	50%	0.90465

Annex 4

MONITORING PLAN

No further more monitoring information of the project activity.