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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title of document: China Fujian Putian LNG Generation Project
Version of document: Version 03
The date of the document: 26th March 2007

A.2. Description of the project activity:

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Fujian Putian LNG Power Plant is designed to construct a grid connected natural-gas based combined cycle gas turbine power plant with total installed capacity of 1,528 MW (382MW×4) located on the north of the Mayzhou Bay Xuyu Penisular Xiuyu District, Putian city, Futian Province. The proposed project will be connected to East China Power Grid (ECPG). The proposed project consists of four generating blocks, each of which composes of a single-axis gas turbine, a heat recovery steam generator, a steam turbine, a generator with all hydrogen cooling and self-parallel-excitation system, and 500KV transmission lines for power evacuation. The proposed project will use the natural gas imported from Indonesian Punggul Gas Field. No other startup fuels or auxiliary fuel will be applied for power generation.

The proposed project will supply strong and stable electricity to support Fujian power grid, and provide peak regulation function as the project activity. The annual output of the proposed project is expected at 6,112GWh when all the generating units putting into operation, which can mitigate the high pressure of Fujian power grid regarding to power shortage incurred by the greatly increased power demand and balance the grid peak loads. As a clean fuel power project, the proposed project can reduce GHGs emissions compared with conventional thermal power plants, thus be considered as an environmental-friendly project, which will substitute part of thermal power in ECPG. Thus, the proposed project provides a combination of positive environmental, economic, and sustainable development benefits. The specific sustainable development benefits of this proposed project are described as follows:

- Supply reliable power to Fujian province, help satisfy the increasing demand for electricity;
- Provide better service for smoother balancing of grid peak loads;
- Consist with Fujian's energy policy aiming at optimization of energy structure, and diversification of energy mix;
- Contribute to environment protection of Fujian Province by improving electricity efficiency and mitigating GHG emission;
- Encourage and promote the technique (combined cycle gas turbine) progress.
- Create 180 permanent staff positions during the operation period.

In terms of environmental and power benefits, the proposed project is in line with the choice of China's energy industry's prior area and support China's policy of harnessing zero-impact energy resource. The social, economic and environmental benefits contribute to sustainable development of the country and region.

A.3. Project participants:

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Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.		
Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
People's Republic of China (Host)	CNOOC Fujian Gas Power Co., Ltd	No
Japan	Mitsubishi Corporation	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (form CDM-NM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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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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Fujian Province

A.4.1.3. City/Town/Community etc:

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Dongzhuang Town, Xiuyu District of Putian City, Fujian Province, China.

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 proposed project is located on Qianyun Village, Dongzhuang Town, Xiuyu District, Putian City, Fujian Province, P. R, China, where Putian City has the geographical coordinates of 118°27--119°56" east longitude, 25°2"-25°46" north latitude. Geographically, the project is situated on the Xiuyu Peninsula, close to the Meizhou Bay in the north. It's 35km away from the downtown of Putian city and 130KM away from Fuzhou city the capital of Fujian Province. The figure 1, 2 and 3 below show the location of Fujian Province, Putian City and the proposed project site.

Figure 1 Location of Fujian Province

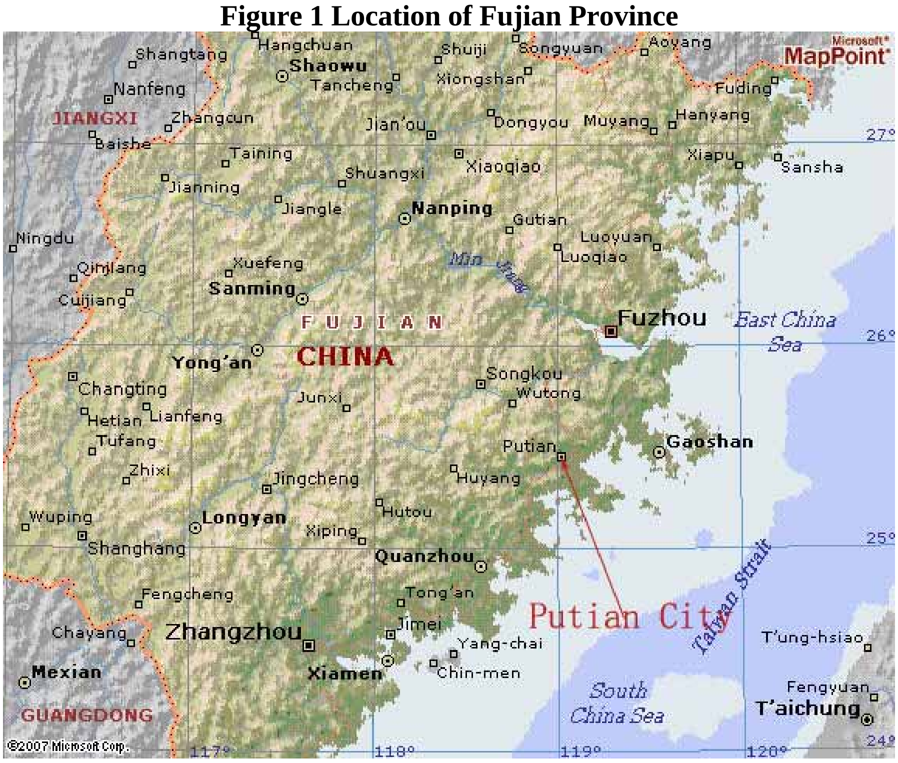

Figure 2 Location of Putian City

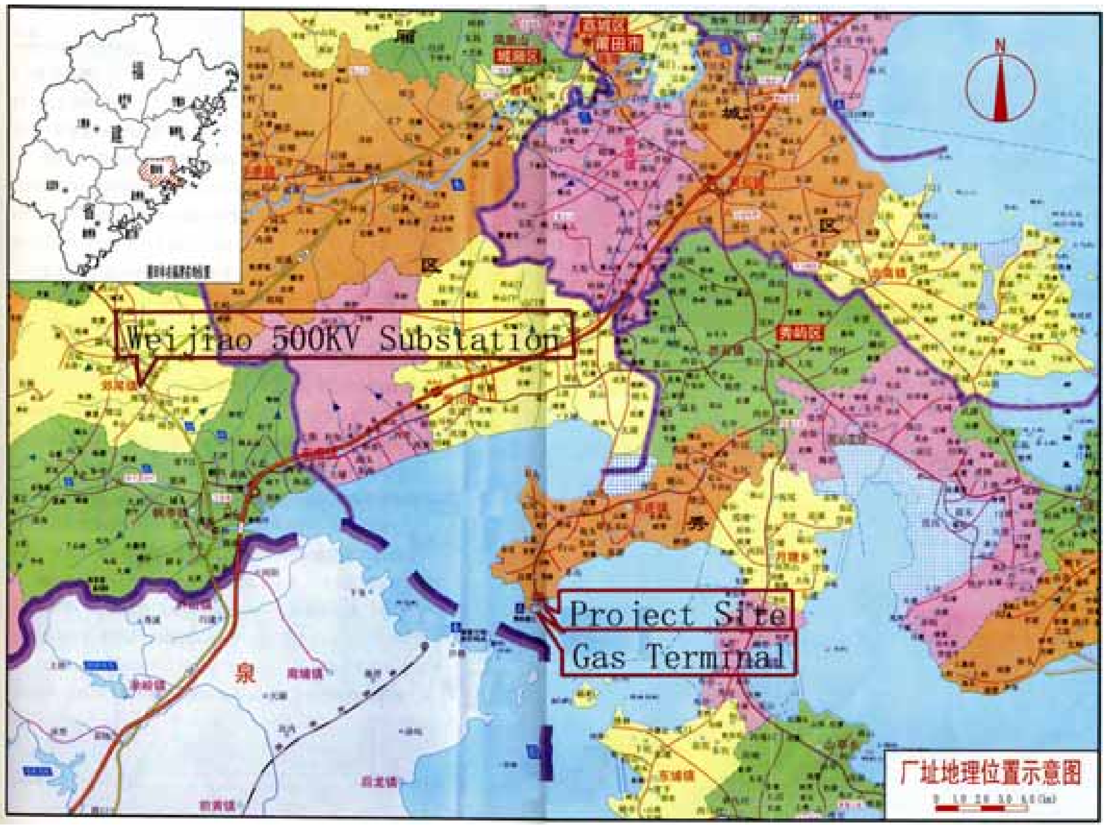

Figure3 Location of the project site

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

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The proposed project falls into:
Sectoral Scope Number: 1. Energy industries: grid-connected electricity generating project using non-renewable fuel

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

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The proposed project is a grid-connected natural gas based combined cycle power plant, with installed capacity of 1,528 MW (382 MW×4), which is proposed to construct 4 single-axis S109FA combined cycle blocks. Based on the preliminary design, the main equipments of each configuration comprises as the following:

- One combined cycle;
- One gas turbine;
- One matching triple pressure heat recovery steam generator;
- One steam turbine; and
- One common generator.

The gas turbine and the steam turbine are on the same axis. Both of them are consolidated to drive the generator. The specific details for the equipments are as the following:

Table 1 Technique Index of The Main Equipments

Equipments	Key Index		Type	Manufacture
Combined Cycle	Rated Power (MW)	385.88	MPCP1	DFSTW/MHI (Dong Fang Steam turbine Works and MITSUBISHI Heavy Industry)
	Rated Speed (r/min)	3,000		
Gas turbine	Concentration of NOx emission (ppmV)	< 25	M701F	DFSTW/MHI (Dong Fang Steam turbine Works and MITSUBISHI Heavy Industry)
Heat recovery steam generator	Outlet flow of high-pressure steam (t/h)	276.9	To be determined	To be determined
Steam turbine	Rated Power (MW)	138.7	TC2F-30	DFSTW (Dong Fang Steam turbine Works)
	Rated Speed (r/min)	3,000		
Power generator	Rated Power (MW)	409.7	QFR-400-2-20	DFSTW (Dong Fang Steam turbine Works)
	Rated Speed (r/min)	3,000		

The main process of power generation within the project includes:

- The first phrase of the process takes place in the gas turbine. The natural gas would be fired in gas combustion chamber and expanded in gas turbine that drives on the power generator to convert heat energy into electricity energy. The proposed chooses dry low NO_x type burner in gas turbine, which will significantly reduce the emission of NO_x. The gas turbine also drives the axial compressor to supply the compressed ambient air to the combustor;

- Then, the hot exhaust gas passes through the gas turbine to the matching triple pressure heat recover system generator to be utilized to produce steam. The steam turbine generator is designed to operate with steam at 10Mpa in the high pressure cylinder, then at 2.21Mpa in the medium pressure cylinder, at 0.33Mpa in the low pressure cylinder at last.

- The steam will be introduced to and expanded in steam turbine to drive the power generator for generating electricity. The generator applies hydrogen cooling and self-parallel-excitation System.

The proposed project operates at around 75% of capacity throughout the year. The efficiency of the project can reach 57% on average. Because the temperature of the local place may severely affect on the rating of the gas turbine unite, the average output is estimated to 382 MW of each generator.

The auxiliary system of the proposed project includes water supply system, water treatment and demineralization plant condensing equipment, compressed air system, air conditioning system, effluent treatment system, and etc.

The electricity generated by the project is will be stepped up to 550KV and be connected to Putian substation by using two sets of 4×LGj-400 transmission lines, and then supplied to the Fujian Grid, an integrated part of the ECPG.

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

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The project chooses renewable crediting period, the emission reductions for the first 7-year crediting period are as following:

Years	**Annual estimation of emission reductions in metric tonnes of CO_2 e**
2008 (Oct. ~ Dec.)	156,665
2009	1,566,654
2010	2,506,646
2011	2,506,646
2012	2,506,646
2013	2,506,646
2014	2,506,646
2015 (Jan.~Sep.)	1,879,985
Total estimated reductions (metric tonnes of CO_2e)	16,136,534
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (metric tonnes of CO_2e)	2,305,219

A.4.5. Public funding of the project activity:

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No public funding from Annex I countries is provided for this project.

SECTION B. Application of a baseline and monitoring methodology:

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

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Methodology and tool applied by the Project are as the following:

Version 01 of approved baseline methodology AM0029 – “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas.” (Sectoral Scope 01, 19 May 2006);

Version 01 of approved monitoring methodology AM0029– “Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel.” (Sectoral Scope 01, 19 May 2006); and

Version 03 of the tool for demonstration and assessment of additionality.

For the above methodologies please refer to website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The project activity meets all the applicability conditions defined in the approved methodology AM0029 as the following reasons:

- The project activity is the construction and operation of a new natural gas fired grid-connect electricity generation plant;
- The geographical/physical boundaries of the baseline grid (East China Power Grid) can be clearly identified and information pertaining to the grid and estimating baseline emissions is publicly available;
- Natural gas is sufficiently available in the region where the project is located, which can be demonstrated as the following:

  - The LNG used in the proposed project will be imported from Indonesia, and supplied by the LNG terminal located on the north of the Mayzhou Bay Xuyu Penisular Xiuyu Distict, Putian city, Futian Province, 700 meters away from the project site. The terminal will annually import about 2.6 million tones of LNG from Indonesian Tanggul Gas Field in the first phrase and mainly supply gas to Fuzhou, Putian, Quanzhou, Zhangzhou, Xiamen. The terminal is designed to put into operation in 2007 and will reach the turnover volume of 2.8 million tons in 2010. In the future, it will raise the capacity to 7 million tones a year.

  - The Indonesian Punggul Gas Field has the natural gas reserve of 14.4Tcf,which can support a Liquefied Natural Gas Factory with the production capacity of 10million tones for 20years. The natural gas is so abundant that it can ensure the LNG supply for the proposed project for a long time and other LNG power if any are to be constructed.

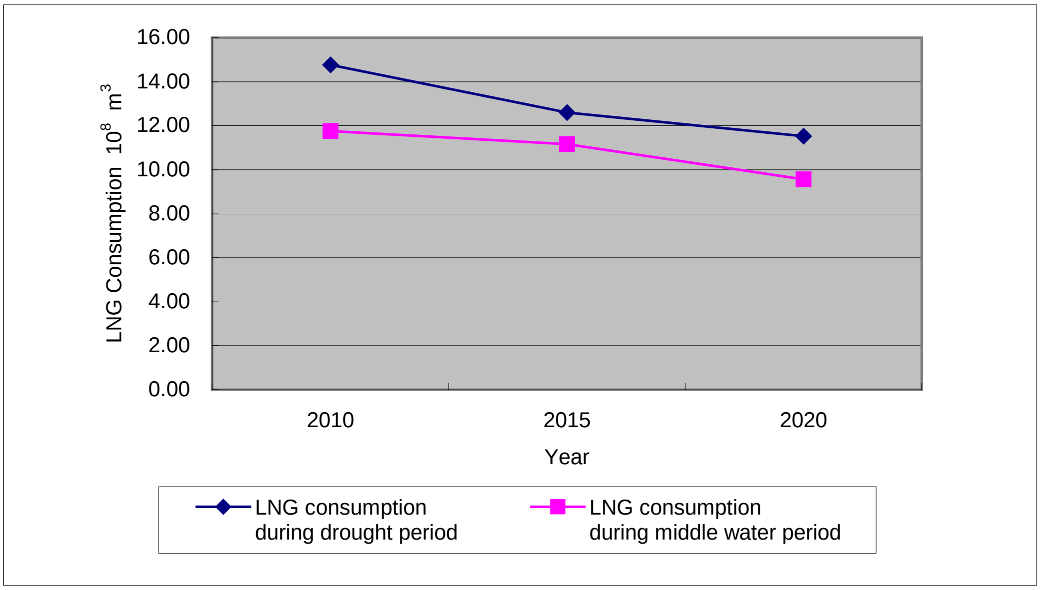

Figure 4The annual consumption of natural gas by the four unites

There is a seasonal variation of LNG consumption by the proposed project within the low and middle period. Hydropower is the major power source of Fujian Province, especially the run-of-river plants. Thus, the seasonal change (e.g. rainfall and drought periods) is the main factor greatly affecting the electricity supply in the Province. The run-of-river plants cannot run normally in the low period, which will lead to serious shortage of energy supply. However, hydropower will generate considerable amount of electricity during the middle period. Once the proposed project constructed, it can generate great amount of electricity to mitigate the power shortage in low period, which will result in a larger LNG consumption. Whereas, it will reduce the electricity generation in middle period, thus, leading to a lower LNG consumption.

As is shown in the figure 4 above, the maximum annual gas consumption by the project in drought period in Fujian gird is about 14.76×10^8 m^3 (1.02 million tones) annually while it can reach 11.76×10^8 m^3 (0.82 million tones) in middle-flow period. It will just take up a small part of LNG supply capacity of the LNG terminal meaning the project activity doesn't constrain the future LNG capacity additions in Fujian.

To conclude, as a new grid-connected power generation using natural gas, the project applies the methodology AM0029 to determine the project baseline and calculate GHG emission reductions resulting from the project activity.

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

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According to AM0029, the spatial extent of the project boundary includes the project site and all power plants connected physically to the baseline grid as defined in ACM0002.

	Source	Gas	Included?	Justification / Explanation
Baseline	Power generation in baseline grid (East China Power Grid)	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 Activity	On-site natural gas combustion due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

For the proposed project, the project boundary is from the point the LNG supply with pipelines from the gas terminal to the point the electricity exported to the East China Power Grid (ECPG). Schematically the figure shows the project boundary, indicating energy flows into the boundary and fugitive methane emissions associated with natural gas.

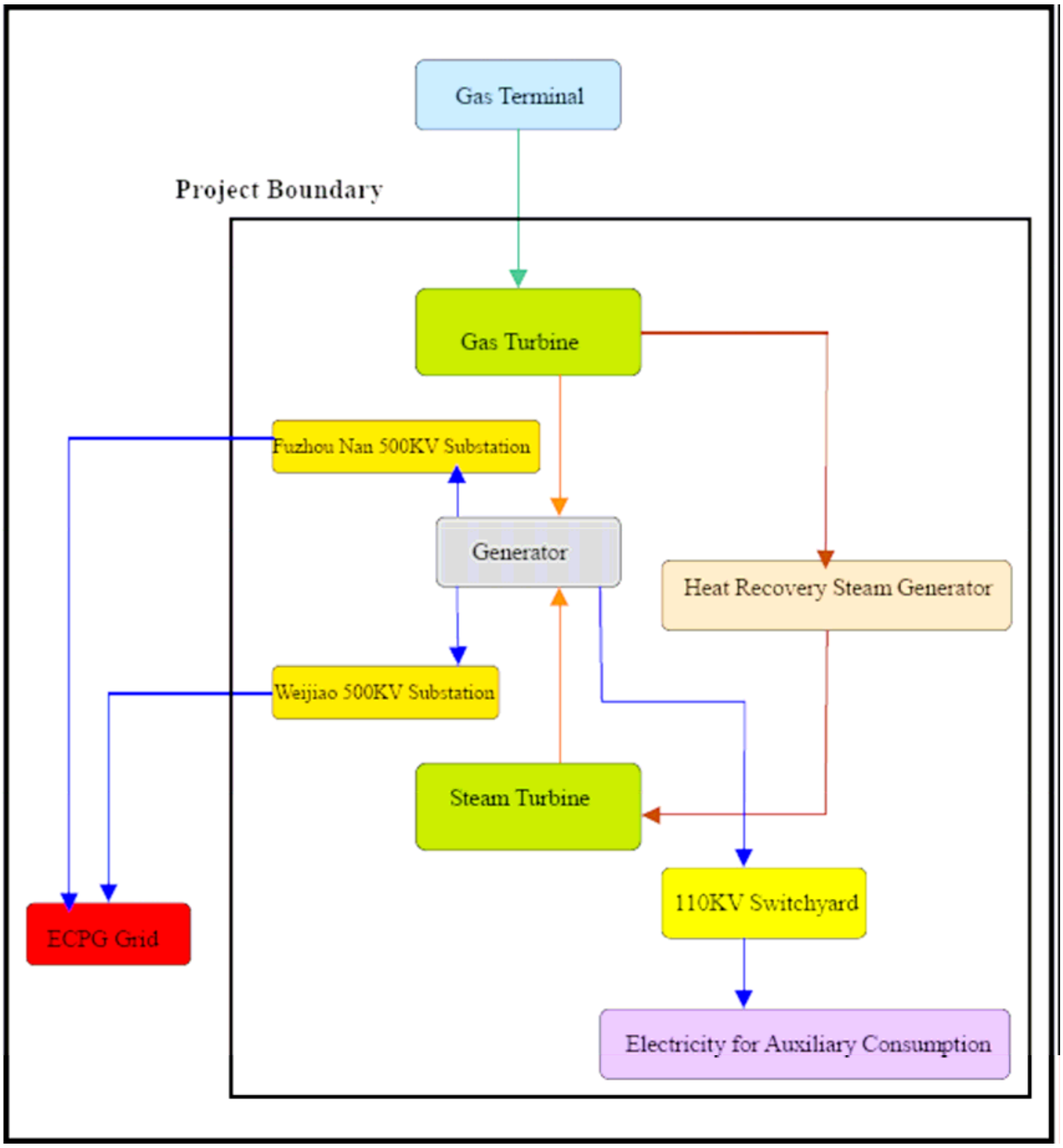

Figure 5 Project Boundary

As is shown above, the project boundary covers gas supply pipelines, gas turbines, steam turbines, heat recovery steam generators, generators, all other power generating equipments, captive consumption units and energy consumption equipments, since the part of electricity generated will be used for auxiliary consumption.

As mentioned above, according to methodology AM0029, the spatial extent of the project boundary includes the project site and all power plants connected physically to the baseline grid (ECPG) defined in ACM0002.

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

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According to AM0029, the following steps shall be used to define the baseline scenario:

1. Identify plausible baseline scenarios

The identification of alternative baseline scenarios should include all possible realistic and credible alternatives that provide outputs or services comparable with the proposed CDM project activity (including the proposed project activity without CDM benefits).

According to AM0029, alternatives to be analyzed should include, inter alia:

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

Based on the above, the plausible baseline scenarios are identified as the following Table 2:

Table 2 Plausible Baseline Scenario

No.		Plausible Baseline Scenario	Technique
1		The project activity not implemented as a CDM project	Gas-steam combined cycle
2		Natural gas power generation using gas turbine single cycle technology.	Single cycle gas turbine
3		Power generation using hydropower	Hydropower
4		Power generation using wind power	Wind power
5		Power generation using nuclear power	Nuclear power
6	a	Power generation using coal-fired power	Sub critical coal-fired power plant with a unit capacity of 300 MW*
	B		Sub critical coal-fired power plant with a unit capacity of 600 MW*
	c		Super critical coal-fired power plant with a unit capacity of 600 MW*
7		Power generation using oil-fired power	Oil based gas-steam combined cycle with similar capacity as the project activity
8		Import of electricity from connected grids	

* The generator capacity commonly used in China.

Currently, there is no large-scale single cycle natural gas turbine power generation project operated or under construction in China. Furthermore, this technology is rarely used now due to its lower heat efficiency level around 38%[1]. Thus, alternative 1 is not a feasible baseline scenario.

Fujian Province is abundant in water resources with potential installed capacity of 10,930MW available to be developed. However, as its hydropower development has experienced long history since 1920's[2],

[1] Http://www.hdrqw.com/news/20060505-31.htm

hydropower resources with good potential and economical conditions have been almost developed already. Until the end of 2004, 8,890 MW of hydropower resources has been exploited[3] accounting for 81% of total capacity. Almost all the large or middle scale hydropower resources have already been finalized the development[4]. As the limited hydropower resources remained, development of new hydropower cannot provide outputs or services comparable with the project activity. Therefore, alternative 3 is not a realistic and credible baseline scenario.

In China, development of wind power is just start-up. There are few wind power plants built in Fujian Province with little installed capacity. Moreover, wind power is of seasonal nature with low load, which cannot deliver outputs or services comparable to the project activity. Thus, alternative 4 is not a feasible baseline scenario.

The proposed project is designed to provide electricity and full-year peak regulation services. Whereas, for the purpose of operation safety, the nuclear power plant shall be under the base load operation in China[5]. Therefore, alternative 5 cannot provide outputs or services comparable with the project activity, and is not a realistic and credible baseline scenario.

According to the Feasibility Study of the proposed project, import of electricity from connected grids cannot provide peak regulation function as the project activity. Therefore, alternative 8 is not a realistic and credible baseline scenario.

To be concluded, the feasible alternatives that provide outputs or services comparable with the project activity include the following, and all the alternatives are consistent with the current laws and regulations::

- Alternative 1: The project activity not implemented as a CDM project;
- Alternative 6a: Power generation using sub critical coal-fired power technology with a unit capacity of 300 MW;
- Alternative 6b: Power generation using sub critical coal-fired power technology with a unit capacity of 600 MW;
- Alternative 6c: Power generation using super critical coal-fired power technology with a unit capacity of 600 MW; and
- Alternative 7: Power generation using oil based gas-steam combined cycle technology with similar capacity as the project activity.

2. Identify the economically most attractive baseline scenario alternative

According to AM0029, the economically most attractive baseline scenario alternative is identified from all alternatives remaining after step 1 by using investment analysis. The levelized cost of electricity production should be used as financial indicator for investment analysis.

The levelized cost formula used in this PDD was drawn from the *Appendix 5 Cost Estimation Methodology of Projected Costs of Generating Electricity. Update 2005 (OECD 2005)* as the following:

$$EGC = \Sigma\,[(I_t + M_t + F_t)\,(1+r)^{-t}]\ /\ \Sigma\,[E_t\,(1+r)^{-t}] \qquad (1)$$

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[2] http://engine.cqvip.com/content/f/81012a/2004/000/006/jj31_f4_9906963.pdf

[3] http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=146835

[4] http://www.hwcc.com.cn/newsdisplay/newsdisplay.asp?Id=146835

[5] Feasibility Study

Where:

EGC: Average lifetime levelized electricity generation cost per kWh
I_t: Capital expenditures in the year t
M_t: Operation and maintenance expenditures in the year t
F_t: Fuel expenditures in the year t
E_t: Electricity generation in the year t
R: Discount rate

The main parameters and assumptions for levelized cost analysis of Alternative 1, Alternative 6a~c, and Alternative 7 are shown as the following Table 3 and Table 4:

Table 3 Parameters of Alternative 1

Construction Investment (10,000 RMB)	502,351
Project Lifetime (Year)	23 (including 3 years of construction)
Annual Operation and Maintenance Expenditure (10,000 RMB)	The 3rd year: 6,411 The 4th year: 20,786 The 5th~22nd year: 27,626 The 23rd: 15,126
Fuel Expenditure (10,000 RMB)	The 3rd year: 9,244 The 4th year: 92,441 The 5th~22nd year: 147,906 The 23rd: 80,116
Annual electricity generation (GWh)	The 3rd year: 382 The 4th year: 3,820 The 5th~22nd year: 6,112 The 23rd: 3,311

* Feasibility Study of the project

Table 4 Parameters of Alternative 6a~c and Alternative 7

	Alternative 6a	Alternative 6b	Alternative 6c	Alternative 7
Unit Capacity (MWh)	300	600	600	300
Annual Operation Hours	5,000	5,000	5,000	5,000
Discount Rate (%)	8%	8%	8%	8%
Investment Expenditure (RMB/KW)[6]	3,589	3,623	4,235	3,056
Material Expenditure (RMB/MWh)	7	7	7.49	7
Water Expenditure (RMB/MWh)	1	1	0.24	0
Desulfuration Expenditure (RMB/MWh)	1.5	1.5	1.53	0
Employee Num. (Person/MW)	0.38	0.38	0.3	0.33
Human resource cost per capita (RMB/year)	30,000	30,000	30,000	30,000
Maintenance cost (%)[7]	2.5%	2.5%	2.5%	2.5%

[6] State Electricity Regulation Committee (www.serc.gov.cn)
[7] Yang Xuzhong, Economic Evaluation of Electric Engineering and Tariff 1st Edition, P131, China Electric Publishing House, 2003.

Other O&M Expenditure (RMB/MWh)	15	15	13.59	12
Energy Consumption for Power Generation (gce/KWh)[8]	330	320	299	180
Fuel Cost (RMB/t)[9]	265	265	265	2,700
Construction Period (Year)	3	3	3	1
Operation Period (Year)	30	30	30	20

Based on the calculation, the results of levelized cost analysis are shown as follows:

Table 5 Result Of Levelized Cost Analysis

	Alternative 1	Alternative 6a	Alternative 6b	Alternative 6c	Alternative 7
Levelized Cost (RMB/KWh)	0.3785	0.2012	0.1993	0.2065	0.5845

As shown in Table 5, Alternative 6b has the lowest levelized cost. Then, the sensitivity analysis is employed to confirm that the conclusion regarding the financial attractiveness is robust to reasonable in the critical assumptions. Fuel cast and load factor are taken as the variations for the sensitivity analysis. Table 6 below demonstrates the results.

Table 6 Sensitivity Analysis Of The Levelized Cost (RMB/KWh)

Variables	Fluctuation Range	Alternative 1	Alternative 6a	Alternative 6b	Alternative 6c	Alternative 7
Fuel Cost	+10%	0.4025	0.2099	0.2078	0.2144	0.6331
	+5%	0.3905	0.2055	0.2036	0.2104	0.6088
	0%	0.3785	0.2012	0.1993	0.2065	0.5845
	-5%	0.3665	0.1968	0.1951	0.2025	0.5602
	-10%	0.3545	0.1924	0.1909	0.1986	0.5359
Load Factor	+10%	0.3675	0.1931	0.1912	0.1970	0.5773
	+5%	0.3729	0.1969	0.1951	0.2015	0.5807
	0%	0.3785	0.2012	0.1993	0.2065	0.5845
	-5%	0.3852	0.2059	0.2041	0.2120	0.5887
	-10%	0.3924	0.2111	0.2094	0.2181	0.5933

The sensitivity analysis confirms that Alternative 6b always has the lowest levelized cost within reasonable variations in the critical assumptions. According to AM0029, the most economically attractive alternative can be considered as the most plausible baseline scenario. Therefore, Alternative 6b "Power generation using sub critical coal-fired power technology with a unit capacity of 600 MW" is selected as the most plausible baseline scenario.

[8] Http://www.ccchina.gov.cn/source/fa/fa2002082803.html, the research report of Impact of 2% Appreciation of RMB on Key Electricity Enterprises supplied by United Securities, http://www.nanfangdaily.com.cn/southnews/sjjj/200609280667.asp.
[9] Http://www.b2btielu.com/news/qthq/2006-3/16/6253.asp (anthracite coal near coal mines), http://www.mm9mm.com/oil/lube/2006-01-13/17942.html

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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The following steps are used to demonstrate the additionality of the proposed project based on the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board.

According to the version 01 of AM0029, the assessment of additionality comprises the following steps:

Step 1: Benchmark investment analysis

Substep 2b. Option III - Apply benchmark analysis

According to the "*Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects",* the financial benchmark IRR (after tax) of total investment in China power sector is at 8%. This benchmark is currently used for financial appraisal of the power project in China.

Substep 2c. Calculation and comparison of financial indicators

(1) Basic parameters for financial appraisal of the proposed project are as the following:

Installed Capacity (MW)	1,528
Annual electricity generation (GWh)	382 (Oct 1st 2008) 3,820 (2009) 6,112 (2010~2027) 3,310.67 (2028)
Project Lifetime (Year)	23(including 3 years of construction). Part of generators will be put into operation from the 3rd year.)
Total Investment (Million RMB)	5,420.92
Prospective Pool purchase Price (excluding VAT, RMB / MWh)	391.20
VAT	17%
Income Tax	33%
Crediting Period (Year)	21 (7×3)
Estimated Price Of Natural Gas (including VAT, RMB/ m^3)	1.411

(2) Based on benchmark analysis (Option III), if the financial indicator (such as IRR) of the proposed project is less than the benchmark, the proposed project is not attractive.

The IRR on total investment of the proposed project without CDM revenues are shown in Table 7 below. Without CDM, the IRR of total investment is 6.39% obviously lower than the benchmark of 8%, and the NPV on total investment is negative. Therefore, the proposed project is not financially attractive.

Table 7 Financial Indicators of the Proposed Project (Total Investment)

(Without CDM Revenue)

IRR (BENCHMARK=8%)	**NPV** (ic=8%) (Million Yuan)
6.39%	-549

Sub-step 2d. Sensitivity analysis

The objective of sensitivity analysis is to conclude that whether the proposed project is unlikely to be financially attractive or be financially attractive.

Three parameters are used for sensitivity analysis of financial attractiveness:

- Total investment
- Price of natural gas
- Pool purchase price

Provided that total investment, price of natural gas and pool purchase price change with fluctuation ranging from –10% ~ +10%, the impacts of these indicators on IRR of total investment are analysed. The results are shown in Table 8 and Figure 6.

Table 8 IRR (Total Investment) Sensitivity To Different Financial Parameters (Without CDM)

Parameter / Range	-10%	-7.5%	-5%	-2.5%	0	+2.5%	+5%	+7.5%	+10%
Total investment	7.49%	7.23%	6.95%	6.72%	6.39%	6.28%	6.03%	5.81%	5.64%
Price Of Natural Gas	8.96%	8.38%	7.73%	7.13%	6.39%	6.14%	5.13%	4.39%	3.65%
Pool purchase Price	1.64%	3.05%	4.31%	5.43%	6.39%	7.48%	8.43%	9.37%	10.34%

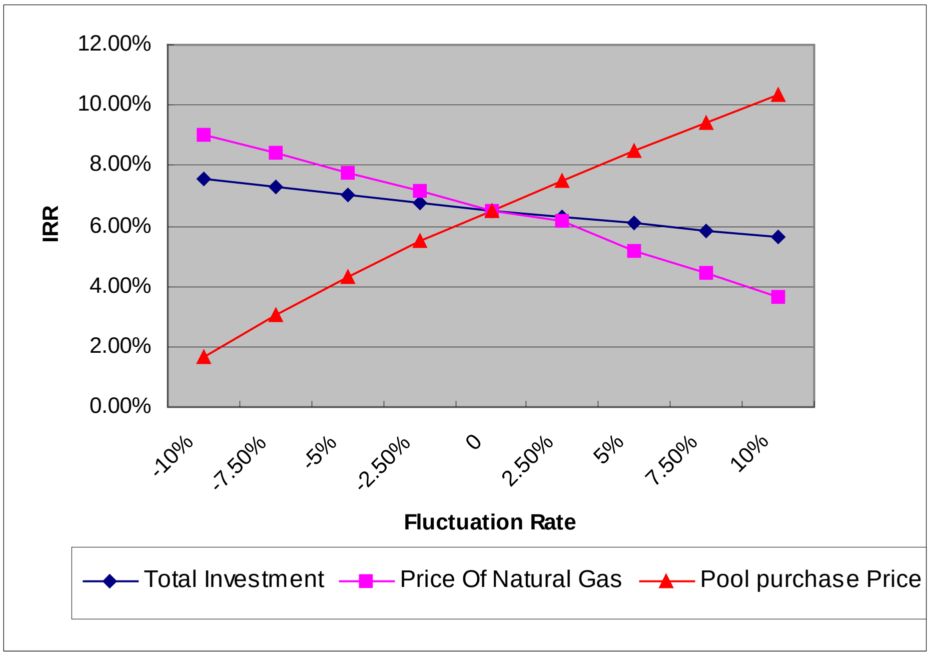

Figure6 IRR (Total Investment) Sensitivity To Different Financial Parameters (Without CDM)

It can be concluded that the impact of pool purchase price on IRR is the most sensitive, following by the price of natural gas. The impact of total investment on IRR is minimal.

Pool purchase price
According to the feasibility study, the average pool purchase price for fossil-fired power in Fujian Grid is at RMB362Yuan/MWh (including VAT). The prospective pool purchase price of the proposed project is expected at RMB 457.71 Yuan/MWh (including VAT) higher than the average price so far. Thus, the pool purchase price of the proposed project cannot rise by 2.5% or above further to improve the poor profit return.

Therefore, the pool purchase price makes the project unattractive. Without CDM revenue, it would be a barrier for the implementation of the proposed project.

Price of natural gas
The natural gas price of RMB 1.411 Yuan/m^3 was estimated in 2004 when compiling the feasibility study. It is expected that the natural gas price in China will be steadily raised by annual rate of 5%~8%[10] to compare with the international price. Therefore, the actual natural gas price for the proposed project will be much higher than the expected price in feasibility study, which definitely demonstrates that the proposed project is less financially attractive resulting from the increasing price according to the sensitive analysis above. The natural gas price is a barrier affecting the feasibility and implementation of the proposed project.

Total Investment
As shown in Table 8 above, when the total investment is decreased by 10%, the IRR still cannot reach the benchmark.

[10] http://news.sina.com.cn/s/2006-11-10/121910464536s.shtml

Based on the above financial analysis the proposed project is obviously less financial attractive if it cannot implement CDM.

Step 2 Common practice analyses

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

At the present, the power plants using natural gas just accounts for very small share of China's power market at 2.1%[11] of the total power generation in China, most of which are of small scale. The only one natural gas power plant in ECPG which has a comparable size to the proposed project and has already entered into operation is Huaneng Shanghai Gas Turbine Power Plant with installed capacity of 1,200 MW.

Currently, there are other new natural gas power generation projects similar to the proposed project designed for construction in ECPG, which include:

- Zhejiang Provincial Energy Group Zhenhai Natural Gas Power Generation Co., Ltd
- Yuyao Grid Connected Electricity Generation Project using Natural Gas
- Zhejiang Southeast Electric Power Company Limited Xiaoshan Power Plant ' s Natural Gas Power Generation Project
- Shanghai Grid Connected Natural Gas Combined Cycle Power Plant
- Hangzhou Hadian Banshan Power Generation Co., Ltd ' s Nature Gas Power Generation Project
- Nanjing Grid Connected Natural Gas Combined Cycle Power Plant
- Huaneng Jinling natural gas power plant
- Zhangjiagang Natural Gas Power Plant

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

The exist project "Huaneng Shanghai Gas Turbine Power Plant with the installed capacity of 1,200 MW" has entered into operation since 30 July 2006. This project responds to the national strategy "transferring western gas to the east" and is one of important programmes of Shanghaiwhich enjoys the support from government. So there are no barriers for this project.

Due to financial barriers, all the above projects are in the process of CMD development.

The proposed project will be the first natural gas based combined cycle power plant constructed in Fujian Province. However, it faces low pool purchase price and increased natural gas price without the favorable policy and guarantee, and bears higher risks. Therefore, the Project is not a common practice.

Step 3 Impact of CDM Registration

If the proposed project is registered as a CDM project, it can be bring the following benefits:

(1) The CDM revenues can improve the poor IRR and NPV of total investment of the proposed project, thus make the project more financial attractive.

Given the CERs price is at 9 Euro/tCO_2e and the project gets CERs revenue for the first 7-year crediting period, the IRR of total investment of the project could rise to 8.09% exceeding the

[11] http://tubeexpo.com/read.php?id=4414

benchmark (seeing Table 9 below). Thus, the proposed project will be financial attractive, if it gets CERs income.

Table 9 Comparison of Financial Indicators of the Proposed Project With CDM Revenue And Without CDM Revenue (Total Investment)

	IRR (BENCHMARK=8%)	**NPV** (ic=8%) (Million Yuan)
Without CDM	6. 39%	-549
With CDM	8.09%	28.22

(2) The CDM revenue will increase the total revenues of the proposed project, which can help the project cover the high cost of maintenance, and alleviate the risks regarding to the low and uncertain pool purchase price and high natural gas price;

(3) The CDM revenue can reduce the pressure from high investment and cash flow risks, and can improve the repayment capability of the project owner to pay back the loan;

(4) If the project is registered as CDM project, it will attract and encourage new local players to invest in natural gas based electricity generation plants, which contribute to low emission and bring stable power supply.

In conclusion, the proposed project is additional, not (part of) the baseline scenario. Without CDM support, the proposed project would unlikely occur, and the corresponding emission reductions generated by the project could not be realized.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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In accordance with the Methodology AM0029, the following steps are employed to calculate the emission reductions generated by the proposed project.

Step 1 Calculation of Project emissions

The project activity is on-site combustion of natural gas to generate electricity. The CO_2 emissions from electricity generation (PEy) are calculated as follows:

$$PE_y = \sum_f FC_{f,y} \times COEF_{f,y} \qquad (2)$$

Where:

$FC_{f,y}$: is the total volume of natural gas or other fuel 'f' combusted in the project plant or other startup fuel (m^3 or similar) in year(s) 'y'

$COEF_{f,y}$: is the CO_2 emission coefficient (tCO_2/m^3 or similar) in year(s) for each fuel and is obtained as:

$$COEF_{f,y} = \sum NCV_y \times EF_{CO_2,f,y} \times OXID_f \qquad (3)$$

Where:
$NCV_{f,y}$: is the net calorific value (energy content) per volume unit of natural gas in year 'y' (GJ/m^3) as determined from the fuel supplier, wherever possible, otherwise from local or national data;
$EF_{CO2,f,y}$: is the CO_2 emission factor per unit of energy of natural gas in year 'y' (tCO_2/GJ) as determined from the fuel supplier, wherever possible, otherwise from local or national data;
$OXID_f$: is the oxidation factor of natural gas.

According to the feasibility study, Putian LNG project is not designed to apply other startup fuels or auxiliary fuel for electricity generation. Thus, the project emission from electricity generation is only resulted from the natural gas consumption.

According to the feasibility study, the natural gas consumption rate of the proposed project is at 0.1938 m^3/KWh. Based on the annual electricity generated by the proposed project ($EG_{PJ,y}$), the amount of annual natural gas combustion ($FC_{NG,y}$) by the proposed project can be calculated. The net fuel calorific value ($NCV_{\text{Natural gas}}$) of natural gas used by the project is at 34,402 KJ/m^3.

The carbon emission factor of natural gas ($EF_{co2,\text{ natural gas},\ y}$) is taken the default value of IPCC as 15.30 tC/TJ. And the $OXID_{\text{Natural gas}}$ is taken as 1.00, which is taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

The proposed project consists of 4 generator units. The first unit will put into operation from Oct 1st 2008, and the rest will start generating power in 2009 successively. The annual output (exclude the last operation year 2028) of the proposed project is expected at 6,112GWh when all the generating units putting into operation. The specific annual power generation are calculated as the following:

	Time of Starting Operation	Annual Electricity Generation (EG) (KWh)			
		2008 (Oct.~Dec.)	2009	2010~2027	2028 (Jan.~Sep.)
No.1 Unit	Oct 1st, 2008	382,000,000	1,528,000,000	1,528,000,000	620,750,006
No.2 Unit	Mar 1st, 2009	-	1,273,333,333	1,528,000,000	620,750,006
No.3 Unit	July 1st, 2009	-	764,000,000	1,528,000,000	620,750,006
No.4 Unit	Nov 1st, 2009	-	254,666,667	1,528,000,000	620,750,006
Annual Electricity Generation (EG) (KWh)		382,000,000	3,820,000,000	6,112,000,000	2,483,000,025

Step 2 Calculation of Baseline Emissions

Baseline emissions are calculated by multiplying the electricity generated in the project plant ($EG_{PJ,y}$) with a baseline CO_2 emission factor ($EF_{BL},CO_{2,y}$), as follows:

$$BE_y = EG_{PJ,y} \times EF_{BL,CO2,y} \qquad (4)$$

Sub-step 2a: Determination of the baseline CO_2 emission factor

According Methodology AM0029, in order to address the uncertainty relating to which type of other power generation is substituted by the power generation of the proposed project in a conservative manner, project participants shall use for EF_{BL}, CO_2, $_y$ the lowest emission factor among the following three options:

For the first crediting period:
Option 1: The build margin, calculated according to ACM0002;
Option 2: The combined margin, calculated according to ACM0002, using a 50/50 OM/BM weight; and
Option 3: The emission factor of the technology (and fuel) identified as the most likely baseline scenario under "Identification of the baseline scenario" above, and calculated as follows:

$$BE_{Bl,CO2}(tco2/MWh) = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh \qquad (5)$$

Where:
$COEF_{BL}$: the fuel emission coefficient (tCO2e/GJ), based on national average fuel data, if available, otherwise IPCC defaults can be used;
η_{BL} : the energy efficiency of the technology, as estimated in the baseline scenario analysis above.

Option 1

As the proposed project will be connect to Fujian Power Grid which is a part of ECPG (regional grid). So emission factors of ECPG are used for determining the $EF_{BL,CO2,y}$.

According to ACM0002, the build margin of ECPG is calculated by the following equation:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \bullet COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad (6)$$

Where
Fi,m,y is the amount of fuel *i* (tce) consumed by plant *m* in year *y*.
COEFi,m,y is the CO2 emission coefficient (tCO2/tce) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*.
GENm,y is the electricity (MWh) delivered to the grid by plant *m*, equals to generation minus plant self consumption.

In this PDD, the BM ex-ante method is employed. And because it is very difficult to obtain the data of five most recently built power plants as these data are considered as confidential business information in China, the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently is selected as as the sample group *m*. The power plants which are CDM projects are not included in sample group m.

However, even for those built most recently power plants that comprise 20% of the system generation, it is also difficult to obtain the specific data regarding to fuel consumption and electricity generation additions by each power sources as confidential reason. Considering this situation, the following clarifications are given by EB for deviation in use of methodology AM0005 and AMS-I.D by several project activities in China when estimating BM emission coefficient.

The sample m of the proposed project makes accumulation to the year 2002 according to the newly increased installed capacity of ECPG of recent 1~3 years. The newly increased installed capacity occupy

21.60% of the total installed capacity in 2004, which is near to 20% of the newly increased installation in the recent 1~3 years. So the calculation by using the data between the years 2002 and 2004 satisfies the requirements of ACM0002.

According to ACM0002 and clarifications by EB, the main steps for BM calculation are as following:

(I) Calculation of weights of CO_2 emissions by coal-fired, oil-fired and gas-fired plants in total CO_2 emissions of ECPG.

$$\lambda_{coal} = \frac{\sum_{ieCOAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

$$\lambda oil = \frac{\sum_{ieOIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (8)$$

$$\lambda Gas = \frac{\sum_{ieGAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (9)$$

Where:

$F_{i,j,y}$: is the total amount of fuel *i* (in a mass or volume unit) consumed by Province j in ECPG for power generation in year y;

$COEF_{i,j\,y}$: is the total amount the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the oxidation rate of the fuel in year(s) y.

This PDD employs the CO_2 emission weights by coal-fired, oil-fired and gas-fired plants of total CO_2 emission of ECPG in 2004.

(II) Calculation of emission factor of thermal power ($EF_{thermal\ power}$) of ECPG.
The $EF_{thermal\ power}$ is calculated as a weighted emission factor as the following formula:

$EF_{new\ thermal\ plants} = EF_{new\ coal\ new\ plants} \text{ x } \lambda_c + EF_{new\ fuel\ oil/diesel\ new\ plants} \text{ x } \lambda_f + EF_{new\ natural\ new\ plants} \text{ x } \lambda_n$ (10)

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,\ Adv}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available ($PGCC_{Adv}$) in China.

According to the data issued by China DNA, the efficiency levels of domestic sub-critical 600 MW coal power unit and the efficiency level of 200 MW combined cycle power unit are taken as the efficiency level of the best technology for coal-fired power plants, and oil and gas fired power plants commercially available in China, which are at 36.53% (336.66 gce/KWh) and 45.87% (268.13 gce/kWh), respectively.

(III) Calculation of Build Margin (BM) emission factor of ECPG.

Finally, weighted average build margin emission factor (EF_BM,y) are calculated by multiplying the $EF_{\text{thermal power}}$ with the weight of new capacity addition by thermal power of total capacity addition in ECPG.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (11)$$

Where:

CAP_{Total} : the total capacity addition of ECPG between 2002~2004;

$CAP_{Thermal:}$ the capacity addition by thermal power of ECPG between 2002~2004.

Therefore, the BM of ECPG is calculated as 0.7869 tCO2/MWh (See details in Table A1 and Table A2 in Annex 3). The method of BM calculation above refers to "the value of China's Regional Grid Baseline Emission Factors Determination" published by DNA (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1053.pdf).

Option 2

(I) Calculation of the Operating Margin Emission Factor ($EF_{OM,y}$)

The ACM0002 provides four options to calculate the operating margin:

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

For the proposed project activity, because the dispatch data of the Grid in China is not available to the public, options (b) and (c) can't be adopted. Furthermore, since low-cost/must-run power sources constitute less than 50% of the East China Power Grid, option (a) (simple OM) is the only reasonable and feasible method among the four options.

The Simple OM emission factor ($EF_{OM,\ simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. The formula of $EF_{OM,\ simple,y}$ calculation is:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \bullet COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (12)$$

Where:

$F_{i,j,y}$ is the total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year(s) *y*, *j* refers to the power sources serving the grid, excluding those low-operating cost and must-run power plants, and including imports to the grid,

$COEF_{i,j\,y}$ is the total amount the CO_2 emission coefficient of fuel *i* (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the oxidation rate of the fuel in year(s) y, and

$GEN_{j,y}$ is the electricity output (MWh) supplied to the grid by the sources *j*.

The CO_2 emission coefficient $COEF_i$ is then obtained as:

$$COEF_i = NCV_i \bullet EF_{CO2,i} \bullet OXID_i \qquad (13)$$

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *I,* national value is used;
$OXID_i$ is the oxidation factor of the fuel, IPCC default is used.

This PDD calculates the Operating Margin (OM) emission factors of ECPG in 2002, 2003 and 2004, respectively. Then, the OM emission factor of ECPG is calculated as the weighted average of the three years, which is at 0.9381 tCO_2/MWh (See details in Table A1 and Table A3 in Annex 3).

(II) Calculation of the Build Margin Emission Factor ($EF_{BM,y}$)
As the above calculation in Option 1, the BM of ECPG is 0.7869 tCO2/MWh.

(III) Calculation of Combined Margin Emission Factor ($EF_{CM,y}$)
The Combined Margin Emission Factor ($EF_{CM,y}$) is calculated as the weighted average of $EF_{OM,y}$ and $EF_{BM,y}$, the weights are 50% and 50%, respectively.

$$\begin{aligned} EF_{CM,y} &= EF_{OM,y} \times 0.5 + EF_{BM,y} \times 0.5 \qquad (14) \\ &= 0.9381 \times 0.5 + 0.7869 \times 0.5 \\ &= 0.8625 \text{ tCO2/MWh} \end{aligned}$$

The method of OM calculation refers to official website: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1053.pdf issued by China's DNA.

Option 3
The technology (and fuel) that is identified as the most possible baseline scenario of the proposed project is coal.

The carbon emission factor (EF_c) of coal is taken the default value of IPCC as 25.8 tC/TJ. The OXID of coal is 0.98 which is IPCC default. Thus, the fuel emission coefficient (tCO2e/GJ) is calculated as 0.093 tCO2e/GJ.

According to "the value of China's Regional Grid Baseline Emission Factors Determination" published by DNA (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1047.doc), the most advanced business technology efficiency level of coal- fired plant ($PGCC_{coal}$) in China is used for determine the η_{BL}, which is taken as 336.66 gce/KWh, corresponding to efficiency level of 36.53%.

Therefore, the most possible baseline emission factor is calculated as 0.9136 tCO2/MWh.

According to AM0029, the lowest emission factor among the three options above shall be used as the baseline emission factor, thus option 1 emission factor of Build Margin (0.7869 tCO2/MWh) is used.

Sub-step 2a: Baseline CO_2 Emission
Once the baseline emission factor is determined, the baseline emission can be calculated based on the formula 4 above.

Step 3 Calculation of Leakage

Leakage may result from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. According AM0029, the following leakage emission sources shall be considered:

- Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.

- In the case LNG is used in the project plant: CO_2 emissions from fuel combustion/ electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system.

Thus, leakage emissions are calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,\,CO2,\,y} \qquad (15)$$

where:
LE_y : Leakage emissions during the year y in tCO_{2e};
$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH_4 emissions in the year y in tCO_{2e};
$LE_{LNG,CO2,y}$: Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_{2e}.

Sub Step 3a Calculation Of Leakage Emission Due to Fugitive Upstream Methane Emissions
According to Methodology AM0029, the leakage emission due to fugitive upstream CH_4 emissions ($LE_{CH4,y}$) is calculated by the following formula:

$$LE_{CH4,\,y} = \left[FC_y \times NCV_{NG,\,y} \times EF_{NG,\,upstream,\,CH4} - EG_{PJ,\,y} \times EF_{BL,\,upstream,\,CH4}\right] \times GWP_{CH4} \qquad (16)$$

where:
$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH4 emissions in the year y in tCO2e;
FC_y : Quantity of natural gas combusted in the project plant during the year y in m^3;
$NCV_{NG,y}$: Average net calorific value of the natural gas combusted during the year y in GJ/m^3;
$EF_{NG,upstream,CH4}$: Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in t CH_4 per GJ fuel supplied to final consumers;
$EG_{PJ,y}$: Electricity generation in the project plant during the year in MWh;
$EF_{BL,upstream,CH4}$: Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH_4 per MWh electricity generation in the project plant, as defined below;
GWP_{CH4}: Global warming potential of methane valid for the relevant commitment period.

GWP is taken as 21 tCO2e/tCH4. According to AM0029,the natural gas emission factors for the location of the project activity should be used. Thus, $EF_{NG,upstream,CH4}$ uses IPCC default value of other oil exporting countries / rest of world (296 tCH_4/PJ).

According to AM0029, the emission factor for upstream fugitive CH_4 emissions occurring in the absence of the project activity ($EF_{BL,upstream,CH4}$) should be calculated consistent with the baseline emission factor ($EF_{BL,CO2}$) which is the build margin factor of East China Power Grid. Thus, option 1 is used to calculate this factor as following formula:

$$EF_{BL,\ upstream,\ CH4} = \frac{\sum_j FF_{i,k} \times EF_{k,upstream,CH4}}{\sum_j EG_j} \qquad (17)$$

where:

$EF_{BL,upstream,CH4}$: Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in t CH_4 per MWh electricity generation in the project plant j Plants 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;

$EF_{k,upstream,CH4}$: 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 i Plants included in the operating margin.

Based on the method of calculating BM taken by the Chinese DNA, the $EF_{BL,upstream,CH4}$ is calculated as the following way:

(I) Calculation of weights of upstream fugitive methane emissions from production of different kinds of fuel required by coal-fired, oil-fired and gas-fired plants in ECPG.

$$\lambda_{Coal} = \frac{\sum_{COAL,j} FF_{j,\ coal} \times EF_{coal,\ upstream,\ CH4}}{\sum_{j,k} FF_{j,\ k} \times EF_{k,\ upstream,\ CH4}} \qquad (18)$$

$$\lambda_{Oil} = \frac{\sum_{OIL,j} FF_{j,\ oil} \times EF_{oil,\ upstream,\ CH4}}{\sum_{j,k} FF_{j,\ k} \times EF_{k,\ upstream,\ CH4}} \qquad (19)$$

$$\lambda_{Gas} = \frac{\sum_{GAS,j} FF_{j,\ gas} \times EF_{gas,\ upstream,\ CH4}}{\sum_{j,k} FF_{j,\ k} \times EF_{k,\ upstream,\ CH4}} \qquad (20)$$

Where:

$FF_{j,k}$: Quantity of fuel type k (a coal or oil type) combusted in power plant j included in the build margin;

$EF_{k,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or oil type) in t CH_4 per MJ fuel produced.

This PDD employs weights of upstream fugitive methane emissions from production of different kinds of fuel required by coal-fired, oil-fired and gas-fired plants in ECPG in 2004.
Because 95%[12] of the coal production in China are produced by underground mining, so the $EF_{coal, upstream,CH4}$ is calculated as the weighted average of the default values for underground and surface mining in Table 2 of AM0029.

$$EF_{coal,\ upstream,CH4} = 13.4 \times 95\% + 0.8 \times 5\% = 12.77 \ \text{t } CH_4 \text{ / kt coal}$$

$EF_{oil,\ upstream,CH4}$ is taken as the default value in Table 2 of AM0029, which is at 4.1 t CH_4 / PJ. $EF_{gas,\ upstream,CH4}$ is 296 t CH_4 / PJ, which is the default value of other oil exporting countries/rest of world defined in Table 2 of AM0029.

Then, the λ_{coal}, λ_{oil} and λ gas are calculated as 99.46%, 0.03% and 0.51%, respectively. (See details in Table A4-2 in Annex 3)

(II) Calculation of emission factor for upstream fugitive methane emissions by thermal power plants ($EF_{thermal\ power,\ upstream,CH4}$) included in the build margin of ECPG.

The $EF_{thermal\ power,\ upstream,CH4}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal\ power,\ upstream,CH4} = \lambda_{Coal} \times EF_{Coal,upstream,CH4,Adv} + \lambda_{Oil} \times EF_{Oil,upstream,CH4,Adv} + \lambda_{Gas} \times EF_{Gas,upstream,CH4,Adv} \quad (21)$$

Where:
$EF_{Coal,upstream,\ CH4,\ Adv}$, $EF_{Oil,\ upstream,\ CH4,\ Adv}$ and $EF_{Gas,\ upstream,\ CH4,\ Adv}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available ($PGCC_{Adv}$) in China .

According to the data issued by China DNA, the efficiency levels of domestic sub-critical 600 MW coal power unit and the efficiency level of 200 MW combined cycle power unit are taken as the efficiency level of the best technology for coal-fired power plants, and oil and gas fired power plants commercially available in China, which are at 336.66 gce/KWh and 268.13 gce/KWh, respectively.

Based on the formula above, the $EF_{thermal\ power,\ upstream,CH4}$ is calculated at 0.0043 t CH_4 / MWh. (See details in Table A4-1and Table A4-2 in Annex 3)

(III) Calculation of the $EF_{BL,upstream,CH4}$

Finally, $EF_{BL,upstream,CH4}$ is calculated by multiplying the $EF_{thermal\ power,\ upstream,CH4}$ with the weight of new capacity addition by thermal power of total capacity addition in ECPG.

[12] http://www.news365.com.cn/wxpd/jy/yxfzjsdjy/200607/t20060710_1014234.htm

$$EF_{BL,\,upstream,\,CH4} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{thermal\ power,\ upstream,\,CH4} \qquad (22)$$

Where:
CAP_{Total} : the total capacity addition of ECPG between 2002~2004;
$CAP_{Therma:}$ the capacity addition by thermal power of ECPG between 2002~2004.

The proportion of thermal power in the recently build installed capacity of ECPG during the year 2002~2004 is at 87.39%.(See details in TableA2-1.2 in Annex 3) Thus, $EF_{BL,upstream,CH4}$ is calculated at 0.003747 tCH_4/MWh.

Sub Step 3b Calculation Of CO_2 Leakage Emission From LNG
CO_2 emissions from fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system ($LE_{LNG,CO2,y}$) should be estimated by multiplying the quantity of natural gas combusted in the project with an appropriate emission factor, as follows:

$$LE_{LNG,CO2,y} = FC_{LNG,y} \times EF_{CO2,\ upstream,\ LGN} \qquad (23)$$

where:
$LE_{LNG,CO2,y}$: Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO2e;
FC_y: Quantity of natural gas combusted in the project plant during the year y in m^3;
$EF_{CO2,upstream,LNG}$: Emission factor for upstream CO2 emissions due to fossil fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system.

According AM0029, $EF_{CO2,upstream,LNG}$ is taken as 6 t CO_2/TJ [13]as a rough approximation.

Where total net leakage effects are negative ($LEy < 0$), LEy should be assumed at 0.

Step 4: Calculation of Emission Reductions
To calculate the emission reductions the project participant shall apply the following equation:

$$ER_y = BE_y - PE_y - LE_y \qquad (24)$$

Where:
ER_y: emissions reductions in year y (t CO_{2e})
BE_y: emissions in the baseline scenario in year y (t CO_{2e})
PE_y: emissions in the project scenario in year y (t CO_2e)
LE_y: leakage in year y (t CO_{2e})

[13] This value has been derived on data published for North American LNG systems. "Barclay, M. and N. Denton, 2005. Selecting offshore LNG process. http://www.fwc.com/publications/tech_papers/files/LNJ091105p34-36.pdf (10th April 2006)".

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

Data / Parameter:	$F_{i,j,\ 2002\sim2004}$
Data unit:	Ton or m^3
Description:	The total amount of fuel *i* (in a mass or volume unit) consumed by Province j in ECPG for power generation in year 2002,2003 and 2004.
Source of data used:	China Electric Power Yearbook
Value applied:	See A3 in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the ACM0002.
Any comment:	For OM.

Data / Parameter:	$EG_{j\ 2002\sim2004}$
Data unit:	MWh
Description:	The electricity generation by the Province *j* in ECPG in year 2002, 2003 and 2004.
Source of data used:	China Electric Power Yearbook
Value applied:	See table A3 in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the ACM0002.
Any comment:	For GEN calculation.

Data / Parameter:	$CPR_{j\ 2002\sim2004}$
Data unit:	%
Description:	The captive power rate by the Province *j* in ECPG in year 2002, 2003 and 2004.
Source of data used:	China Electric Power Yearbook
Value applied:	See table A3 in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with the ACM0002.
Any comment:	For GEN calculation.

Data / Parameter:	$GEN_{j\ 2002\sim2004}$
Data unit:	MWh
Description:	The electricity output (MWh) supplied to the grid by the Province *j* in ECPG in year 2002, 2003 and 2004.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591157181.xls
Value applied:	See table A3 in Annex 3
Justification of the choice	The data selected comply with the ACM0002.

of data or description of measurement methods and procedures actually applied :	
Any comment:	For OM calculation.

Data / Parameter:	NCV i
Data unit:	kj/Kg or kj/m^3
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	Page 365, China Energy Statistical Yearbook 2005
Value applied:	See table A3 in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002，the national value is used.
Any comment:	For OM and BM calculation.

Data / Parameter:	$EF_{co2,\ I}$
Data unit:	tC/Tj
Description:	CO_2 emission factor per energy unit of fuel i.
Source of data used:	The values of coke, coke oven gas, other gas and refinery gas are taken from IPCC 2006, and others are from IPCC 1996.
Value applied:	See table A3 in Annex.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The national value is unavailable, and the lower values between IPCC 1996 and 2006 are used for the conservative.
Any comment:	For OM and BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	
Description:	The oxidation factor of the fuel.
Source of data used:	Page 1.29, Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	See table A3 in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The national value is unavailable, and the lower values between IPCC 1996 and 2006 are used for the conservative.
Any comment:	

Data / Parameter:	Installed Capacity $_{j\ 2002,\ 2003,\ 2004}$
Data unit:	MW
Description:	The installed capacity of Province j in ECPG in year 2002, 2003 and 2004.

Source of data used:	China Electric Power Yearbook
Value applied:	See table A1 in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with ACM0002.
Any comment:	For BM calculation.

Data / Parameter:	$PGCC_{Adv, I}$
Data unit:	%
Description:	the efficiency level of the best technology for each fuel type commercially available in China.
Source of data used:	Official website of China DNA: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf
Value applied:	See table A2-1.1 and A4-2 in Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data selected comply with ACM0002.
Any comment:	For BM calculation.

Data / Parameter:	$EF_{NG,upstream,CH4}$
Data unit:	tCH_4/PJ
Description:	Emission factor for upstream fugitive methane emissions of natural gas production
Source of data used:	IPCC
Value applied:	296
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value for other oil exporting countries / rest of world is adopted.
Any comment:	

Data / Parameter:	$EF_{coal, , ,underground\ mining\ , upstream,CH4}$
Data unit:	tCH_4/kt
Description:	Emission factor for upstream fugitive methane emissions from production of coal by underground mining.
Source of data used:	IPCC 1996
Value applied:	13.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AM0029, the IPCC default value is applied.
Any comment:	

Data / Parameter:	$EF_{coal, , , surfacing\ mining, upstream,CH4}$
Data unit:	tCH_4/kt
Description:	Emission factor for upstream fugitive methane emissions from production of coal by surfacing mining.
Source of data used:	IPCC 1996
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AM0029, the IPCC default value is applied.

Data / Parameter:	$EF_{oil, ,upstream,CH4}$
Data unit:	tCH_4/kt
Description:	Emission factor for upstream fugitive methane emissions from production of oil.
Source of data used:	IPCC
Value applied:	4.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$EF_{CO2,upstream,LNG}$
Data unit:	$t\ CO_2/TJ$
Description:	Emission factor fpr upstream CO_2 emission due to energy consumption associated with LNG process.
Source of data used:	This value has been derived on data published for North American LNG systems. “Barclay, M. and N. Denton, 2005. Selecting offshore LNG process. http://www.fwc.com/publications/tech_papers/files/LNJ091105p34-36.pdf (10th April 2006)
Value applied:	6
Justification of the choice of data or description of	Since there is no country or local specific value available, the default value recommended by the methodology AM0029 is adopted.

measurement methods and procedures actually applied :	
Any comment:	

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

>>

Step 1 Calculation of Project emissions

According to step 1 in Section B6.1, the project emissions are calculated as the following:

(1) Natural Gas Combustion By The Proposed Project

Year	Annual Electricity Generation (EG) (KWh)	Natrual Gas Consumption Rate (m^3/KWh)	Annual Natrual Gas Consumption (m^3)
2008(Oct.~Dec.)	382,000,000	0.1938	74,031,600.00
2009	3,820,000,000		740,316,000.00
2010~2027	6,112,000,000		1,184,505,600.00
2028(Jan.~Sep.)	2,483,000,025		481,205,404.85

(2) $COEF_{\text{Natural gas, y}}$

NCV (Kj/m^3)	Carbon Emission Factors (tC/Tj)	EF_{CO2} (tCO_2/Tj)	OXID	COEF (tCO_2/m^3)
34,402	15.30	56.10	1.00	0.00193

(3) Project Emissions

Year	Annual Natrual Gas Consumption (m^3)	COEF (tCO_2/m^3)	Annual Project Emission (tCO_{2e})
2008(Oct.~Dec.)	74,031,600.00	0.00193	142,877.45
2009	740,316,000.00		1,428,774.49
2010~2027	1,184,505,600.00		2,286,039.19
2028(Jan.~Sep.)	481,205,404.85		928,703.43

Step 2 Calculation of Baseline Emissions

Based on the formula 4 of step 2 in Section B.6.1, the baseline emissions are calculated as the following:

Year	Annual Electricity Generation (EG) (KWh)	EF_BL,CO2 (tCO2/MWh)	Baseline Emission (tCO2e)
2008(Oct.~Dec.)	382,000,000	0.7869	300,595.80
2009	3,820,000,000		3,005,958.00
2010~2027	6,112,000,000		4,809,532.80
2028(Jan.~Sep.)	2,483,000,025		1,953,872.72

Step 3 Calculation of Leakage

Sub Step 3a Calculation of leakage emission due to fugitive upstream methane emissions

(1) Leakage of natural gas combustion

Year	Annual Natural Gas Combustion (FC) (m^3)	NCV_{NG} (KJ/m3)	$EF_{NG,upstream,CH4}$ (t CH4/PJ)	Leakage of natural gas combustion (tCH4)
2008(Oct.~Dec.)	74,031,600.00	34,402	296	753.86
2009	740,316,000.00			7,538.63
2010~2027	1,184,505,600.00			12,061.81
2028(Jan.~Sep.)	481,205,404.85			4,900.11

(2) Leakage in baseline

Year	Annual Electricity Generation (EG) (MWh)	$EF_{BL,upstream,CH4}$ (tCH_4/MWh)	Leakage in baseline (tCO_{2e})
2008(Oct.~Dec.)	382,000,000	0.003747	1,431.39
2009	3,820,000,000		14,313.89
2010~2027	6,112,000,000		22,902.22
2028(Jan.~Sep.)	2,483,000,025		9,304.03

(3) $LE_{CH4,y}$

Year	Leakage of natural gas combustion (tCH4)	Leakage in baseline (tCO2e)	GWP (tCO2e/tCH4)	LE_{CH4} (tCO2e)
2008(Oct.~Dec.)	753.86	1,431.39	21	-14,228.04
2009	7,538.63	14,313.89		-142,280.40
2010~2027	12,061.81	22,902.22		-227,648.64
2028(Jan.~Sep.)	4,900.11	9,304.03		-92,482.26

Sub Step 3b Calculation of CO_2 Leakage Emission From LNG

Year	Annual Natural Gas Combustion（FC）(m^3)	NCV $_{NG}$ (KJ/m3)	$EF_{LNG,upstream,Co2}$ (t CO2/TJ)	$LE_{LNG,CO2}$ (tCO2)
2008(Oct.~Dec.)	74,031,600.00	34,402	6	15,281.01
2009	740,316,000.00			152,810.11
2010~2027	1,184,505,600.00			244,496.17
2028(Jan.~Sep.)	481,205,404.85			99,326.57

Finally, leakage from the proposed project is calculated as the following:

Year	LE_{CH4} (tCO_{2e})	$LE_{LNG,CO2}$ (tCO_2)	Leakage (tCO_2)
2008(Oct.~Dec.)	-14,228.04	15,281.01	1,052.97
2009	-142,280.40	152,810.11	10,529.71
2010~2027	-227,648.64	244,496.17	16,847.53
2028(Jan.~Sep.)	-92,482.26	99,326.57	6,844.31

Step 4: Calculation of Emission Reductions
Based on the formula 24 above, the emission reductions generated by the proposed project are calculated as:

Year	Baseline Emission (tCO2e)	Annual Project Emission (tCO2e)	Annual Leakage (tCO_2)	Annual Emission Reductions (tCO2e)
2008(Oct.~Dec.)	300,595.80	142,877.45	1,052.97	156,665.38
2009	3,005,958.00	1,428,774.49	10,529.71	1,566,653.80
2010~2027	4,809,532.80	2,286,039.19	16,847.53	2,506,646.08
2028(Jan.~Sep.)	1,953,872.72	928,703.43	6,844.31	1,018,324.98

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

>>

Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2008	142,877	300,596	1,053	156,665
2009	1,428,774	3,005,958	10,530	1,566,654
2010	2,286,039	4,809,533	16,848	2,506,646
2011	2,286,039	4,809,533	16,848	2,506,646
2012	2,286,039	4,809,533	16,848	2,506,646
2013	2,286,039	4,809,533	16,848	2,506,646
2014	2,286,039	4,809,533	16,848	2,506,646
2015	1,714,529	3,607,150	12,636	1,879,985
Total (tCO_{2e})	14,716,377	30,961,367	108,456	16,136,534

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$FC_{LNG, y}$
Data unit:	m^3
Description:	Annual quantity of LNG consumed in the project activity
Source of data to be used:	LNG flow meter reading at the project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	74,031,600 (Oct.~Dec. 2008) 740,316,000 (2009) 1,184,505,600 (2010~2027) 481,205,405 (Jan.~Sep. 2028)
Description of measurement methods and procedures to be applied:	The LNG flow rate will be monitored continuously both by supplier and the project owner. The LNG consumption will be aggregated automatically and recorded daily.
QA/QC procedures to be applied:	The total LNG consumption will be monitored both at the supplier and the project owner for cross-verification. Natural gas supply metering to the project will be subjected to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The reading will be double checked by the gas supply company.
Any comment:	

Data / Parameter:	$NCV_{Natural\ gas}$
Data unit:	KJ/m^3
Description:	Net Calorific Value of natural gas consumed by the proposed project.
Source of data to be used:	Fuel supplier
Value of data applied for the	34,402

purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measure Report of LNG character as determined from the fuel supplier
QA/QC procedures to be applied:	No additional QA/QC procedures may need to be planned
Any comment:	

Data / Parameter:	$EF_{CO2, Natural\ gs, y}$
Data unit:	tCO2/GT
Description:	Emission factor of LNG consumed in the project activity
Source of data to be used:	Fuel supplier
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	15.30
Description of measurement methods and procedures to be applied:	Measure Report of NG character as determined from the fuel supplier
QA/QC procedures to be applied:	No additional QA/QC procedures may need to be planned
Any comment:	

Data / Parameter:	EG_y
Data unit:	GWh
Description:	Electricity supplied to the grid by the project
Source of data to be used:	Ammeter reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in Section B.5	382 (Oct.~Dec. 2008) 3,820 (2009) 6,112 (2010~2027) 2,483 (Jan.~Sep. 2028)
Description of measurement methods and procedures to be applied:	The readings of electricity meter will be hourly measured and monthly recorded. Data will be archived for 2 years following the end of crediting period by the means of electronic and paper backup.
QA/QC procedures to be applied:	The electricity output from each turbine will be monitored and recorded at the on-site control center using a computer system. The project operator will be responsible for recording this set of data. Electricity sales invoice will also be obtained for double check.
Any comment:	Electricity supplied by the project activity to the grid. Double check by the receipts of sales.

B.7.2. Description of the monitoring plan:

>>

The project owner is the user of this monitoring plan and will be responsible for this monitoring plan. The project owner must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process. This process also reinforces that CO_2 reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs).

Emission reductions will be achieved through avoided power generation of fossil fuel electricity due to the power generated by the proposed project. The grid-connected output is therefore defined as the key data to monitor.

Operational and Management Structure For Monitoring

The project owner has assigned a Monitoring Team to carry out the whole monitoring process according to the Figure 7 below.

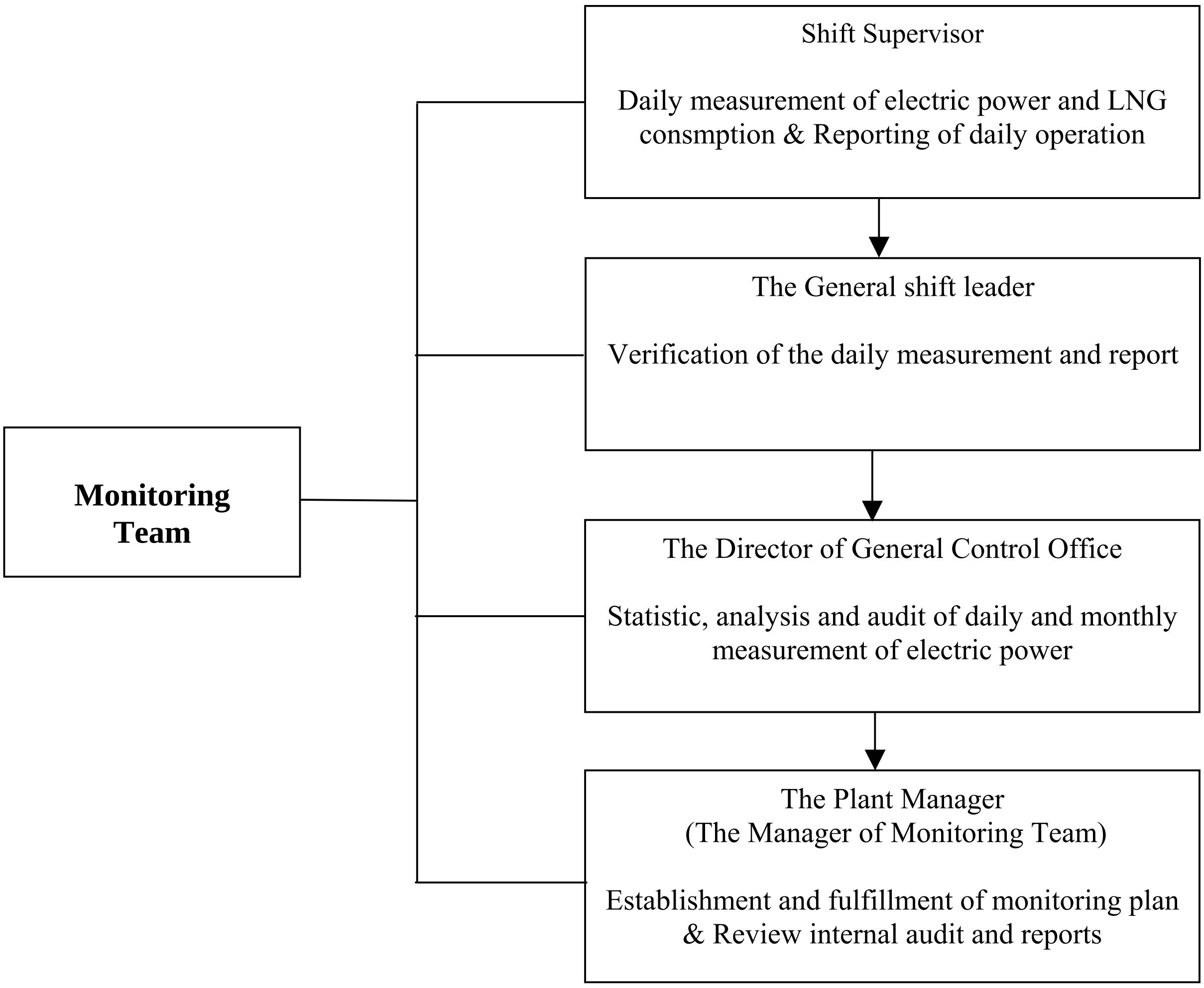

Figure 7 Monitoring and Management Structure

The plant manager of the proposed project will establish the monitoring plan, and hold the overall responsibility for the monitoring process. The first step is the measurement of the daily electrical energy supplied to the grid and LNG consumption and reporting of daily operation, which will be carried out by shift supervisor. Secondly, the general shift leader will verify the daily measurement and operation report. Then, the data and report will be submitted to the director of general control office who will be responsible for statistic, analysis and audit the daily and monthly measurement, collection of sales receipts provided by the grid of the power supply, and prepare monitoring report of the project activity including operating periods, power generation, power delivered to the grid, equipment defects, etc. Finally, the plant manager will review the internal audit and monitoring reports.

Monitoring Plan
The approved monitoring methodology AM0029 is used for developing the monitoring plan.

Monitoring plan is a diversion and schedule of a series of monitoring task. Monitoring task must be implemented according to the monitoring plan in order to ensure that the real, measurable, and long-term greenhouse gas emission reduction for the project is monitored and reported.

1. The user of the monitoring plan
The project owner, is the user of this plan and will adhere to the guidelines set out in the monitoring plan. This plan should be modified according to actual condition and requirements of DOE in order to ensure that the monitoring is credible, transparent and comprehensive.

Overall responsibility for daily monitoring and reporting lies with the project owner. A CDM workgroup will be established by the project owner to carry out the monitoring tasks.

2. Installation of meters
2.1 Installation of ammeters
Grid-connected electricity generated by the project will be mainly monitored through the main Meter installed in the substation. A computer system will be installed at the on-site control center. Both of the meters can be read remotely through a communication line. When the main meter is out of order, the readings from the computer system will be used for reference.

2.2 Installation of the LNG metering equipment
Consumption of LNG can be monitored by metering equipment at the front of the LNG pipe intake. A computer system will also be installed at the on-site control center to monitor the data. Both of the meters have the capability of accumulating the consumption of LNG and can be read remotely through a communication line. When the main meter is out of order, the readings from the computer system will be used for reference.

3. Calibration of meters & metering
3.1 **Calibration of meters**
An agreement should be signed between the project owner and the grid company, which defines the arrangements and the required quality control procedures to ensure the accuracy:
(a) The metering equipment will be properly calibrated and checked annually for accuracy.
(b) The metering equipment shall have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5% of full-scale rating.
(c) Calibration is carried out by the grid company with the records being supplied to the project owner, and these records will be maintained by the project owner and the appointed third party.

(d) Both meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

All the meters installed shall be tested by a third party within 10 days after:

(a) Detection of a difference larger than the allowable error in the readings of both meters;
(b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

3.2 Metering

The specific steps for data collection and reporting are listed below:

(a) Grid company, together with the project owner reads the main meter and records data on the last day of every month.
(b) Project owner reads the backup meter and records data on the last day of every month Grid company supplies readings to the project owner and provides invoice.
(c) Project owner records the data of net electricity delivered to the grid Project owner provides two meters' readings and photocopies of invoices to DOE for verification.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the grid-connected electricity generated by the proposed project shall be determined by reading the backup meter, unless a test by either party reveals it is inaccurate:

1. If the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the proposed project owner and grid company shall jointly prepare an estimate of the correct reading; and
2. If the proposed project owner and the grid company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

4. Monitoring

Data that will be monitored include:

4.1 Monitoring of the Grid-connected electricity generated by the Project

The electricity output can be monitored by main ammeter at the substation (interconnection facility connecting the facility to the grid). The electricity output from each turbine will be monitored and recorded at the on-site control center using a computer system. The project operator will be responsible for recording this set of data. The main ammeter will be controlled, operated and maintained by the Fujian Grid. The backup computer system will be controlled, operated and maintained by the project owner. Both of the meters can be read remotely through a communication line. Electricity sales invoice will also be obtained for double check.

The readings of electricity meter will be hourly measured and monthly recorded. Data will be archived for 2 years following the end of crediting period by the means of electronic and paper backup. Detailed monitoring procedures will be established in accordance with the Grid Connect Agreement. The meter reading will be already accessible for the DOE. Calibration tests records will be maintained for verification.

4.2 Monitoring of the quantity of the LNG combusted

The total LNG consumption will be monitored through metering equipment by both at the supplier and project end for cross-verification.

Consumption of LNG can be monitored by metering equipment at the front of the LNG pipe intake. The data can also be monitored and recorded by a computer system at the on-site control center. The intake metering equipment will be controlled, operated and maintained by the selling party. The backup computer system will be equipped at the front of the generation unites, which will be controlled, operated and maintained by the project owner. Both of the meters have the capability of accumulating the consumption of LNG and can be read remotely through a communication line.

The LNG flow rate will be monitored continuously both by supplier and the project owner. The LNG consumption will be aggregated automatically and recorded daily. The reading will be double checked by the gas supply company.

Detail monitoring procedures will be established in accordance with the Purchasing Agreement.
The meter reading will be already accessible for the DOE. Calibration tests records will be maintained for verification.

4.3 Monitoring of NCV

NCV of the NG was used during the calculation of the CO2 emission coefficient, so the measure report of NG Character must be obtained from the supplier.

4.4 Monitoring of the data needed to calculate the baseline emission factor

The baseline emission factors for the ECG are obtained according to China's Regional Grid Baseline Emission Factors Determined published by DNA. The project owner should check the data and summit the revised ex-post calculation to the DOE on an annual basic. If data for determining the baseline emission factors is no longer provided by the DNA, the project owner should notify the CDM developer or other qualified entities to redesign the access to obtain the data to calculate the conservative baseline emission factor of the project boundary.

The emission reduction of the project is calculated on the basic of the deviation of AM0029 agreed by EB. The CDM project developer should advise the project owner that when the data is available, the calculation of emission factor should be strictly in accordance with the methodology and be validated by the DOE.

4.5 Quality assurance and quality control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process, which will be ensured through the CDM mechanism in terms of the need for verification of the emission on an annual basic according to the Project Designed Document and the CDM manual.

5. Data Management System

The CDM manual set out the procedures for checking information from the primary source to the end-data calculation in physical document. If the data and information is from the Internet, the website must be provided. Moreover, the credibility and reliability of the data and information must be confirmed by the project developer or other qualified entities. The project owner is responsible for providing additional data and information for validation and verification requirements of the DOE.

Physical document such as paper-based maps, diagrams and environmental assessments will be collected in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results will be indexed. All paper-based information will be kept on the technology department of the project owner and all the material will have a copy for backup. And all data including calibration records is kept until 2 years after the end of the total credit time of the CDM project.

6. Verification and Monitoring Result

The project owner will sign a verification agreement with the specific DOE and agree to a timeframe work set by the EB for carrying out the verification while considering the buyer's schedule. The project owner will make the time arrangement for the verification and will prepare for the audit verification to the best of itself. The project owner will facilitate the verification by providing the DOE with all required necessary information before, during and, in the event of queries, after verification.

If the project owner deems that the requirement from the DOE is not within the verification, they should refer to the CDM developer or other qualified entities to confirm weather the requirements are reasonable. If considered unreasonable, a rejection letter in written form should be provided to the DOE with justifiable reasons. If the project owner and the DOE can not reach an agreement, they can go to the EB or UNFCCC for arbitration.

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 baseline study and monitoring plan of the proposed project were conducted by the Beijing Changjiang River International Holding on 26th March 2007

Mr. Zheng KANG, ponykang@yahoo.com.cn ,Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

Ms. Shunrong LIN, linnet2001@hotmail.com, Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

Ms. Meiyu OU, oumeiyu@126.com, Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/10/2008

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

>>
21 years

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

>>

C.2.1. Renewable crediting period

>>

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

>>
01/10/2008

C.2.1.2. Length of the first crediting period:

>>
7 years.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

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

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The project owner delegated China Global Engineering Company to conduct the required EIA. This Company has qualification for EIA consultancy services certified by State Environmental Protection Administration (SEPA) in 2002 and is independent from the project owner. And the Environmental Protection Bureau of China approved the EIA report in Dec. 2004.

According to the EIA report, the impacts rising from the proposed project were identified, and the mitigation measures were suggested and defined in the following two phrases.

Construction Phase

Ecosystem impact

According to the characteristic of the proposed project, the possible impacts on the vegetation and animals during the construction period will mainly concentrate on the construction area. The area is the first stage engineering of Putian LNG Power Plant. At present, there is mainly wasteland in this area. In addition, neither cultural relics, nor mineral resources were identified during the EIA survey. Even no buildings were found there. Thus the proposed project will not lead to pulling down of the original residence and displacement of local population. So the adverse impact on the vegetation and animals inhabiting there can be considered minimal.

Wastewater

In order to protect the water of sea area from being polluted, the wastewater from vehicles cooling, and washing, concrete mixing and equipments test is not allowed to discharge into Meizhou Bay directly. Instead the wastewater will be retained in the sedimentation tank before discharged. The oil water from vehicles will be collected and delivered to the local oil water treatment site, which will be treated with the specific treatment equipments before recycled. The domestic sewage generated from labor forces must be treated in septic tank and then will be discharged into the sea in accordance with Sea Water Quality Standard (GB3097-1997). The disposed water mentioned above must meet Integrated Wastewater Discharge Standard (GB8978-1996) grade I.

Dust

The major air pollutant is dust during the construction period. Several dustproof measures such as watering, wet operation method and selection and proper conservation of construction equipments and vehicles etc in accordance with Environment Air Quality Standard (GB3095-1996) grade II.

Noise

The noise is mainly generated from construction equipments and vehicles during the construction period will be strictly controlled in accordance with Standard of Noise at Boundary of Industrial Enterprises (GB12348-90) III and Standard of Environmental Noise of Urban Area (GB3096-1993) III using these measures: setting noise barrier around the construction site, arranging the construction time and plan reasonably etc. Thus the impact on local area will be mitigated as possible.

Solid waste
The solid waste generated from earth-rock excavation will be collected and delivered to the designated dumpsites or recycled. The domestic garbage from construction and livelihood area will be disposed by the local department of environment and sanitary every day.

Operation phase

Air pollution
Since the proposed project is a LNG power plant, the emission of SO_2 and TSP is very slight and negligible compared with the conventional coal fired power plant. And its major air pollutant is NO_X. The proposed project will adopt dry-type low NO_X emission combustion system, which could drastically reduce NO_X. Emission. The NO_X. Emission of the proposed project is expected to 0.0083mg per cubic meter at maximum, which could meet the requirement of Emission Standard of Air pollutants for fossil power plant (GB13223-1996) and Emission Standard of Air pollutants coal-burning oil-burning gas fired boilers (GB13271-2001).

Wastewater
The wastewater generated from the generation progress, which is mainly comprised of acidic and basic wastewater will be disposed in the neutralization tank before discharged into the sea in accordance with Integrated Wastewater Discharge Standard （GB8978-1996） and Sea Water Standard (GB3097-1997). The domestic sewage mainly generated from the permanent staff during the operation period, whose main pollutants are COD and BOD, will be retained in a sedimentation tank and then will be used for virescence or irrigation purpose when it can meet the requirement of Integrated Wastewater Discharge Standard (GB3097-1997). The oil water will be collected and delivered to the local oil water treatment site. The wastewater from the cooling system will be treated before recycled.

Noise
Noise mainly resulted from machines and vehicles during the operation. In accordance with Standard of Noise at boundary of industrial enterprises (GB12348-90), several measures will be taken to mitigate the negative impacts: the pumps, turbines and generators will be installed inside; sound absorption material will be used; sound insulation workroom will be set up; Doors and windows of controlling and office building will avoid to face the residential area；Heat Recovery Turbine will be equipped with 30dB sound insulator; Green Belts will be built between project site and neighbourhood areas to minimize the noise effectively.

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

>>
The environmental impacts of the proposed project are not considered to be significant.

SECTION E. Stakeholders' comments

>>

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

>>

To understand the attitudes of local stakeholders toward to the proposed project, the project owner carried out a project specified survey of the local residents who might be affected by the project activity in the form of distributing 50 copies of questionnaires (See Table 10 below) to the individuals. The result shows that local stakeholders give their strong supports to the proposed project.

Table 10 Spot Check Questionnaires for the Public on the Environment Impact Assessment of Putian Natural Gas（LNG） Power Plant Project

<table>
<tr><td>Name</td><td></td><td>Gender</td><td></td><td>Age</td><td></td><td>Education</td><td></td></tr>
<tr><td>Company</td><td colspan="3"></td><td>Vocation</td><td colspan="3"></td></tr>
<tr><td colspan="8">Project Introduction:

Fujian Putian LNG Power Plant is designed to construct a grid connected natural-gas based combined cycle gas turbine power plant with total installed capacity of 1,528MW (382MW×4) located on the north of the Mayzhou Bay Xuyu Penisular Xiuyu District, Putian city, Futian Province. The proposed project will be connected to Fujian power Grid, which is a major part of ECPG. The Power Plant will be installed 4 generating blocks, each of which consists of a combine cycle, a single-axis gas turbine, a heat recovery steam generator, a steam turbine, and ancommon generator.500KV transmission lines will be constructed for power evacuation.

The proposed project will supply strong and stable electricity to support Fujian power grid. The annual output of the proposed project is expected at 6,112GWh when all the generating units putting into operation, which can mitigate the high pressure of Fujian power grid regarding to power shortage incurred by the greatly increased power demand and balance the grid peak loads.

As a clean fuel power project, the proposed project can reduce GHGs emission reductions compared with conventional thermal power plants, thus be considered as an environmental-friendly project. Also, the proposed project will contribute more social and economic social benefits to local area such as providing job opportunities, improving standard of living of local people, supporting the construction of local schools and infrastructure, and etc. Thus, the proposed project provides a combination of positive environmental, economic, and sustainable development benefits</td></tr>
<tr><td colspan="3">1. Are you familiar with the proposed project?</td><td colspan="2">A. Yes</td><td colspan="2">B. No</td><td>C. Indifferent</td></tr>
<tr><td colspan="3">2. Do you support the construction of the proposed project?</td><td colspan="3">A. YES</td><td colspan="2">B. NO</td></tr>
<tr><td colspan="3">3. Do you support the proposed project develop CDM?</td><td colspan="3">A. YES</td><td colspan="2">B. NO</td></tr>
<tr><td colspan="3">4 .How much the proposed project do you think will impact on your daily life?</td><td colspan="2">A. Positive</td><td colspan="2">B. Negative</td><td>C. No idea</td></tr>
</table>

<table>
<tr><td rowspan="2">5. Which benefits do you think will be brought by the proposed project?</td><td colspan="4">A. More job opportunities</td><td colspan="4">B. Increase of Income</td><td colspan="4">C. Economic development</td></tr>
<tr><td colspan="6">D. Improvement of local infrastructure</td><td colspan="6">E. Others</td></tr>
<tr><td>6. To what extent the negative impacts could influence on local environment?</td><td colspan="3">A. Severe</td><td colspan="3">B. Partial</td><td colspan="3">C. Little</td><td colspan="3">D. No</td></tr>
</table>

E.2. Summary of the comments received:

>>
During the survey, 50 responses have been received at 100% rate of return. The following is a summary of the key findings:

1) The average age of the sample group is at 42;
2) 16% and 56% are at high and middle education level, respectively;
3) 100% know the construction of the proposed project;
4) 100% agree with its construction;
5) 100% agree that the proposed project develops as CDM project;
6) 100% deeply believe that the project will bring positive impacts to their daily life.
7) Most of the respondents consider the project will contribute to local development. In one way, 80% believe the project can promote local economic development, 70% consider the project can increase the local job opportunities, 74% think it can increase local income, 66% consider the project will contribute to local infrastructure construction.
8) 92% of the respondents consider the negative impacts of the project on local environment is little.

Conclusion
The survey shows that the proposed project receives strong support from local people. The respondents generally deemed that the project generate reliable electricity, accelerate the economic development, and induce some other multiple benefits relating to their livelihoods.

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

>>
The local residents and authorities are all supportive of the proposed project. Therefore, there is no need to modify the project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	
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Salutation:	Ms.
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Direct FAX:	
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Represented by:	
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Salutation:	Mr.
Last Name:	Nishio
Middle Name:	
First Name:	Ryutaro
Department:	Global Environment Business Department
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>
There is no public funding for the proposed project.

Annex 3

BASELINE INFORMATION

>>
For calculation of OM and BM of ECPG, please refer to:

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1052.xls
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf

Table A1 Basic Data of the East China Power Grid

Table A 1-1Basic Data of The East China Power Grid in 2002

	Installed capacity（MW）					Electricity generation and supply by thermal power plants		
	Hydro power	Fuel-fired power	Nuclear power	Other	Total	Electricity generation （MWh）	Power self-consumption rate (%)	Power supply to the Grid (MWh)
Shanghai	0.00	11,382.60	0.00	0.00	11,382.60	61,648,000	5.44%	58,294,348.80
Jiangsu	137.20	20,599.00	0.00	0.00	20,736.20	116,716,000	6.09%	109,607,995.60
Zhejiang	5,866.80	13,082.40	1,678.00	50.20	20,677.40	69,287,000	5.95%	65,164,423.50
Anhui	649.10	9,056.30	0.00	0.00	9,705.40	45,703,000	6.36%	42,796,289.20
Fujian	6,512.00	6,999.90	0.00	12.00	13,523.90	30,850,000	6.68%	28,789,220.00
Sum	13,165.10	61,120.20	1,678.00	62.20	76,025.50	324,204,000	—	304,652,277.10
Share	17.32%	80.39%	2.21%	0.08%	—	Electricity Import *(MWh) 7,883,000	Total power supply (MWh)	312,535,277.10

Data source: China Electric Power Yearbook 2003
* Eelectricity import from Centre China Power Grid.

Table A1-2. Basic data of the East China Power Grid in 2003

	Installed capacity（MW）					Electricity generation and supply by thermal power plants			
	Hydro power	Fuel-fired power	Nuclear power	Other	Total	Electricity generation （MWh）		Power self-consumption rate (%)	Power supply to the Grid (MWh)
Shanghai	0.00	11,092.60	0.00	0.00	11,092.60	69,444,000		5.14%	65,874,578.40
Jiangsu	137.80	22,245.00	0.00	0.00	22,382.80	133,277,000		5.90%	125,413,657.00
Zhejiang	6,054.50	15,321.20	2,406.00	39.70	23,821.40	83,089,000		5.31%	78,676,974.10
Anhui	649.10	9,284.90	0.00	0.00	9,934.00	54,156,000		6.06%	50,874,146.40
Fujian	6,761.10	7,092.80	0.00	12.00	13,865.90	42,146,000		5.07%	40,009,197.80
Sum	13,602.50	65,036.50	2,406.00	51.70	81,096.70	382,112,000		—	360,848,553.70
Share	16.77%	80.20%	2.97%	0.06%	—	Electricity Import* (MWh)	24,461,910	Total power supply (MWh)	385,310,463.70

Data source: China Electric Power Yearbook 2004
* Eelectricity import from Centre China Power Grid and Yangcheng City in Shangxi Provicne.

Table A1-3. Basic data of the East China Power Grid in 2004

	Installed capacity（MW）					Electricity generation and supply by thermal power plants		
	Hydro power	Fuel-fired power	Nuclear power	Other	Total	Electricity generation （MWh）	Power self-consumption rate (%)	Power supply to the Grid (MWh)
Shanghai	0.00	12,014.90	0.00	3.40	12,018.30	71,127,000	5.22%	67,414,170.60
Jiangsu	126.50	28,289.50	0.00	17.60	28,433.60	163,545,000	5.93%	153,846,781.50
Zhejiang	6,418.40	21,439.80	3,056.00	39.70	30,953.90	95,255,000	5.68%	89,844,516.00
Anhui	692.80	9,364.50	0.00	0.00	10,057.30	59,875,000	6.03%	56,264,537.50
Fujian	7,180.10	8,315.40	0.00	12.00	15,507.50	50,490,000	6.07%	47,425,257.00

Sum	14,417.80	79,424.10	3,056.00	72.70	96,970.60	440,292,000		—	414,795,262.60
Share	14.87%	81.91%	3.15%	0.07%	—	Electricity Import* (MWh)	38,583,460	Total power supply (MWh)	453,378,722.60

Data source: China Electric Power Yearbook 2005
* Eelectricity import from Centre China Power Grid and Yangcheng City in Shangxi Provicne.

Table A2 Build Margin Factor of East China Power Grid

Table A2-1.1 Emission Factor of Newly Built Thermal Power Plants of East China Power Grid

	Carbon Emission Factors (tC/Tj)	EF_{CO2} (tCO2/Tj)	OXIDi	Power Supply Efficiency of The Best Power Technology (%)	Emission Factor of Best Techonology (tCO2e/MWh)	The mix of CO_2 emission by thermal power of East China Power Grid in 2004	EF $_{\text{new thermal plants}}$ (tCO2e/MWh)
	A	**B=A*44/12**	**C**	**D**	**E=3.6/D/1000*B*C**	**H**	**I**
Standard Coal	25.8	94.60	0.98	36.53%	0.9136	96.08%	0.9004
Fuel Oil/diesel	21.10	77.37	0.99	45.87%	0.6011	3.39%	
Natrual Gas	15.30	56.10	0.995	45.87%	0.4381	0.53%	

Table A2-1.2 Build Margin Factor of East China Power Grid

	Installed Capacity 2002 (MW)	Installed Capacity 2003 (MW)	Installed Capacity 2004 (MW)	New Capacity Additions (MW)	Split of Electricity generation from New Capacity	Emission Factor of Newly Bulit Thermal Power Plants (tCO2e/MWh)	Weighted Average Build Margin Emission Factor *EFBM,y* (tCO2e/MWh)
	A1	A2	B	C	D	E	F
Source				C=B-A1	D=C/Total C	Table A2-1.1	F=E*D
Hydro Power Plant	13,165.10	13,602.50	14,417.80	1,252.70	5.98%	0.000	0.000
Thermal Power Plant	61,120.20	65,036.50	79,424.10	18,303.90	87.39%	0.9004	0.7869

Nuclear Power	1,678.00	2,406.00	3,056.00	1,378.00	6.58%	0.000	0.000
Others	62.20	51.70	72.70	10.50	0.05%	0.000	0.000
Total	76,025.50	81,096.70	96,970.60	20,945.10	100.00%		0.7869
Percentage of the Installed Capacity of 2004	78.40%	83.63%	—	21.60%			

Table A 3 Simple OM emission factor of the East China Power Grid

Table A 3-1.1 Calculation of emission of the East China Power Grid in 2002

	Fi						Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	Shanghai (10^4t) (10^8m^3)	Jiangsu (10^4t) (10^8m^3)	Zhejiang (10^4t) (10^8m^3)	Anhui (10^4t) (10^8m^3)	Fujian (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)					
	A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H=G*44/12**	**I**	**J**	**K=F*H*I*J*10^{-2}**
RAW COAL	2,386.00	5,674.69	2,923.66	2,025.05	1,336.49	14,345.89	25.80	94.60	20,908.00	0.98	278,071,961.26
CLEANED COAL						0.00	25.80	94.60	26,344.00	0.98	0.00
OTHER WASHED COAL						0.00	25.80	94.60	8,363.00	0.98	0.00
COKE						0.00	29.50	108.17	28,435.00	0.98	0.00
COKE OVEN GAS	2.23	0.02				2.25	13.00	47.67	16,726.00	0.995	178,489.42
Other gas	66.82					66.82	13.00	47.67	5,227.00	0.995	1,656,520.58
Crude oil						0.00	20.00	73.33	41,816.00	0.99	0.00
Gasoline		0.07				0.07	18.90	69.30	43,070.00	0.99	2,068.43
Diesel	1.21	13.45	30.00			44.66	20.20	74.07	42,652.00	0.99	1,396,741.75
Fuel oil	53.20	1.19	91.38	1.09	12.60	159.46	21.10	77.37	41,816.00	0.99	5,107,205.43
LPG						0.00	17.20	63.07	50,179.00	0.995	0.00
Refinery gas	0.84					0.84	18.20	66.73	46,055.00	0.995	25,687.51
Natural gas						0.00	15.30	56.10	38,931.00	0.995	0.00

Other petroleum products*	10.00	3.47				13.47	20.00	73.33	38,369.00	0.99	375,218.89
Other coking products						0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy(renewable energy or waste heating)	3.00		10.40			13.40	0.00	0.00	0.00	0.00	0.00
Emission of the East China Power Grid (tCO2e)	286,813,893.26										

Data source:
China Energy Statistical Yearbook 2003
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A3 -1.2 Calculation of CO_2 emission of the Central China Power Grid in 2002

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	JIAGNXI (10^4t) (10^8m^3)	HENAN (10^4t) (10^8m^3)	HUBEI (10^4t) (10^8m^3)	HUNAN (10^4t) (10^8m^3)	CHONGQING (10^4t) (10^8m^3)	SICHUAN (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)					
	A	**B**	**C**	**D**	**E**	**F**	**G=Sum(A:F)**	**H**	**I=H*44/12**	**J**	**K**	**L=J*I*J*K*10^{-2}**
RAW COAL	1,062.63	4,679.02	1,710.00	1,113.78	398.57	1,964.32	10,928.32	25.80	94.60	20,908.00	0.98	211,827,873.74
CLEANED COAL	2.72						2.72	25.80	94.60	26,344.00	0.98	66,430.55
OTHER WASHED COAL	3.66	26.49			249.99		280.14	25.80	94.60	8,363.00	0.98	2,171,973.06
COKE		1.15					1.15	29.50	108.17	28,435.00	0.98	34,663.36
COKE OVEN GAS			1.11				1.11	13.00	47.67	16,726.00	0.995	88,054.78
Other gas		2.16					2.16	13.00	47.67	5,227.00	0.995	53,548.11
Crude oil		0.67	1.17			0.81	2.65	20.00	73.33	41,816.00	0.99	80,449.80
Gasoline							0.00	18.90	69.30	43,070.00	0.99	0.00
Diesel	1	1.34	1.08	2.19	0.51	0.51	6.63	20.20	74.07	42,652.00	0.99	207,353.29
Fuel oil	0.33	0.16	0.34	0.69		1.51	3.03	21.10	77.37	41,816.00	0.99	97,045.23
LPG		0.02					0.02	17.20	63.07	50,179.00	0.995	629.76

Refinery gas	0.49			1.9			2.39	18.20	66.73	46,055.00	0.995	73,087.08
Natural gas						1.75	1.75	15.30	56.10	38,931.00	0.995	380,294.07
Other petroleum products*							0.00	20.00	73.33	38,369.00	0.99	0.00
Other coking products							0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy(renewable energy or waste heating)		3.38					3.38	0.00	0.00	0.00	0.00	0.00
Emission of the Central China Power Grid (tCO2e)	215,081,402.81											

Talbe A3-1.3 Electricity Generation and Supply of Central China Power Grid in 2002

Province	Electiry generation by thermal Power (MWh)	Self-consumption rate (%)	Power Supply (MWh)	Electiry generation by Hydropower (MWh)	Self-consumption rate (%)	Power Supply (MWh)	Other (MWh)	Total (MWh)
Jiangsu	18648000	7.67	17217698	6151000	0.78	6103022.2		
Henan	84734000	8.03	77929860	4859000	0.49	4835190.9		
Hubei	34301000	7.73	31649533	27854000	0.26	27781579.6		
Hunan	20058000	7.73	18507517	25329000	0.39	25230216.9		
Chongqing	14727000	10.21	13223373	3748000	1.62	3687282.4		
Sichuan	27879000	9.59	25205404	44499000	0.4	44321004		
Total (MWh)			183733385			111958296		295691681

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Table A3 -1.4 Average OM of Central China Power Grid in 2002

CO_2 emission of Central China Power Grid (tCO2e)	215,081,402.81
Power Supply (MWh)	295,691,681.00
Average OM(tCO2e/Mwh)	0.7274

Table A3-1.5 Calculation of Simple OM emission factor of the East China Power Grid in 2002

Total power supply by thermal of the East China Power Grid (MWh)	Emission of the East China Power Grid (tCO2e)	Emission of power import ($EM_{2002,\ import}$) (tCO2e)	Total Emission (tCO2e)	OM emission factor of the East China Power Grid (tCO2e/Mwh)
312,535,277.10	286,813,893.26	5,733,968.21	292,547,861.47	0.9360

Table A 3-2.1 Calculation of emission of the East China Power Grid in 2003

	Fi						Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	Shanghai (10^4t) (10^8m^3)	Jiangsu (10^4t) (10^8m^3)	Zhejiang (10^4t) (10^8m^3)	Anhui (10^4t) (10^8m^3)	Fujian (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)					
	A	**B**	**C**	**D**	**E**	**F=A+B+C +D+E**	**G**	**H=G*44/12**	**I**	**J**	**K=F*H*I*J*10^{-2}**
RAW COAL	2618	6417.74	3442.4	2669.67	1754	16,901.81	25.80	94.60	20,908.00	0.98	327,614,351.95
CLEANED COAL						0.00	25.80	94.60	26,344.00	0.98	0.00
OTHER WASHED COAL						0.00	25.80	94.60	8,363.00	0.98	0.00
COKE						0.00	29.50	108.17	28,435.00	0.98	0.00
COKE OVEN GAS	1.99	0.06				2.05	13.00	47.67	16,726.00	0.995	162,623.69
Other gas	66.34					66.34	13.00	47.67	5,227.00	0.995	1,644,621.00
Crude oil						0.00	20.00	73.33	41,816.00	0.99	0.00

Gasoline						0.00	18.90	69.30	43,070.00	0.99	0.00
Diesel	1.26	14.71	13.99			29.96	20.20	74.07	42,652.00	0.99	936,999.17
Fuel oil	95.49	0.76	174.48		18.89	289.62	21.10	77.37	41,816.00	0.99	9,275,986.69
LPG						0.00	17.20	63.07	50,179.00	0.995	0.00
Refinery gas	0.49	0.96				1.45	18.20	66.73	46,055.00	0.995	44,341.53
Natural gas						0.00	15.30	56.10	38,931.00	0.995	0.00
Other petroleum products*	18.91	5.3	15.04			39.25	20.00	73.33	38,369.00	0.99	1,093,343.84
Other coking products						0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy(renewable energy or waste heating)	5.68		7.08			12.76	0.00	0.00	0.00	0.00	0.00
Emission of the East China Power Grid (tCO2e)	340,772,267.86										

Data source:
China Energy Statistical Yearbook 2004
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 3-2.2 Calculation of CO_2 emission factor of the Central China Power Grid in 2003

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	JIAGNXI (10^4t) (10^8m^3) A	HENAN (10^4t) (10^8m^3) B	HUBEI (10^4t) (10^8m^3) C	HUNAN (10^4t) (10^8m^3) D	CHON GQING (10^4t) (10^8m^3) E	SICHUAN (10^4t) (10^8m^3) F	Total (10^4t) (10^8m^3) G=Sum(A:F)	H	I=H*44/12	J	K	$L=J*I*J*K*10^{-2}$
RAW COAL	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13,851.66	25.80	94.60	20,908.00	0.98	268,492,109.09
CLEANED COAL							0.00	25.80	94.60	26,344.00	0.98	0.00
OTHER WASHED COAL	2.03	39.63			106.12		147.78	25.80	94.60	8,363.00	0.98	1,145,763.47
COKE				1.22			1.22	29.50	108.17	28,435.00	0.98	36,773.30
COKE OVEN GAS			0.93				0.93	13.00	47.67	16,726.00	0.995	73,775.63
Other gas							0.00	13.00	47.67	5,227.00	0.995	0.00

Crude oil		0.5	0.24			1.2	1.94	20.00	73.33	41,816.00	0.99	58,895.33
Gasoline							0.00	18.90	69.30	43,070.00	0.99	0.00
Diesel	0.52	2.54	0.69	1.21	0.77		5.73	20.20	74.07	42,652.00	0.99	179,205.78
Fuel oil	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.10	77.37	41,816.00	0.99	155,656.71
LPG							0.00	17.20	63.07	50,179.00	0.995	0.00
Refinery gas	1.76	6.53		0.66			8.95	18.20	66.73	46,055.00	0.995	273,694.28
Natural gas					0.04	2.2	2.24	15.30	56.10	38,931.00	0.995	486,776.41
Other petroleum products*							0.00	20.00	73.33	38,369.00	0.99	0.00
Other coking products							0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy(renewable energy or waste heating)		11.04			16.2		27.24	0.00	0.00	0.00	0.00	0.00
Emission of the Central China Power Grid (tCO2e)	270,902,649.98											

Table A3-2.3 Electricity Generation and Supply of Central China Power Grid in 2003

Province	Electiry generation By thermal Power (MWh)	Self-consumption rate (%)	Power Supply (MWh)	Electiry generation by Hydropower (MWh)	Others (MWh)	Total (MWh)
Jiangsu	27165000	6.43	25418291	3864000		
Henan	95518000	7.68	88182218	5457000		
Hubei	39532000	3.81	38025831	38775000		
Hunan	29501000	4.58	28149854	24401000		
Chongqing	16341000	8.97	14875212	3951000		
Sichuan	32782000	4.41	31336314	50000000		
Total (MWh)			225987719	126448000		352435719.2

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Table A3 -2.4 Average OM of Central China Power Grid in 2003

CO_2 emission of Central China Power Grid (tCO2e)	215,081,402.81
Power Supply (MWh)	352,435,719.20
Average OM(tCO2e/Mwh)	0.7687

Table A 3-2.5 Average OM emission factor of the Yangcheng City in Shanxi Province in 2003

Coal Consumption Rate (gce/kWh)	Carbon Emission Factors (tC/Tj)	NCV (Kj/Kg)	OM (tCO2e/MWh)
343	25.8	29,271	0.9498

Table A3-2.6 Calculation of Simple OM emission factor of the East China Power Grid in 2003

Total power supply by thermal of the East China Power Grid (MWh)	Emission of the East China Power Grid (tCO2e)	Emission of power import ($EM_{2003,\ import}$) (tCO2e)	Total Emission (tCO2e)	OM emission factor of the East China Power Grid (tCO2e/Mwh)
385,310,463.70	340,772,267.86	20,741,911.11	361,514,178.97	0.9382

Table A 3-3.1 Calculation of emission of the East China Power Grid in 2004

	Fi						Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	Shanghai (10^4t) (10^8m^3)	Jiangsu (10^4t) (10^8m^3)	Zhejiang (10^4t) (10^8m^3)	Anhui (10^4t) (10^8m^3)	Fujian (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)					
	A	**B**	**C**	**D**	**E**	**F=A+B+C+D+E**	**G**	**H=G*44/12**	**I**	**J**	**$K=F*H*I*J*10^{-2}$**
RAW COAL	2,779.60	7,601.90	4,008.90	2,906.20	2,183.70	19,480.30	25.80	94.60	20,908.00	0.98	377,594,225.72
CLEANED COAL						0.00	25.80	94.60	26,344.00	0.98	0.00
OTHER WASHED COAL		5.46			4.63	10.09	25.80	94.60	8,363.00	0.98	78,229.49
COKE						0.00	29.50	108.17	28,435.00	0.98	0.00
COKE OVEN GAS	2.59					2.59	13.00	47.67	16,726.00	0.995	205,461.15
Other gas	72.46					72.46	13.00	47.67	5,227.00	0.995	1,796,340.63
Crude oil						0.00	20.00	73.33	41,816.00	0.99	0.00
Diesel	2.69	27.17	6.23			36.09	20.20	74.07	42,652.00	0.99	1,128,714.95
Fuel oil	58.52	55.07	202.89		23.26	339.74	21.10	77.37	41,816.00	0.99	10,881,236.51
LPG						0.00	17.20	63.07	50,179.00	0.995	0.00
Refinery gas	0.77	0.55				1.32	18.20	66.73	46,055.00	0.995	40,366.08
Natural gas		0.14				0.14	15.30	56.10	38,931.00	0.995	30,423.53
Other petroleum products*	21.22	1.37	24.89			47.48	20.00	73.33	38,369.00	0.99	1,322,597.85
Other coking products						0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy (renewable energy or waste heating)	6.43		15.48			21.91	0.00	0.00	0.00	0.00	0.00
Emission of the East China Power Grid (tCO2e)	393,077,595.90										

Data source:
China Energy Statistical Yearbook 2005
Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

Table A 3-3.2 Calculation of CO_2 emission factor of the Central China Power Grid in 2004

	Fi							Carbon Emission Factors (tC/Tj)	$EF_{CO2,i}$ (tCO_2/Tj)	NCV (Kj/Kg) (Kj/m^3)	OXIDi	Emission (tCO_2e)
	JIAGNXI (10^4t) (10^8m^3)	HENAN (10^4t) (10^8m^3)	HUBEI (10^4t) (10^8m^3)	HUNAN (10^4t) (10^8m^3)	CHONGQING (10^4t) (10^8m^3)	SICHUAN (10^4t) (10^8m^3)	Total (10^4t) (10^8m^3)					
	A	**B**	**C**	**D**	**E**	**F**	**G=Sum(A:F)**	**H**	**I=H*44/12**	**J**	**K**	**$L=J*I*J*K*10^{-2}$**
RAW COAL	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17,144.10	25.80	94.60	20,908.00	0.98	332,310,753.18
CLEANED COAL		2.34					2.34	25.80	94.60	26,344.00	0.98	57,149.81
OTHER WASHED COAL	48.93	104.22			89.72		242.87	25.80	94.60	8,363.00	0.98	1,883,012.41
COKE		109.61					109.61	29.50	108.17	28,435.00	0.98	3,303,869.86
COKE OVEN GAS			1.68		0.34		2.02	13.00	47.67	16,726.00	0.995	160,243.83
Other gas					2.61		2.61	13.00	47.67	5,227.00	0.995	64,703.96
Crude oil		0.86	0.22				1.08	20.00	73.33	41,816.00	0.99	32,787.09
Gasoline		0.06			0.01		0.07	18.90	69.30	43,070.00	0.99	2,068.43
Diesel	0.02	3.86	1.7	1.72	1.14		8.44	20.20	74.07	42,652.00	0.99	263,961.05
Fuel oil	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.10	77.37	41,816.00	0.99	460,244.21
LPG							0.00	17.20	63.07	50,179.00	0.995	0.00
Refinery gas	3.52	2.27					5.79	18.20	66.73	46,055.00	0.995	177,060.32
Natural gas						2.27	2.27	15.30	56.10	38,931.00	0.995	493,295.73
Other petroleum products*							0.00	20.00	73.33	38,369.00	0.99	0.00
Other coking products							0.00	25.80	94.60	28,435.00	0.98	0.00
Other energy(renewable energy or waste heating)		16.92		15.2	20.95		53.07	0.00	0.00	0.00	0.00	0.00

Emission of the Central China Power Grid (tCO2e)	339,209,149.89

Talbe A3-3.3 Electricity generation and supply by Central China Power Grid in 2004

Province	Electiry generation by thermal Power (MWh)	Self-consumption rate (%)	Power Supply (MWh)	Electiry generation by Hydropower (MWh)))	Self-consumption rate (%)	Power Supply (MWh)	Other (MWh)	Total (MWh)
Jiangsu	30127000	7.04	28006059	3890000	1.2	3843320		
Henan	109352000	8.19	100396071	6884000	0.43	6854398.8		
Hubei	43034000	6.58	40202363	69512000	0.12	69428585.6		
Hunan	37186000	7.47	34408206	24236000	0.51	24112396.4		
Chongqing	16520000	11.06	14692888	5670000	2.09	5551497	725000	
Sichuan	34627000	9.41	31368599	58902000	0.39	58672282.2		
Total (MWh)			249074186			168462480	725000	418261666

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Table A3 -3.4 Average OM of Central China Power Grid in 2004

CO_2 emission of Central China Power Grid (tCO2e)	339,209,149.89
Power Supply (MWh)	418,261,666.30
Average OM(tCO2e/Mwh)	0.8110

Table A 3-3.5 Average OM emission factor of the Yangcheng City in Shanxi Provicne in 2004

Coal Consumption Rate (gce/kWh)	Carbon Emission Factors (tC/Tj)	NCV (Kj/Kg)	OM (tCO2e/MWh)
341	25.8	29,271	0.9442

Table A3-3.6 Calculation of Simple OM emission factor of the East China Power Grid in 2004

Total power supply b thermal of the East China Power Grid (MWh)	Emission of the East China Power Grid (tCO2e)	Emission of power import ($EM_{2004, import}$) (tCO2e)	Total Emission (tCO2e)	OM emission factor of the East China Power Grid (tCO2e/Mwh)
453,378,722.60	393,077,595.90	32,843,328.99	425,920,924.90	0.9394

Table A 3-4 Simple OM of East China Power Grid

CO_2 Emission of East China Power Grid (tCO_{2e})			**Power Supply of East China Power Grid**		
2002	2003	2004	2002	2003	2004
292,547,861	361,514,179	425,920,925	312,535,277	385,310,464	453,378,723
Total	1,079,982,965		Total	1,151,224,463	

EF_OM (tCO2/MWh) 0.9381

Table A4-1 Calculation of Leakage emission of fugitive CH_4 emission of the East China Power Grid in 2004

	Fi						EF_k,upstream,CH_4		NCV (Kj/Kg) (Kj/m^3)	Leakage emission of fugitive CH_4 Emission (tCO_4)
	Shanghai (10^3t) (10^6m^3)	Jiangsu (10^3t) (10^6m^3)	Zhejiang (10^3t) (10^6m^3)	Anhui (10^3t) (10^6m^3)	Fujian (10^3t) (10^6m^3)	Total (10^3t) (10^6m^3)				
RAW COAL	27,796	76,019	40,089	29,062	21,837	194,803.00	12.77	t CH_4/kt coal	20,908	2,487,634
CLEANED COAL		54.6			46.3	100.90	12.77	t CH_4/kt coal	8,363	1,288
COKE OVEN GAS	259					259.00	296	t CH_4/PJ	16,726	1,282
Other gas	7246					7,246.00	296	t CH_4/PJ	5,227	11,211

Diesel	26.9	271.7	62.3			360.90	4.1	t CH_4/PJ	42,652	63
Fuel oil	585.2	550.7	2028.9		232.6	3,397.40	4.1	t CH_4/PJ	41,816	582
Refinery gas	7.7	5.5				13.20	296	t CH_4/PJ	46,055	180
Natural gas		14				14.00	296	t CH_4/PJ	38,931	161
Other petroleum products	212.2	13.7	248.9			474.80	4.1	t CH_4/PJ	38,369	75
Total	36,133	76,929	42,429	29,062	22,116	206,669.20				2,502,478

Table A4-2 CH_4 Emission Factor for Upstream Fugitive Methane Emissions by Newly Built Thermal Power Plants of East China Power Grid

	Power Supply Efficiency of The Best Power Technology (gce/kwh)	Emission Factors for Fugitive CH_4 Upstream Emissions	NCV (Kj/Kg) (Kj/m^3)	Emission Factors for Fugitive CH_4 Upstream Emissionsof Best Techonology (tCO2e/MWh)	The mix of fugitive methane emissions by thermal power of East China Power Grid in 2004	$EF_{new\ thermal\ plants}$ (tCO2e/MWh)
Standard Coal	336.66	12.77 t CH_4/kt coal	-	0.004	99.46%	
Fuel Oil/diesel[1)]	268.13	4.10 t CH_4/PJ	41,816	0.000032	0.03%	0.0043
Gas[2)]	268.13	296.00 t CH_4/PJ	38,931	0.0023	0.51%	

1)1 g =1.4286 gce
2)1 m^3=1.3300 kgce

Annex 4

MONITORING INFORMATION

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See section B.7.2.