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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China Guangdong Shenzhen Qianwan LNG generation project.
Version 07
Completed on 23 April, 2009.

A.2. Description of the project activity:

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Qianwan LNG Generation Project (QLGP) is to construct a high efficient LNG (liquefied nature gas) CCGT (combined-cycle gas turbine) plant. The proposed project has a capacity of 1083.09 MW (3× 361.03 MW) with annual electricity generation of 3700 GWh. The annual net electricity generation is 3611GWh.The proposed project will consume 505.6 thousand tons of LNG per annum.

Electricity to be generated by QLGP will subsequently displace power generation by coal-fired thermal plants and reduce CO_2 emission in China Southern Power Grid (CSPG), which is dominated by coal-fired generation technology. The estimated annual greenhouse gas (GHG) emission reductions will be

1, 035,685tCO2e.

By using LNG and CCGT, the QLGP will offer the least environmental damaging form of fossil-fuelled electricity generation, produce positive environmental and economic benefits and contribute to the local sustainable development. The specific sustainable development benefits of the proposed project include:

- Consistence with China's national energy policy aiming at optimization of energy structure, improvement of energy security and diversification of energy mix.
- Supply of less GHG-intensive electricity to the Guangdong Provincial Power Grid (GPPG) and CSPG.
- Improvement of reliability of power supply in Shenzhen local grid and GPPG.
- Successful demonstration to other planned or scheduled LNG CCGT plants in other province of China.
- Promote and strengthen technology and knowledge transfer of CCGT.

A.3. Project participants:

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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)
P.R. China (Host)	Shenzhen Guangqian Electric Power Co., Ltd.	No

Japan	MITSUI&CO., LTD.	No

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):

>>
P.R. China

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

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Guangdong Province.

A.4.1.3. City/Town/Community etc:

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Dachan Island, Nanshan District, Shenzhen City.

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 in the Dachan Island, Nanshan District, Shenzhen City, Guangdong Province. The map below shows the location of the proposed project. The geological location of the proposed project is 22° 30´54"N, 113° 50´35"E.

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

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Sectoral Scope: 1 Energy Industry: non-renewable resources

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

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LNG is natural gas that has been processed to remove impurities and heavy hydrocarbons and then compress to liquid. LNG is about 1/600 the volume of natural gas at STP (standard temperature and pressure), making it more convenient to ship. The LNG will be liquefied (-163℃) and imported from Australia's Northwest shelf gas development project by LNG tankers. In receiving terminal, the imported LNG will be heated to convert it to its initial gaseous form and supplied to the users in Pearl River Delta region and Hongkong (including the proposed CCGT power plant). A LNG terminal has been ready near Shenzhen to receive the LNG from Australia and the first shipment has landed in China in 28 June 2006.

The CCGT process includes two parts: the first phase of the process takes place in the gas turbine which burns natural gas to rotate a coupled AC generator to generate electricity. After the fuel is burnt and passes through the gas turbine, the second phase will utilises the additional heat remaining in the exhausted gas through a heat recovery steam to produce steam to power a steam turbine. These "combined cycle" will results in cycle thermal efficiencies of over 50% when used with the most recent gas turbine technology.

The gas turbines and steam turbines in the QLGP are produced by Dongfang Steam Turbine Works (DSTW). These gas turbines are the first domestic made F-class gas turbine in China by local turbine producers. The heat recovery boilers are produced by Hangzhou Boiler Group.

The electricity will be transmitted to the Shenzhen Municipal Power Grid (SMPG) then GPPG and CSPG through a 19km long 220kV transmission line and a 30km long 220kV transmission line. These transmission lines will be the first two marine overhead transmission lines in China with 10 km in the marine area for each.

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

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The QLGP is estimated to reduce 1,035,685 tCO_2e annually. The renewable crediting period is selected for the proposed project. The first crediting period is of 7 years and this may be renewed for a maximum of two further periods of 7 years each. The total emission reduction of the project will be 7,249,795 tCO2e during the first crediting period.

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2009 (June 1-December 31)	604,150
2010	1,035,685
2011	1,035,685
2012	1,035,685
2013	1,035,685
2014	1,035,685
2015	1,035,685
2016(January 1- May 31)	431,535
Total estimated reductions (tonnes of CO_2e)	7,249,795
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	1,035,685

A.4.5. Public funding of the project activity:

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No public funding is involved in this project activity.

SECTION B. Application of a baseline methodology

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

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Version 01 of AM0029: "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" (referred as The Methodology). More information about The Methodology can be found on the website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

The AM0029 also uses the version 06 of ACM0002: "Consolidated Methodology for Grid-connected Electricity Generation from Renewable Sources" and Version 04 of "Tool for the Demonstration and Assessment of Additionality".

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

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The version 01 of AM0029: "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" is applicable under the following conditions:

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

The Methodology is applicable for the proposed project for the following reasons:

- The proposed project is a new natural gas fired plant and will be connected to the SMPG, then GPPG and CSPG. The primary fuel in the proposed project will be LNG imported from Australia.
- The power grid (the CSPG) which the proposed project is to be connected to is clearly identified and information on the characteristics of this grid is publicly available.
- The Meth Panel clarification AM _CLA_0091, acknowledged by the EB during its 41st meeting, regarding the applicability of the AM0029 stated that "notwithstanding where the natural gas is imported from, this applicability condition is to be implemented by demonstrating, through monitoring, that the full demand of natural gas by the project activity is dedicatedly met with imported gas, and where dedicated imports is not the case, the monitoring should show that satisfying the project activity's demand for natural gas will not lead to a shortages in supplies of the gas to other projects within the country."

  As specified in the PDD and further clarified in the validation report, the LNG used by the proposed project will be totally imported from Australia's Northwest Shelf gas development project, i.e. the full demand of natural gas by the project activity will be dedicatedly met with imported gas which conforms to one of the situations indicated in the above clarification, so the project is applicable to the AM0029 in accordance with the Meth Panel clarification AM_CLA_0091. By this Meth Panel definition the project will not and cannot constrain future natural gas capacity additions.

In addition, the propose project is the construction and operation of a new LNG grid-connected electricity generation plant and no other fuel can be used. Therefore, the Project meets the applicability requirement of the methodology AM0029.

Moreover, electricity generated by the project will be supplied to China Southern Power Grid (CSPG). With reference to Notification on Determining Baseline Emission Factor of China's Grid issued by China's DNA on 09/08/2007[1], the geographical/physical boundaries of CSPG can be clearly identified and information pertaining to the grid and used to estimate baseline emissions is publicly available. Therefore, the project meets the applicability requirement of methodology AM0029.

LNG used by the Project is supplied by Guangdong Dapeng LNG Company which gas is sourced from Australia. According to the signed take-or-pay long-term contract (hereafter called "ToP"), Guangdong Dapeng LNG Company will annually import 3.7 million tons of LNG from Australia's Northwest Shelf gas development project over the next 25 years[2]. Guangdong Dapeng LNG Company has also signed take-or-pay (ToP) long-term contracts (25 years) with all of its demand consumers with quantified fuel supply obligation[3]. Of all the consumers, LNG consumed by the Project Owner, accounts for about 13.7% of the total LNG supply. Such long-term contract along the LNG chain ensures that there is no supply constraint because all the LNG demands have been contracted.

In addition, according to the Plan of Guangdong Province Natural Gas Supply in "11th Five-Year Plan" and the long-term goal of Demand to Year 2020[4] issued by Guangdong Provincial Development and Reform Commission, it was found that the supply of natural gas in Guangdong province from 2010 to 2020 will keep increasing, therefore the implementation of the project will not limit natural gas based power capacity additions in the region.

- The LNG used in the proposed project will be imported from Australia and supplied by the first LNG terminal in China. The terminal will annually import about 3.7 million tons of LNG from Australia's Northwest Shelf gas development project over the next 25 years and mainly supply gas to Shenzhen, Dongguan, Guangzhou, Foshan and Hong Kong and five power plants. The second phase is expected to raise the capacity of the project to 6.2 million tons a year. Gas has some special features which distinguish it from other commodities, it is delivered through a long fixed chain (from exploration to final users) capacity-bound investment. The specific features of natural gas means the natural gas project had to be protected by long-term contracts with strict supply and off-take obligations. To hedge the risk, The Guangdong Dapeng LNG, operator of the LNG project also signed take-or-pay (ToP) long-term contracts with potential demand consumers. Such long-term contract along the LNG chain make sure that there is no supply constrain (all LNG demand have been contracted), thus no

[1] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889
[2] http://www.cnooc.com.cn/zhyww/xwygg/2007_6_29/244684.shtml

[3] http://www.dplng.com/cn/project/project_01.aspx

[4] Plan of Guangdong Province Natural Gas Supply in "11th Five-Year Plan" and the long-term goal of Demand to Year 2020[4] issued by Guangdong Provincial Development and Reform Commission.

possible leakage. Additionally, in the LNG supply contract, there is clause to ensure that the LNG will be supplied preferentially to household user once there is supply constrain. Such clause also makes sure that the proposed project couldn't lead to fuel switch activity thus no possible leakage.

To conclude, the Methodology is applicable to the proposed project.

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

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According to the version 01 of AM0029, in the calculation of project emissions, only CO_2 emissions from fossil fuel combustion at the project plant are considered. In the calculation of baseline emission, only CO_2 emissions from fossil fuel combustion in power plants in the baseline are considered.

The GHGs included in or excluded from the project boundary are listed as follows:

	Source	Gas	Included?	Justification/Explanation
Baseline	Power generation in baseline	CO_2	Yes	Main emission source
		CH_4	No	Excluded from simplification. This is conservative
		N_2O	No	Excluded from simplification. This is conservative
Project Activity	On-site fuel combustion due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Excluded from simplification.
		N_2O	No	Excluded from simplification.

The project boundary of the proposed project includes the QLGP project site and all power plants connected physically to the baseline grid. According to ACM0002, the China Southern Power Grid which the proposed project is connected to is defined as baseline grid which includes Guangdong, Guangxi, Yunnan and Guizhou province.

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

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According to the version 01.1 of AM0029, the following steps are used to define the baseline scenario:

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

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

In this step, all possible realistic and credible alternatives that provide outputs or services comparable with the proposed CDM project are identified. The options should also be in compliance with all applicable legal and regulatory requirements. The existing and planned generation technologies within CSPG are listed as follows:

Alternatives	Output and Service	Plausibility
Natural Gas power generation using	Generation, full-year peak regulation capacity	Plausible for higher capacities. Meets all eligibility conditions.

combined cycle gas turbine (CCGT) without CDM.		
Natural Gas power generation using single Gas Turbine technology	Generation, full-year peak regulating capacity	Not Plausible. It is not widely used in CSPG because the thermal efficiency is lower than that of the CCGT.[5]
Light Oil based power plants using CCGT	Generation, full-year peak regulating capacity	Plausible
Coal based power plant with Sub-critical boilers	Generation, full-year peak regulating capacity	Plausible
Coal based power plant with Supercritical boilers	Generation, full-year peak regulating capacity	Plausible
Wind	Generation	Not plausible. It will not deliver outputs and services for peak load. [6]
Solar	Generation	Not plausible. It will not deliver outputs and services for peak load.[6]
Biomass	Generation	Not plausible. It will not deliver outputs and services for peak load.[6]
Nuclear	Generation	Not plausible. It will not deliver outputs and services for peak load.[6]
Hydro	Generation	Not plausible. It will not deliver outputs and services comparable to the project activity with full-year peak regulation capacity. [6]
Import	Import from Three Gorgers	Not plausible. It will not deliver outputs and services comparable to the project activity with full-year peak regulation capacity.[7]

According to AM0029, the selected alternatives need not consist solely of power plants of the same capacity, load factor and operational characteristics. It could be several smaller plants, or the share of a larger plant. Thus, from the above analysis, following are the plausible baseline alternatives:

Fuel	Technology	Output and Service
Natural Gas	CCGT	Generation, full-year peak regulation capacity
Light Oil	CCGT	Generation, full-year peak regulating capacity
Coal	Sub critical	Generation, full-year peak regulating capacity
Coal	Supercritical	Generation, full-year peak regulating capacity

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[5] http://www.china5e.com/gasturbine/introduction.php

[6] Peaking capacity analysis in Guangdong Grid. Hao CHEN, Zhanying LI. Guangdong Electric Power. Apr 2001. Vol.14 No.2, pp6-8

[7] Power source characteristics of project “Power from west to east” and its influences on Guangdong power system. Zhigang CHEN, Qingyi HUANG. Guangdong Electric Power. Apr 2002. Vol 15, No 2. pp9-12.

The efficiency and technical life time of the previous technologies are listed in the next step.

Step 2: Identify the economically most attractive baseline scenario alternative.
According to the version 01 of AM0029, the economically most attractive baseline scenario alternative is identified using levelised cost as a financial indicator. The basic levelised cost methodology used in this PDD is based on Annex 10 of "Projected Costs of Generation Electricity" published by IEA. The formula applied to calculate the levelised electricity generation cost (EGC) is the following:

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

With:

- EGC: Average lifetime levelised electricity generation cost per kWh.
- I_t: Capital expenditure in the year t.
- M_t: Operation and maintenance expenditures in the year t.
- F_t: Fuel expenditure in the year t.
- E_t: Electricity generation in the year t.
- r: Discount rate.

The relevant assumptions and parameters are listed as following:

Table 1 Parameters for Coal-fired, NG and oil-fired CCGT

Item	Unit	300MW Coal-fired sub-critical	600MW Coal-fired supercritical	600MW Coal-fired sub-critical	180 MW Oil fired CCGT	300 MW NG CCGT
Investment Cost	RMB/kW	4515	4074	3938	3137	3106
Material Expenditure	RMB/MWh	6	5	5	15	8
Other O&M Expenditure	RMB/MWh	12	10	10	18	12
Water Expenditure	RMB/MWh	1	1	1	1	1
Annual wage	Million RMB	6.2	10.3	10.3	6	6
Power generation coal consumption (PGCC)	gce/kWh	320	299	312[8]	225[9]	0.1815 （m^3/kWh）
Annual generating hours	H	5000	5000	5000	3500	3500

Source: Design reference cost index for thermal power transmit electricity and transformer electricity projects (2004), 2005 April, China Electrical Power Press.

[8] Operation data of 600 MW units national competition in 2006, 312gce/kWh is equal to generation efficiency of 39.42%.

[9] "Notice of electricity price of oil-fire power plants floating with price of fuel oil" issued by Guangdong Province Price Supervision Bureau on July. 2003. http://www.lawon.cn/law/viewDetail.jsp?id=72965

Table 4 Fuel expenditure for different technologies:

Fuel	Fuel Cost	Source
Coal	192.64 RMB/tce (including desulphurization cost)	National Economic Operation Analysis of Coal Enterprises of from Jan. to May, 2004 http://www.chinacoal.gov.cn/jingjiyunxing/node_4623.htm
NG	1.55 RMB/Nm^3	Calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract
Fuel oil	2100 RMB/t	"Notice of electricity price of oil-fire power plants floating with price of fuel oil" issued by the Guangdong Province Price Supervision Bureau on July. 2003. http://www.lawon.cn/law/viewDetail.jsp?id=72965

Table 5 Construction period and technical lifetime

Technology	Construction	Life time
300MW coal fired plant	3 years	20 Years
600 MW coal fired plant subcritical	4 years	20Years
600 MW coal fired plant supercritical	4 years	20 Years
CCGT (oil fired)	2 years	20 Years
NG CCGT	3 year	20 Years

Source: Design reference cost index for thermal power transmit electricity and transformer electricity projects (2004), 2005 April, China Electrical Power Press.

Based on the above parameters and levelised cost calculation formula, the levelised cost of corresponding generation technology can be calculated and listed in the following table.

Table 6 Result and sensitive analysis of Levelised cost

Fuel	Levelised Cost	Load Factor		Fuel Cost	
	RMB/kWh	+10%	-10%	+10%	-10%
300 MW Subcritical	0.2427	0.2280	0.2607	0.2489	0.2365
600 MW Supercritical	0.2195	0.2063	0.2358	0.2253	0.2138
600 MW Subcritical	0.2173	0.2045	0.2330	0.2233	0.2113
CCGT with fuel oil	0.6366	0.6248	0.6510	0.6838	0.5893
CCGT with LNG	0.4324	0.4206	0.4469	0.4605	0.4043

According to the Methodology AM0029, the baseline alternatives should include all possible realistic and credible alternatives that provide outputs or services comparable with the proposed project, these alternatives need not consist solely of power plants of the same capacity, load factor and operational characteristics (i.e. several smaller plant, or the share of a larger plant may be a reasonable alternative to the project activity).however they should deliver similar services(e.g. peak vs. base load power). Therefore, within the grid boundary any alternative which can supply comparable output or services, i.e., peak load and power amount, can be identified as the baseline scenario. It is understood that the selection of the baseline scenario will not be influenced by the alternatives with varying operational hours, efficiencies and load factors.

In the PDD, after having excluded the alternatives not providing peak load, or not in compliance with all applicable legal and regulatory requirements, five alternatives (the proposed project without CDM; 600

MW Super Critical Plant; 600 MW Sub Critical Plant; 300 MW Sub Critical Plant and 180MW Oil fired CCGT) were identified to further conduct investment analysis, since these five alternatives can provide the comparable service for the grid. The levelised cost has been used as financial indicator to identify the economically most attractive baseline scenario alternative. And the 600 MW Sub Critical Plant with lowest levelised cost has been finally identified as the baseline scenario.

Moreover all the input value for levelised cost of these five alternatives can be substantiated as follows: the main parameters used to calculate the levelised cost of the project are mainly sourced from Design reference cost index for thermal power transmit electricity and transformer electricity projects (2004), 2005 April, China Electrical Power Press. The power generation coal consumption of 600MW Coal-fired sub-critical sourced from Operation date of 600MW units national competition in 2006[10] and the power generation coal consumption of 180MW Oil fired CCGT sourced from Notice of electricity price of oil-fire power plants floating with price of fuel oil[11]. The power generation fuel cost of 300MW coal-fired sub-critical、600MW coal-fired sub-critical and 600MW coal-fired supercritical sourced from National Economic Operation Analysis of Coal Enterprises of from Jan to May, 2004.[12] The power generation fuel cost of 180MW Oil fired CCGT sourced from Notice of electricity price of oil-fire power plants floating with price of fuel oil[13]. The power generation fuel cost of proposed project without CDM calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract[14]. Based on the listed parameters, the same results can be obtained as required by the methodology AM0029.

In levelised cost analysis, the Project Participant has considered the varying assumptions on the operational hours and load factor already. A fluctuating of -10%~+10% on load factor has been demonstrated in the spreadsheet of Levelised Cost. Because the Load factor=operation hour /8760, so the sensitive analysis on operational hours would thus result the same.

Regarding the efficiency, it's calculated as following formula, which is sourced from the Energy Statistic website of China Government[15]:
Efficiency=3600/fuel consumption/29308

According to the above formula, the fuel consumption is the only variable in determine the efficiency. Thus, the sensitive analysis of fuel consumption can represent the variation of efficiency. Therefore, please refer to the following table on Fuel Consumption with fluctuating range of ±10%.

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[10] Operation date of 600MW units national competition in 2006.

[11] "Notice of electricity price of oil-fire power plants floating with price of fuel oil" issued by Guangdong Province Price Supervision Bureau on July. 2003.

[12] http://www.chinacoal.gov.cn/jingjiyunxing/node_4623.htm

[13] "Notice of electricity price of oil-fire power plants floating with price of fuel oil" issued by Guangdong Province Price Supervision Bureau on July. 2003.

[14] Financial Assessment (FA) by Guangdong Electric Power Design Institute in May 2004

[15] http://xmecc.smexm.gov.cn/2007-12/20071227102507.htm

Fuel	Levelised Cost	Fuel Consumption	
	RMB/kWh	10%	-10%
300 MW Subcritical	0.2427	0.2489	0.2365
600 MW Supercritical	0.2195	0.2253	0.2138
600 MW Subcritical	0.2173	0.2233	0.2113
CCGT with fuel oil	0.6366	0.6838	0.5893
CCGT with LNG	0.4324	0.4605	0.4043

According to the sensitive analysis of fuel consumption above, 600 MW Subcritical coal-fired power plant is still the most attractive baseline scenario alternative.

The fluctuating range of ±10% on load factor, fuel costs and fuel consumption (as well as efficiency) is a common practice in levelised cost sensitive analysis. And it would be difficult to predict a further expended fluctuating range beyond ±10%. Nevertheless , to be conservative, even if the we conduct the levelised cost analysis on the load factor (operational hours), the fuel cost and fuel consumption with fluctuating range as much as ±50%, 600 MW sub critical power plant would still remain to be the lowest. The specific sensitive analysis demonstrates as below:

Fuel	**Levelised Cost**	**Load Factor**									
	RMB/kWh	50%	40%	30%	20%	10%	-10%	-20%	-30%	-40%	-50%
300 MW Subcritical	0.2427	0.1887	0.1964	0.2053	0.2157	0.228	0.2607	0.2832	0.3122	0.3508	0.4048
600 MW Supercritical	0.2195	0.1709	0.1778	0.1859	0.1952	0.2063	0.2358	0.256	0.2821	0.3168	0.3655
600 MW Subcritical	0.2173	0.1702	0.1769	0.1847	0.1938	0.2045	0.233	0.2526	0.2778	0.3114	0.3585
CCGT with fuel oil	0.6366	0.5932	0.5994	0.6066	0.6149	0.6248	0.651	0.6691	0.6923	0.7233	0.7667
CCGT with LNG	0.4324	0.389	0.3952	0.4024	0.4107	0.4206	0.4469	0.4649	0.4882	0.5191	0.5625

Fuel	**Levelised Cost**	**Fuel Cost**									
	RMB/kWh	50%	40%	30%	20%	10%	-10%	-20%	-30%	-40%	-50%
300 MW Subcritical	0.2427	0.2735	0.2674	0.2612	0.255	0.2489	0.2365	0.2304	0.2242	0.2181	0.2119
600 MW Supercritical	0.2195	0.2483	0.2426	0.2368	0.2311	0.2253	0.2138	0.208	0.2023	0.1965	0.1907
600 MW Subcritical	0.2173	0.2473	0.2413	0.2353	0.2293	0.2233	0.2113	0.2053	0.1993	0.1932	0.1872
CCGT with fuel oil	0.6366	0.8728	0.8256	0.7783	0.7311	0.6838	0.5893	0.5421	0.4948	0.4476	0.4003
CCGT with LNG	0.4324	0.5731	0.5449	0.5168	0.4887	0.4605	0.4043	0.3761	0.348	0.3199	0.2917

Fuel	Levelised Cost	Fuel Consumption									
	RMB/kWh	50%	40%	30%	20%	10%	-10%	-20%	-30%	-40%	-50%
300 MW Subcritical	0.2427	0.2735	0.2674	0.2612	0.255	0.2489	0.2365	0.2304	0.2242	0.2181	0.2119
600 MW Supercritical	0.2195	0.2483	0.2426	0.2368	0.2311	0.2253	0.2138	0.208	0.2023	0.1965	0.1907
600 MW Subcritical	0.2173	0.2473	0.2413	0.2353	0.2293	0.2233	0.2113	0.2053	0.1993	0.1932	0.1872
CCGT with fuel oil	0.6366	0.8728	0.8256	0.7783	0.7311	0.6838	0.5893	0.5421	0.4948	0.4476	0.4003
CCGT with LNG	0.4324	0.5731	0.5449	0.5168	0.4887	0.4605	0.4043	0.3761	0.348	0.3199	0.2917

According to the version 01.1 of AM0029, the baseline alternatives with the best financial indicator, i.e. the lowest levelised cost, can be pre-selected as the most plausible scenario. Then the 600 MW subcritical coal-fired power plant has the lowest levelised cost, then the most plausible scenario. The sensitive analysis in the previous table confirms and supports that the 600 MW subcritical coal-fired power plant is always the least levelised cost alternatives within reasonable variations in the critical assumptions.

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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According to the version 01 of AM0029, the project proponent is required to demonstrate that the GHG reductions from the project activity are additional to those that would have occurred in absence of the project activity. The assessment of additionality demonstrates that the proposed CDM project activity is unlikely to be financially attractive and is not common practice in the relevant sector by applying two specified steps of the latest version of "Tool for the demonstration and assessment of additionality":

The following timeline provides background information that is helpful in appreciating the barriers the Project has encountered and continues to face. In accordance with the CDM registration process, the Project Company can provide the CDM validator with documentation and access to the responsible persons to substantiate the timeline and assertions made in the PDD.

August 2002	Meeting Minutes	Carbon Credit Conference [16] held in Zhuhai City, participants included World Bank and Yudean Group etc. Project investors first time know CDM project.
February 2003	Minute of Yudean and Zhuhai Electric Power Company	Shenzhen Qianwan LNG Project (SQLP) started CDM investigation, paid attention to the influence on project economic potential if CDM applicable[17].

[16] Minute of Carbon Credit Conference held in Zhuhai.

[17] Minute of Yudean Group and Zhuhai Electric Power Company held in February 2003.

March 2003	Equipment contract	Yudean Group signed the main equipment contract[18] as the investor of SQLP. The contract clearly stated that the purchase would be executed on the condition of obtaining the approval from NDRC, upon SQLP notice of contract validity[19] equipment supplier provides the Performance Guarantee
July 2003	FSR	Guangdong Electric Power Design Institute (GEDI) finished the FSR of SQLP.
November 2003	CDM Case Study on LNG	"Case Study of Clean Development Mechanism Project of Zhuhai Power Plant Project Phase II" was finished.
February 2004	SQLP authorized GEDI to reassess the project	Owing to the increasing natural gas price etc, SQLP authorized GEDI to reassess the project Financial Assessment (FA) based on the FSR compiled in July 2003.
April 30th, 2004	LNG Sales and Purchase Contract	Yudean Group, as the project investor, signed the LNG Sales and Purchase Contract of SQLP. The contract contained the effective condition of obtaining the official approval from NDRC and the project participant confirms in written to the contract counterparty on validity of the contract.
May 2004	FA published, in which CDM was seriously considered.	GEDI finished the FA for SQLP. In the FA, SQLP considered CDM revenues and the increasing natural gas price etc. After calculated by GEDI, the IRR of total investment is 5.55 percent without CDM revenues, while 9.26 percent with CDM revenues.
May 28th, 2004	Directorate Decision	The shareholders of SQLP started to take part in CDM project.
May 31 th,2004	FSR, Financial Assessment(FA) and applying documents submitted to NDRC	After project owner submitted FSR and FA etc, SQLP received confirm letter[20] issued by Guangdong provincial Development and Reform Commission.
July 13th, 2004	NDRC Approval letter	SQLP was approved by NDRC.
December 14th, 2004	Construction Permit	SQLP obtained the Construction Permit
May 2005	Minute	SQLP knew that India natural gas

[18] Contract for Gas Turbine Combined Cycle Power Generation Project Qianwan LNG Power Plant (Contract No. 03JP01GTA10IXC0007)

[19] Notice issued by SQLP dated Aug 11, 2004.

[20] Confirm letter issued by Guangdong provincial Development and Reform Commission.

		project applying CDM has been approved by India government and started to validation[21].
October 2005	Notice	SQLP build up CDM work group[22]
May 19th 2006	Methodology approval	Methodology AM0029 was approved by EB.
June 2006	Directorate Decision	Owing to the methodology AM0029 approved by EB, SQLP started to apply CDM project[23].
July 19, 2006	CDM consulting agreement	CDM consulting agreement with Tsinghua University[24] was signed to speed up the development process.
September 16,2006	PDD public on UNFCCC website	The Version 01 PDD of the proposed project was public on UNFCCC website[25].
October 2006	PPA	SQLP signed Power Purchasing Agreement (PPA) with Guangdong Power Grid Company.
June 26 2008	EPRA	EPRA of proposed project was signed by SQLP and Mitsui[26].

Above is SQLP performance time table. According to the following reasons and EB's latest guidance on the definition of start date, the project start date should be changed to August 18th, 2004, which was the earliest date of main equipment contract, LNG Sales and Purchase Contract and PPA came into force. Therefore, the project start is redefined as August 18th, 2004.
The main equipment contract signed in March 2003 as well as LNG Sales and Purchase Contract signed in April 2004, which were attached with effective conditions. In other words, the contracts are the intent only, when SQLP meet with effective conditions prescribed in above contracts, the contracts start to enter into force.

A. Article 23 in main equipment contract states that the effective condition as: (1) the project obtains the official approval from NDRC, (2) upon SQLP notice of contract validity equipment supplier provides the Performance Guarantee. The main equipment contract shall not be valid or come into force until all two conditions were met with above requirements. Although, SQLP got the approval letter issued by NDRC on July 13th, 2004. Performance Guarantee from supplier was issued on August 18th, 2004[27] based on receipt of SQLP notice of contract validity. According to the terms of main equipment contract, the advance payment should be paid by project owner to

[21] SQLP's Minute date May 2005.

[22] Notice of SQLP building up CDM work group.

[23] SQLP'Directorate Decision date June 3, 2006.

[24] CDM consulting agreement with Tsinghua University date July 19,2006

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

[26] EPRA signed by SQLP and Mitsui dated June 26, 2008.

[27] Performance Guarantee from supplier was issued on August 18th, 2004

supplier after the effectiveness of contract[28]. Therefore, according to the main equipment contract, the actual legal effective date of the contract shall be on August 18th, 2004.

B．Article 2.2.1 in LNG Sales and Purchase Contract states that the effective condition[29] is: (1) the project obtains the official approval from NDRC. And （2）the project participant confirms in written to the contract counterparty on validity of the contract. The SQLP got the approval letter of NDRC on July 13th, 2004. The SQLP confirmation letter was issued on September 29th, 2004[30]. The counterparty (Dapeng LNG company) confirmation letter was issued on June 27th, 2005[31] based on receipt of SQLP confirmation letter. Therefore, according to the LNG Sales and Purchase Contract, the legal effective date of the contact is much later than August 18th, 2004 (the above mentioned main equipment contract effective date).

C．The PPA of SQLP was signed on October 2006 between SQLP and Guangdong Power Grid Company.

1）Prescribing the effective conditions in the contract is the right endued by Chinese law.
Article 45 in the Contract Law of P. R. China (approved in the second meeting of the 9th National People's Congress which held in March 15, 1999) stipulates conditional effectiveness as: The parties may prescribe the validation of a contract be subject to certain conditions. A contract with collateral conditions on its entry into effect shall become effective upon the fulfilment of the conditions. A contract with collateral conditions on its dissolution shall lose its validity upon the fulfilment of the conditions. And from the law firm's legal opinions[32], the prescription of conditional effectiveness in the main equipment contract and LNG Sales and Purchase Contract are conformed to the Contract Law of P. R. China. Mentioned contracts would be actually effective upon the satisfaction of prescribed conditions

2）It is common practice in China to set up the effective conditions in the contracts.
We can see from attached case links, not only the main equipment contracts, LNG Sales and Purchase Contract in power industry, but also in industries of finance, insurance[33], real estate[34], manufacture[35] etc., contract effectiveness upon satisfaction of agreed conditions is a common practice in commercial contracts. The explanation from Supreme Court of P. R. China clarified that the contract effectiveness can be subject to conditions. Contracts with conditions would become effective until all the prescribed conditions are satisfied.

3) According to Chinese statutes and regulations, the effectiveness of equipment, fuel purchasing contracts should be subject to project FSR. Moreover, no construction or actual investment is permitted before the official approval[36].

4) Constrained by the regulations of national power industry administration department, the signed equipment, fuel purchasing contracts are only the intent without legal effectiveness before the

[28] Advance payment invoice issued by supplier on August 23rd,2004

[29] Page 10, LNG Sales and Purchase Contract of 30 April 2004

[30] Confirmation letter was issued by SQPL on September 29th, 2004

[31] Confirmation letter was issued by counterparty of contract on June 27th, 2005

[32] Legal Opinions from law firm
[33] http://www.people.com.cn/GB/paper66/12243/1101925.html
[34] http://www.riel.whu.edu.cn/show.asp?ID=2742
[35] http://www.lawbase.com.cn/lawcase/lawbase_@2599.htm
[36] http://www.law110.com/law/jiwei/16044.htm

governmental approval[37].

5) According to the Directorate Decision dated May 28, 2004, the shareholders have actively seeking potential revenue from participating in CDM. On May 31st, 2004 the project participant submitted to Guangdong provincial Development and Reform Commission the project document together with its FSR and FA applying for government approval.

The project owner had provided DOE with equipment contract, Performance Guarantee of supplier, LNG Sales and Purchase Contract, PPA and other relative regulations as well as legal documents.

As early as February 2004[38] the project entity had commissioned a revision of the Financial Assessment (FA) to take the potential CDM revenue into account based on a case study for a similar natural gas-fired power generation project[39] and the latest data on the gas price and quantity. According to the Directorate Decision dated May 28, 2004[40], to ensure financial viability of the project, the shareholders has also actively seeking potential revenue from participating in CDM even when the Kyoto Protocol was not yet in force and no relevant methodology was available.

It has been demonstrated in the FA that without the CDM revenue, the Internal Rate of Return (IRR) of the project would be 5.55 percent, which was 2.45 percent lower than the industry benchmark of 8 percent[41]. With the CDM revenue, the IRR would be 9.26 percent, higher than the industry benchmark, therefore CDM revenue could mitigate the project risk and improve financial performance.

The construction permit issuance of proposed project was issued on 14 December 2004.

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

Step 1: Benchmark investment analysis.

For determining the financial attractiveness of the proposed project activity, project proponent has taken into consideration all the financial parameters relevant to the project activity and has also conducted sensitivity analysis to reflect the impacts of probable realistic variations of key parameters.

Sub-step 1a. Apply Benchmark Analysis

[37] http://www.cec.org.cn/news/showc.asp?ID=11937

[38] Agreement on Financial Assessment on Qianwan LNG Power Plant with Guangdong Electric Power Design Institute dated February 17, 2004.

[39] "*Case Study of Clean Development Mechanism Project of Zhuhai Power Plant Project Phase II*", Energy Research Institute of the NDRC & Global Climate Change Institute, Tsinghua University, November 2003.

[40] "Directorate decision for Shenzhen Qianwan LNG Project starts to take part in CDM project".

[41] State Power Corporation of China. *"Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects".* Beijing: China Electric Power Press, 2003.

According to the *"Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects"*[42], the Financial benchmark rate of return (after tax) of Chinese Power Industries is 8% of the total investment IRR. This benchmark is widely used for power project investments in China and all the power projects in China are considered viable by the government only if the guaranteed returns of minimum 8% on the capital are ensured. In line with that, the feasibility study of the proposed project and the benchmark investment analysis in this PDD adopt 8% as benchmark FIRR.

Sub-step 1b. Calculation and comparison of financial indicators.

Table 7. Summarizes the data used in the calculation of the project IRR.

Table 7 Main parameters for calculation of financial indicators

Basic Parameters	Value	Unit	Data Source
Installed capacity	1083.09	MW	Feasibility Study
Electricity generation	3700	GWh	Calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract
Net electricity generation	3611	GWh	Calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract
Fixed assets	369,055	10^4 RMB	Feasibility Study
Feed-in tariff (Excluding VAT)	410.61	RMB/MWh	Feasibility Study
Auxiliary electricity consumption rate	2.40%		Feasibility Study
Power generation gas consumption	0.1797	m3/kWh	Feasibility Study
Water expenditure	0.53	RMB/MWh	Feasibility Study
Material expenditure	3.21	RMB/MWh	Feasibility Study
Overhaul of equipment	3.35%		Feasibility Study
Persons	179	Persons	Feasibility Study
Annual average wage	60000	RMB/Year	Feasibility Study
Welfare	55%		Feasibility Study
Operating management expenditure	11.62	RMB/MWh	Feasibility Study
Gas price (Including VAT)	1.55	RMB / m3	Calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract
Insurance	0.25%		Feasibility Study
Depreciation period	15	Years	Feasibility Study
Fixed assets residue	5%		Feasibility Study
Income tax	15%		Feasibility Study
Construction tax	5%		Feasibility Study
Education surcharge	3%		Feasibility Study
Public accumulation fund	10%		Feasibility Study

[42] State Power Corporation of China. Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press, 2003.

Public commonweal fund	5%		Feasibility Study
Operation period	20	Years	Feasibility Study
CERs price	10	USD/tCO2e	

All IRR calculations reported in this section are based on data in the feasibility study[43] unless otherwise noted. All financial data used to arrive at the IRR of the project activity with and without CDM revenues have been provided to the DOE in the process of validation.

The Project is located in Guangdong Province. The Feasibility Study Report (FSR) of the project was completed by Guangdong Electric Power Design Institute (GEPI)[44] in July 2003, which is a qualified third party independent organization. The FSR was approved by the National Development and Reform Commission of 13 July 2004.

According to guidance of EB 38 paragraph 54, data from approved FSR is credible and can be applied to investment analysis. In fact, most data applied to investment analysis are sourced from the FSR compiled in July 2003 except for the assumptions of Gas Price, Supply Gas Volume and Annual Electricity Generation, which were calculated by GEDI based on LNG sales and purchase contract and the calculation model in FSR complied in July 2003.

The financial indicators (FIRR) with and without income from CERs sales are summarized in Table 8. Without income from CERs sales, the FIRR of the proposed project (5.55 percent) is lower than the benchmark FIRR (8 percent) then the proposed project is financially unacceptable because of its low profitability. With income from CERs sales, the financial acceptance will be dramatically improved, the FIRR of the proposed project is higher than the benchmark than financially acceptable.

Table 8 Comparison of financial indicators with and without income from CERs

Items	Unit	Without income from CERs	Benchmark	With income from CERS
FIRR on total investment	%	5.55	8	9.26

By the project's actual input values to the investment analysis described as follows, it could reflect the actual situation of the project, which lacks of financial attractiveness.

1. The input data of Gas Price

Owing to the continuous rising price of crude oil and raw materials in early 2004[45], the value ,1.55 Yuan/m^3 (including tax) used in the PDD, was calculated by GEDI based on LNG sales and purchase contract and the calculation model in FSR complied in July 2003. The gas price value was adopted in Financial Assessment (FA) complied by GEDI in May 2004, which was much higher than 1.442 Yuan/m^3 in FSR (including tax). At present, the gas price of proposed project is increasing to 1.5961 Yuan/m^3 (including tax)[46], higher than 1.55 Yuan/m^3 (including tax). Therefore, 1.55 Yuan/m^3 of gas price adopted in the analysis of investment is conservative and credible.

[43]Refer to Feasibility Study, Guangdong Electric Power Design Institute, July 2003.

[44] http://www.gedi.com.cn/index.asp

[45] http://okokok.com.cn/Htmls/GenCharts/080215/7037.html

[46] Refer to the Notice of the Price of Natural Gas from Guangdong Dapeng Company issued by Bureau of Commodity Price of Guangdong Province [Yuejia 2007 Doc No.190].

2. The input data of Supply gas volume
Supply gas volume was calculated by GEDI based on LNG sales and purchase contract and the calculation model in FSR complied in July 2003. The value was adopted in Financial Assessment (FA) complied by GEDI in May 2004.

3. The input data of Annual Electricity Generation
Annual electricity generation was calculated with the formula of annual supply gas volume divided by unit gas consumption. Supply gas volume was sourced from LNG Sales and Purchase Contract and 0.1797m^3/KWh of unit power generation gas consumption was taken from the FSR. The calculated value was adopted in Financial Assessment (FA) complied by GEDI in May 2004. Moreover, according to the PPA, the annual electricity generation of the project is strictly restricted both by the government annual power generation plan of Guangdong Province and LNG Sales and Purchase Contract.

4. The input data of Load Factor
PLF was calculated according to the formula as follows:
Load factor = Annual Electricity Generation/install capacity/8760
Thereof, the annual Electricity generation of the project was 3,700,000 MWh that was calculated by GEDI based on LNG sales and purchase contract and the calculation model in FSR complied in July 2003 and the total installed capacity was 1,083.09MW that was sourced from FSR. The figure 8,760 was taken from ACM0002 methodology. According to the calculation of the formula, PLF is approximately 39%. On the other hand, since the Project was designed for peak-load, PLF should be low. The following table is the statistics of PLF of the projects succeeding in registration for CDM. Compared with the projects listed in the table, PLF of the Project is similar with them as well.

Project	Capacity	Generation	PLF	Website
	MW	GWh		
Sulige Natural Gas Based Generation Project	350	1225	0.399543379	http://cdm.unfccc.int/UserManagement/FileStorage/WPAOXVLDNXVGNXHDBGV8TXJVT18SH8
Henan Zhengzhou Grid Connected Natural Gas Combined Cycle Power Plant	780	2598	0.380224798	http://cdm.unfccc.int/UserManagement/FileStorage/9K6OR9FROC8WJE6IXZNKM5GOHY65HI
Zhejiang Provincial Energy Group Zhenhai Natural Gas Power Generation Co., Ltd.'s NG Power Generation Project	740	2525.25	0.389554795	http://cdm.unfccc.int/UserManagement/FileStorage/MEWBXZ0AK4T9H7TITJNHP3CMZ3IQNG
Yuyao Electricity Generation Project using Natural Gas	780	2730	0.399543379	http://cdm.unfccc.int/UserManagement/FileStorage/5HKK4F2FS7F3X0BIURTATC65FCF80R

Beijing No.3 Thermal Power Plant Gas-Steam Combined Cycle Project Using Natural Gas	400	1400	0.399543379	http://cdm.unfccc.int/UserManagement/FileStorage/SIOWKZOD4ZU3KRFR98KLYSNF144LAL

5. The input data of Total investment

Investment in fixed assets was taken from the FSR and the figure was 3690.55 million RMB. It's well-known that the amount of purchasing equipments account for the majority of the investment in fixed assets. Owing to the price rising of raw materials[47], total investment is increasing to 3985.79 million RMB[48] in the completion of settlement for the propose project, which is about 8% higher than the value used in FSR. Therefore 3690.55 million RMB of total investment adopted in PDD is conservative and credible. (From PP-respond for request for review)

The value of 3690.55 million RMB of investment in fixed assets in the PDD was sourced from the FSR. The actual investment of the Project is 3985.79 million RMB, which is higher than that estimated in the FSR (3690.55 million RMB). It is further evidenced by the Completion of Settlement and Audit Report of the project issued by Guangzhou Zhiheng Construction cost of the Advisory Co., Ltd. on 22 October 2007. Therefore, the input data of total investment used in the PDD is conservative and credible. (From PP-respond for under review).

6. The input data of O&M (From PP-respond for request for review)

O&M expenditure was taken from the FSR and was composed of fuel cost, materials cost, maintenance cost and personal cost etc. Owing to the continuous rising price of crude oil and raw materials in early 2004[49], fuel transportation costs also rising accordingly, the fuel cost is main part in O&M expenditure. It can conclude that the fuel cost cannot decrease. On the other hand, QLGP is one of the first LNG CCGT power plants in CSPG; currently CCGT units' maintenance is supported by foreign manufacturers. These years the raw material price is increasing[50], such as spare parts etc, which will increase the units' O&M costs in the future. Moreover, a Richter 8.0 earthquake occurred in Sichuan Province on May 12, 2008. Dongfang Steam Turbine Works, as one of the main equipment suppliers for this project, was heavily damaged by this tremendous natural disaster. And it will cause parts supply more difficultly and parts price rise. Furthermore, the O&M cost determination is related to the Consumer Price Index (CPI). It can be found that the CPI was keeping increasing in China from year 2004 to 2007[51] and the accumulated CPI increase is as much as 12.51%. Only in year 2008 itself the CPI in China increased 7% from January to September[52]. So it can be indicated that the O&M cost also has been keeping increasing from 2004 to

[47] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20050228_402231854.htm
http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm

[48] Evidence from completion of settlement and audit report issued by Guangzhou Zhiheng Construction cost of the Advisory Co., Ltd.for Qianwan Project.

[49] http://okokok.com.cn/Htmls/GenCharts/080215/7037.html

[50] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20050228_402231854.htm

http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm

[51] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20080228_402464933.htm

[52] http://www.stats.gov.cn/tjsj/jdsj/t20081030_402513659.htm

2007 and the average personal salary also has been going up from year 2004 to year 2006[53]. Thus, the O&M cost will not decrease so much to make the project IRR above benchmark. So the analysis is reasonable and conservative.

i) LNG cost (From PP-respond for under review)
The LNG cost accounts for O&M cost of the project principally. The value of 1.55 Yuan/m^3 (including tax) was used in the PDD. This value was calculated by Guangdong Electric Power Design Institute based on LNG sales and purchase contract (30 April 2004). This is evidenced in the revision of the Financial Assessment (FA) by Guangdong Electric Power Design Institute in May 2004. Due to the continuous rising price of crude oil and raw materials in early 2004[54], from 1 April 2007, the gas price of the project increased to 1.5961 Yuan/m^3 (including tax), which is evidenced by the Notice of the Price of Natural Gas from Guangdong Dapeng Company issued by Bureau of Commodity Price of Guangdong Province [Yuejia 2007 Doc No.190] on 3 September 2007.It can conclude that the actual LNG cost of the Project is higher than what estimated in the FA. Therefore, the value of 1.55 Yuan/m^3 (including tax) used in the PDD is conservative and credible.

ii) O&M cost other than LNG cost (From PP-respond for under review)
The project's operating cost and maintenance cost other than LNG cost in 2007 and 2008 is 224.34 million RMB[55] and 255.12 million RMB[56] respectively, which is higher than the estimated value in FSR[57].Therefore estimated O&M cost of the Project in the FSR (which is adopted in the PDD) is conservative and credible.

7. The input data of Tariff
a) In China, the policy of electricity tariff was strictly controlled by the government. The electricity tariff will not be significantly changed without regulation by the government. In order to ensure the stability of the price for the whole country, the central government has very strict control for the basic price such as the tariff. It is hard for electricity generation enterprises to make investment decision by expecting that the electricity tariff will be increased. The adjustment of electricity tariff needs to be negotiated by several government departments or even needs to be approved by the CPC Central Committee, which could not be forecasted or controlled by any specific electricity generation enterprise. So it is not possible for power generation project to forecast the change of electricity tariff and apply such change for financial analysis of projects when making project implementation decision. Only fixed electricity tariff derived from relevant electricity guiding price can be adopted, and this is the common practice in China for all projects development The proposed project's actual tariff in the PPA is 0.495Yuan/Kwh (including VAT), which is still applied till present.[58]

b) According to the *Notification of Electric Power Tariff Reform by the Office of national council* issued on 09/07/2003, the related policies for the tariff in China are as follows:

Term 33: the tariff was leaded, taken charge of and managed and controlled by the main government departments for the price in the state. As for the very important tariff decision, the opinions from the electric supervision departments and electric power industry committee etc should be fully considered.

53 http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm

54 http://okokok.com.cn/Htmls/GenCharts/080215/7037.html

55 The audit report of the project was issued by Zhonghengxin CPAs Guangdong in January 2009.

56 The audit report of the project was issued by Zhonghengxin CPAs Guangdong in January 2009.

57 The value of 2007 and 2008 in FSR is 163.66 million RMB and 208.78 million RMB respectively.

58 Electricity invoice of proposed project

The supervision departments can give the suggestions on tariff to the government according to the market situation.

Term 34: the management way for the tariff and the capacity tariff and the tariff for the transmission should be decided and issued by the Price Authority under the State Council.

Term 35: The price authority and the electric supervision departments should supervise and check the price implementation situation.

c) According to the announcement of Guangdong Power Grid Company， during the course from Year 1999 to Year 2003, the average electricity tariff (excluding VAT) of Guangdong Province power plants were 0.3497 RMB/KWh, 0.3439 RMB/KWh, 0.3421RMB/Kwh, 0.3404 RMB/KWh and 0.3389 RMB/kWh respectively[59]. It demonstrates clearly that the bus-bar tariff was debating every year.
As the above analysis, the tariff abatement was not only a fact but also a trend. Therefore, it was impossible for Project Owner to expect or forecast a higher tariff at the time when they made their investment decision.

Furthermore, according to the project's approval issued by NDRC, the project must take part in the on-grid price bidding. In the meanwhile, when the project took part in the on-grid price bidding, the tariff must be agreed with the power grid company and project owner by price bidding. As a matter of fact, the PPA of the project signed with Guangdong Power Grid Company, the actual tariff is 0.495 RMB/kWh (including VAT), which have been being fixed during the past 3 years operation. We can conclude that the tariff is unlikely to increase by 6.5%. Though it is 3.12% higher than the expected tariff in FSR,[60] the IRR is thus increased to 6.72%, still below 8%, which does not impact the project additionality.

Furthermore, in the PDD 0.1797m^3/KWh[61] is applied as gas consumption for power generation. However, as per the monitoring and calculation by Electric Power Research Institute of Guangdong Power Grid Company, the actual power generation gas consumption of proposed project is 0.1934 m^3/KWh in year 2007 and 0.1921m^3/KWh[62] in 2008(from Jan 2008 to Oct 2008) which is 7.6% and 6.9% higher than the value in PDD respectively. While according to the public statistic information, the actual power generation gas consumption of 9F Grade CCGT is averagely 0.197m^3/KWh[63], which demonstrates the propose project's actual gas consumption is within normal range. Thus, base on actual situation, even if we apply the more conservative values of 0.1921 m^3/KWh as an average gas consumption, the propose project's IRR would drop to as low as 2.75%.
As per the analysis above, we can conclude that the tariff is unlikely to increase by 6.5%.Thus even though the tariff is 0.495 RMB/kWh (including VAT), which is 3.12% higher than the expected tariff in FSR, it will not impact the project additionality.
As per the analysis above, we can conclude that the tariff is unlikely to increase by 6.5%.Thus even though the tariff is 0.495 RMB/kWh (including VAT), which is 3.12% higher than the expected tariff in FSR, it will not impact the project additionality.

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[59] "Certificate of the Average Electricity Tariff from Year 1999 to Year 2003 in Guangdong Province" issued by Guangdong Power Grid Company in November.2008.

[60] "Power Purchase Agreement" signed in Oct.2006.

[61] http://tech.bjx.com.cn/html/20080122/106169.shtml

[62] Evidence for power generation gas consumption of proposed project issued by Electric Power Research Institute of Guangdong Power Grid Corporation

[63] http://tech.bjx.com.cn/html/20080122/106169.shtml

8. The input data of the gas consumption for power generation of the Project (From PP-respond for under review)
In the PDD, the value of 0.1797m^3/KWh (under ideal condition) is applied as gas consumption for power Generation. However, as per the monitoring and calculation by Electric Power Research Institute of Guangdong Power Grid Company, the actual power generation gas consumption of proposed project was 0.1934m^3/KWh in 2007(the average value of Year 2007), 0.1921m^3/KWh[64] in 2008 (the average value from Jan 2008 to Oct 2008) which was 7.6% and 6.9% higher than the value in PDD respectively. In addition, according to the public statistic information, the actual power generation gas consumption of 9F Grade CCGT is averagely 0.197m^3/KWh[65], which demonstrates the project's actual gas consumption is within normal range. Therefore, the average value of 0.1797m^3/KWh used in the PDD is the most conservative and credible.

In a word, even if we apply the actual value of the project for IRR calculation (Please refer to the second paragraph in Page 28), without revenues from the sale of CERs, the project lacks of financial attractiveness.

Sub-step 1c. Sensitivity analysis.
Five factors are considered in the following sensitivity analysis:
1) Total investment.
2) Gas price.
3) Annual electricity generation.
4) Feed-in tariff
5) Annual O&M Costs

Assuming the above five factors vary in the range of -10% to +10%, the FIRR of the proposed project (without income from CERs sales) varies to different extent, as shown in Figure 1.

Figure 1 Sensitivity analysis of the Project

[64] Evidence for power generation gas consumption of proposed project is issued by Electric Power Research Institute of Guangdong Power Grid Corporation.

[65] http://tech.bjx.com.cn/html/20080122/106169.shtml

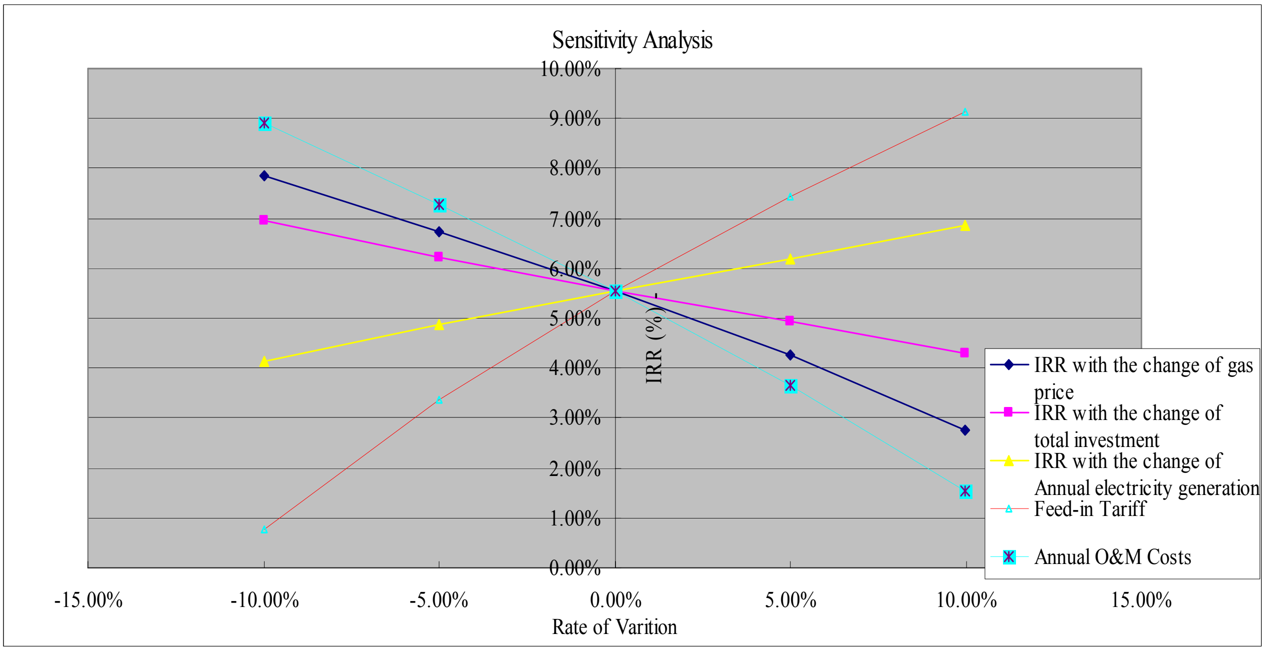

Table 9 Sensitivity analysis

Change Factor	-10%	-5%	0	5%	10%
IRR with the change of gas price	7.86%	6.74%	5.55%	4.26%	2.76%
IRR with the change of total investment	6.97%	6.22%	5.55%	4.92%	4.31%
IRR with the change of Annual electricity generation	4.14%	4.87%	5.55%	6.20%	6.86%
Feed-in Tariff	0.77%	3.35%	5.55%	7.45%	9.13%
Annual O&M Costs	8.37%	7.01%	5.55%	3.92%	2.04%

The change of feed-in tariff is one of the most important factors affecting the financial attractiveness of the proposed project. If the feed-in tariff increases by about 6.5%, the IRR begins to exceed the benchmark. As the feed-in tariff is regulated by the government[66], therefore feed-in tariff changes need to be approved by government. Furthermore, the policy on the feed-in tariff can also be lowered[67], therefore the IRR is not likely to exceed the benchmark 8%.

According to the PPA signed in October 2006(hereinafter called PPA) that has been verified, the feed-in tariff of the project is 0.495RMB/KWh [68](including VAT) or 0.423RMB/KWh (excluding VAT) until

[66] http://www.nnpn.gov.cn/zcfg/guojia/2001/2001g701.htm

[67] http://www.gzwjj.gov.cn/infomake2004/homepage/view/paper.asp?pap_no=PAP_040101_00365

now. Though it is 3.12% higher than the expected tariff in FSR[69], the feed-in tariff have no change from 2006 to 2008. It is evidenced by the electricity invoices of the project from 2006 to 2008.

In general, the change of feed-in tariff is one of the most important factors affecting the financial attractiveness of the proposed project. The project also applied the feed-in tariff as a parameter in sensitive analysis. In china, the feed-in tariff is strictly regulated by the government and feed-in tariff changes need government's approval, which is evidenced by Notification of Electric Power Tariff Reform by the Office of State Council issued on 9 July 2003.According to the Notification of Guangdong Power Grid Company[70], the average electricity tariffs (excluding VAT) of Guangdong Province power plants were declining gradually per year during the course from 1999 to 2003. It was clearly demonstrated that the feed-in tariff was unlikely to increase 6.5% at the time of investment decision. Therefore, the expected feed-in tariff that used in the FSR and financial analysis of PDD has reflected the actual situation while the project owner had their investment decision making in 2004. Moreover, the adjustment of feed-in tariff needs to be negotiated by several government departments or even needs to be approved by the CPC Central Committee, which could not be easy to be forecasted or controlled by any specific electricity generation enterprise. Therefore, it is not easy for power generation project to forecast the change of feed-in tariff and apply such change for financial analysis of projects when making project implementation decision.

In addition, the feed-in tariff and the fuel price are keeping a causal relationship. It can be proved from the following facts.

1) Firstly, there is a national feed-in tariff policy in relation to the fuel price increase issued in Dec 2004[71]. The document states that the increase of feed-in tariff will be based on the fuel price increase. It can also be seen from above policy that the increase of feed-in tariff can only compensate up to about 70% of the fuel price increase. This national feed-in tariff policy indicates that the feed-in tariff cannot fully match the increase of fuel price and should only be adjusted to compensate up to about 70% of fuel price increase if the later reach more than about 5%.Therefore, the increase of feed-in tariff is basically attributed to the increase of fuel price, but such the increase is less than the increase of fuel price. This conclusion can be further demonstrated from Table10 and Figure 2 [Indices of Purchasing Prices of Raw Materials, Fuels and Power[72] and Product Price Index (Electricity tariff) of Guangdong Province from 2004-2006].

2) Secondly, to deal with the sudden increasing of fuel price, the National Development and Reform Commission (hereinafter called NDRC) will issue notifications to adjust the feed-in tariff to address the concerns of the electricity generation enterprises. NDRC issued such a Notification of executing the price

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[68] The Power Purchase Agreement of the project was signed by the project owner and Guangdong Power Grid Company in October 2006.

[69] The expected tariff in FSR is 0.48 RMB/KWh (including VAT) or 0.4106 RMB/KWh (excluding VAT).

[70] "Certificate of the Average Electricity Tariff from Year 1999 to Year 2003 in Guangdong Province" issued by Guangdong Power Grid Company in November.2008.

[71] http://www.ndrc.gov.cn/zcfb/zcfbtz/zcfbtz2004/t20080710_223762.htm

[72] Indices of Purchasing Prices of Raw Materials, Fuels and Power indicate the average of fuel price in Guangdong Province, which has selected the most conservative value in the indices.

linkage between fuel and electricity in China Southern Power Grid on Apr 22, 2005[73]. From the Notification, it can be seen that the increase of feed-in tariff was defined as compensation of fuel price increase since June 2004. It can also be concluded from above facts that the adjustment of feed-in tariff is always time-lagged behind the increase of fuel price.

3) Thirdly, it can be demonstrated from Table 10 and Figure 2 that if the fuel prices are increased, the feed-in tariff of the project would be likely to be adjusted. This is the reason why the feed-in tariff in PPA[74] is 3.12% higher than FSR[75].

4) Finally, if the IRR of the project is reproduced by using the main parameters in Table 7 except three parameters: feed-in tariff, gas price and investment cost that are sourced from actual value[76], but other parameters are still sourced from FSR[77]. If without income from CERs sales, the FIRR of the proposed project would be 5.04%, which is lower than the benchmark FIRR (8 percent) and also lower than the former FIRR (5.55 percent, please see the Table 8). Because the feed-in tariff of the project has no change from 2006 to 2008, even if the feed-in tariff increases by 10% from 2009[0.544RMB/KWh（including VAT） or 0.465RMB/KWh (excluding VAT)], the IRR would still be as low as 7.95%[78], which is still lower than the benchmark FIRR (8 percent) and the project is still additional. All of these show that without revenues from the sale of CERs, the project lacks of financial attractiveness. Therefore, it can be concluded that applying either the parameters of FSR or the actual value of the project for IRR calculation, the IRR of the project is lower than 8% and the project can pass the demonstration of additionality.

In conclusion, the feed-in tariff has a causal relationship with the fuel price. The increase of feed-in tariff basically is attributed to the increase of fuel price. The adjustment of feed-in tariff is always time-lagged behind the increase of fuel price. The feed-in tariff of this project activity would not increase by about 6.5% based on above analysis, therefore the IRR is not likely to exceed the benchmark 8%. This project activity is always additional.

Table 10. Indices of Purchasing Prices of Raw Materials, Fuels and Power and Product Price Index (Electricity tariff) of Guangdong Province from 2004-2006

Year	2004	2005	2006
Indices of Purchasing Prices of Raw Materials, Fuels and Power	100	105.02	108.8

[73] Notification of executing the price linkage between fuel and feed-in tariff in China Southern Power Grid issued by NDRC on Apr 22, 2005.

http://dq.shejis.com/hyzx/hygc/200506/article_23175.html

[74] SQLP signed Power Purchasing Agreement (PPA) with Guangdong Power Grid Company on October 2006.

[75] Refer to Feasibility Study, Guangdong Electric Power Design Institute, July 2003.

[76] The actual feed-in tariff of the project is 0.495RMB/KWh (including VAT) or 0.423 RMB/KWh (excluding VAT); the actual gas price of the project is 1.5961 Yuan/m^3 (including VAT); the actual total investment of the project is 3985.79 million RMB.

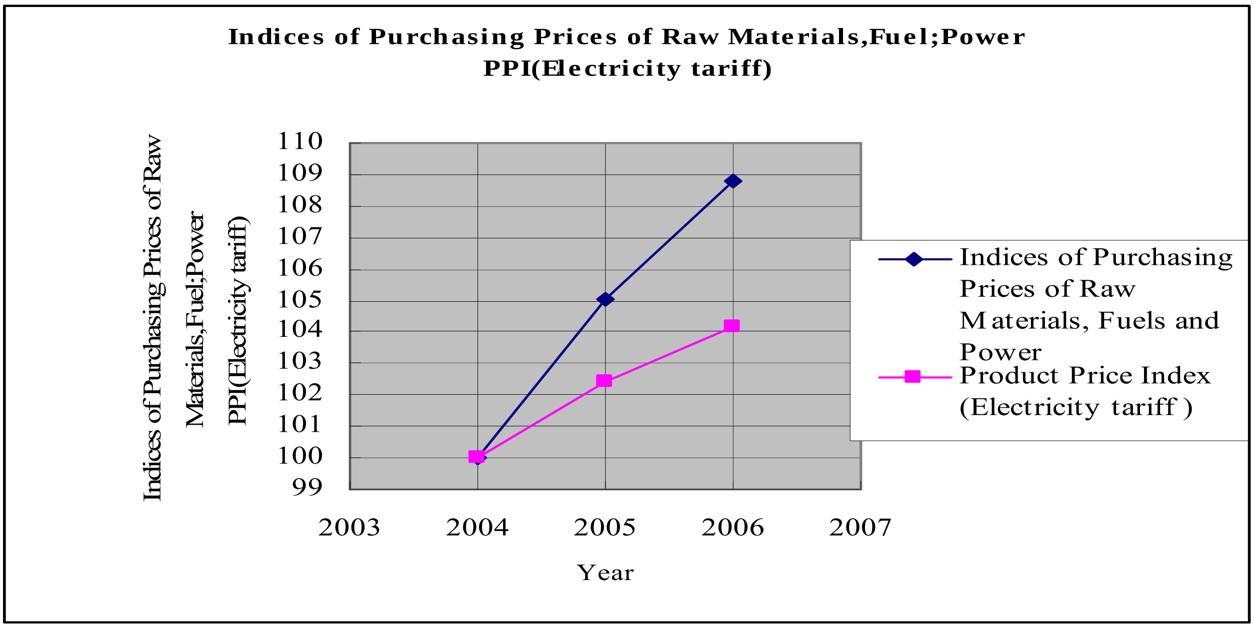
[77] Refer to Feasibility Study, Guangdong Electric Power Design Institute, July 2003.

[78] Refer to new IRR calculation sheet based on feed-in tariff, gas price and investment cost sourced from actual value.

Product Price Index (Electricity tariff)	100	102.4	104.14

Note: Year 2004 as a base year. Data source from http://www.gdstats.gov.cn/tjsj/wjzs/default.htm

Figure 2. Indices of Purchasing Prices of Raw Materials, Fuels and Power and Product Price Index (Electricity tariff) of Guangdong Province from 2004-2006



Gas price is the other one of the most important factors affecting the financial attractiveness of the proposed project. If the gas price decreases by more than 10%, the IRR begins to exceed the benchmark. However, the gas price is increasing these years[79]. The gas price is subject to adjustment based on the pricing clause in the LNG sales and purchase contract, with a correlation to the price fluctuation of crude oil. Currently, the gas price has risen to 1.5961 Yuan/m^3 (including VAT) [80], therefore the IRR will not exceed the benchmark 8%.

The impacts of the annual electricity generation and total investment are less significant. If annual electricity generation increases by about 20%, the IRR begins to exceed the benchmark. Because the annual electricity generation depends on the gas supply contract, the IRR will not exceed the benchmark 8%.

If the total investment decreases by about 17%, the IRR begins to exceed the benchmark. Because the raw material price is increasing these years[81], the actual investment of the Project is 3985.79 million RMB,

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[79] http://okokok.com.cn/Htmls/GenCharts/080215/7037.html

[80] Refer to the Notice of the Price of Natural Gas from Guangdong Dapeng Company issued by Bureau of Commodity Price of Guangdong Province [Yuejia 2007 Doc No.190].

[81] http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20050228_402231854.htm

http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm which is higher than that estimated in the FSR (3690.55 million RMB)[82], therefore the IRR will not exceed the benchmark 8%.

If annual O&M costs decreases by about 8.6%, the IRR begins to exceed the benchmark. Because the QLGP is one of the first LNG CCGT power plants in CSPG, currently CCGT units' maintenance is supported by foreign manufacturers. These years the raw material price is increasing[83], such as spare parts etc, which will increase the units' O&M costs in the future. Meanwhile, the O&M costs would not decrease by 8.6% based on above analysis of the input data of O&M, therefore the IRR will not exceed the benchmark 8%.

In sum, it is clear that with reasonable variations in the critical assumptions, annual electricity generation, total investment, gas price, feed-in tariff and annual O&M costs, the FIRR of proposed project is always lower than the investment benchmark. Therefore, without revenues from the sale of CERs; the project lacks financial attractiveness.

As per the "Tool for the demonstration and assessment of additionality (Version 04)", since the above sensitivity analysis concluded that the proposed CDM project activity is unlikely to be financially attractive, we now proceed to Common practice analysis.

Step 2: Common practice analysis.

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

Step 4 of the latest "Tool for the demonstration and assessment of additionality (Version 04)" prescribes that activities similar to the proposed project activity should be considered for the common practice analysis. Similar project activities include:

- Those activities that are implemented previously or currently underway
- Projects in the same region and/or rely on a broadly similar technology;
- Projects are of similar scale;
- Projects take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.

The common practice analysis part of PDD covered similar LNG projects existed in CSPG, including Huizhou LNG project[84]、Zhujiang LNG project[85] and Shenzhen Dongbu LNG project[86]. As you know, NG and LNG projects must be approved by government. When we compiled the PDD of proposed project, only the above projects were found in public available website, such as NDRC[87], Guangdong Provincial Development and Reform Commission[88] and China Electric Power Yearbook. At present, all

[82] Completion of Settlement and Audit Report of the project issued by Guangzhou Zhiheng Construction cost of the Advisory Co., Ltd. on 22 October 2007

[83] http://finance.jrj.com.cn/news/2008-04-14/000003523708.html

[84] http://cdm.unfccc.int/Projects/Validation/DB/P49RV1HC5MY7O2929WR1OUOFZ0GWZ8/view.html

[85] http://cdm.unfccc.int/Projects/Validation/DB/R5IB6G5JP53QHAVRAHKECF2JSXA1XT/view.html

[86] http://cdm.unfccc.int/Projects/Validation/DB/V4H4XWMUFERHN2EBKNR3A5IQ9JIW07/view.html

[87] http://www.sdpc.gov.cn

[88] http://www.gddpc.gov.cn/

the other projects were under CDM developing. According to "Tool for the demonstration and assessment of additionality (Version 04)", only Huizhou LNG project、Guangzhou Zhujiang LNG project, Shenzhen Dongbu LNG project should be considered for the common practice analysis. Therefore, it is reasonable for selection of the similar project activities in the common practice analysis part of PDD, and the proposed project activity is additional. In last two years, two new-built NG projects in CSPG started construction and could be found in NDRC and Guangdong Provincial Development and Reform Commission's website, and these project are also under CDM developing[89]. Therefore even if we add the two new-built projects in the common practice analysis part of PDD, the proposed project activity is still additional.

During 2002-present, there are no gas-fired capacities in CSPG. It is clear that gas-based power plant is not common practice in the project boundary. The QLGP is one of the first LNG CCGT power plants in CSPG. Other three similar projects: Huizhou LNG power plant, Shenzhen Dongbu LNG power plant and Zhujiang LNG power plant are all in the process of applying as CDM projects.

Sub-step 2b. Discuss any similar options that accruing.
NG fired power stations are not widely available in CSPG, the grid boundary in the PDD. The reasons for low penetration of similar activities are explained in the investment analysis section. Also, low penetration of LNG based power generation in the country is due to relative higher gas price as well as pipeline infrastructure. Thus, the proposed project is additional.

Step 3: Impact of CDM registration.
According to the Additionality Step 3 of the latest AM0029, an analysis of impact of CDM registration is stated as follows:

Besides greenhouse gas emissions reduction, the following positive impacts of the approval and registration of the proposed project activity were anticipated at the beginning of the project activity:

- CDM revenue is important for the project's sustainability by greatly improving the financial performance of the proposed project and overcoming the investment benchmark. The project owner would be more confident in successful implementation of the proposed project.
- As China aims to diversify its energy sources away from carbon intensive sources such as coal and fuel oil to a cleaner fuel such as natural gas, the registration of the proposed project activity will be an important catalyst to encourage other prospective developers to invest in natural gas fired combined cycle power plants, which would lead to further reduction in GHG emissions.

The additionality analysis of the proposed project has clearly demonstrated that the proposed project is additional, according to the version 01.1 of AM0029 and Tool for the demonstration and assessment of additionality version 4.0.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Step 1 Calculate Baseline Emission

[89] http://cdm.unfccc.int/Projects/Validation/DB/WN0RNX1NYQJ20C7RB3XGGGS6WMO8AK/view.html
http://cdm.unfccc.int/Projects/Validation/DB/MFTYH8KY7UWPRYN9Y2N3PEORG21UTE/view.html

Sub-step 1a Calculate Baseline Emission Factor ($EF_{BL,CO2}$)

According to the version 01 of AM0029, the baseline emission factor $EF_{BL,CO2}$, is the lowest emission factor among the following three options:

Option 1. The build margin ($EF_{BL,BM}$), calculated according to ACM0002; and
Option 2. The combined margin ($EF_{BL,CM}$), calculated according to ACM0002, using a 50/50 OM/BM weight, then $EF_{BL,CM}$=0.5$EF_{BL,BM}$+0.5$EF_{BL,OM}$, where $EF_{BL,OM}$ is the operational margin calculated according to ACM0002.
Option 3. The emission factor of the technology (and fuel) identified as the most likely baseline scenario under Section B 4, step 2 "Identification of the baseline scenario" and calculated as follows:

$$EF_{BL,CO_2,Option3} = \frac{COEF_{BL}}{\eta_{BL}} \times 3.6GJ/MWh \qquad (1)$$

Where,
$COEF_{BL}$ is the fuel emission coefficient (tCO_2e/GJ), based on national average fuel data, if available, otherwise IPCC defaults can be used.
η_{BL} is the energy efficiency of the technology, as estimated in the baseline scenario analysis above.

Sub-step 1a1: Calculate the Operating Margin emission factor ($EF_{BL,OM}$)

According to ACM0002, version 06, four alternatives could be used to calculate the OM:
a) Simple OM
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

Dispatch data analysis should be the first methodological choice. Where this option is not selected project participants shall justify why and may use the simple OM, the simple adjusted OM or the average emission rate method taking into account the provisions outlined hereafter.

The Simple OM method (a) can only be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normal for hydroelectricity production.

The average emission rate method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply option (b) is not available, and where detailed data to apply option (c) above is unavailable.

The Simple OM, simple-adjusted OM, and average OM emission factors can be calculated using either of the two following data vintages for years(s) y:

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

For The Project, the simple Operating Margin emission factor was chosen based on the following two reasons:

1. In China, the State Grid Corporation run the interregional dispatch system and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2. For the most recent 5 years (2001-2005), the low-cost/must run resources constitute less than 50% of total: 33.72%, 32.98%, 30.59%, 29.71% and 30.41% for 2001, 2002, 2003, 2004 and 2005[90].

As a result, the simple OM method can be used.

The OM in this PDD is calculated ex-ante based on the most recent 3 years data.

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{BL,OM} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \tag{2}$$

Where,

$F_{i,j,y}$ is the amount of fuel *i* consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources *j* in years *y*,

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in years *y*, and

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

The fuel consumption data for generation is extracted from energy balance table in China Energy Statistical Yearbook. The generation data is extracted from China Electric Power Yearbook. In the China Electric Power Year Book and other data resources, only generation data by fuel type is available. The generation from source *j* can be translated into electricity delivered to the grid by source *j* by excluding the plant self consumption part (please see B.6.2)

Sub-step 1a2. Calculate the Build Margin emission factor ($EF_{BL,BM}$)

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants *m*, as follows:

$$EF_{BL,BM} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \tag{3}$$

Where

[90] As defined in the methodology ACM0002 version 06, the low operating cost and must run resources include hydro, wind, biomass,

$F_{i,m,y}$ is the amount of fuel *i* (tce) consumed by plant *m* in year *y*.

$COEF_{i,m,y}$ is the CO_2 emission coefficient (tCO_2/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*.

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m*, equals to generation minus plant self consumption:

Project participants shall choose the sample of power plants *m* between one of the following two options. The choice among the two options should be specified in the PDD, and cannot be changed during the crediting period.

Option 1. Calculate the Build Margin emission factor $EF_{BL,BM}$ *ex-post* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently or 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. Project participants should use from these two options that sample group that comprises the larger annual generation.

Option 2. For the first crediting period, the Build Margin emission factor $EF_{BL,BM}$ must be updated annually *ex-post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BL,BM}$ should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consists of either the five power plants that have been built most recently, or 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. Project participants should use from these two options that sample group that comprises the larger annual generation.

In this PDD, the BM is determined ex-post based on option 1.

A direct application of this approach is difficult in China. The Executive Board (EB) has provided guidance on this matter with respect to the application of the AMS-1.D and AM0005 methodologies for projects in China on 7 October 2005 in response to a request for clarification by DNV on this matter. The EB accepted the use of capacity additions to identify the share of thermal power plants in additions to the grid instead of using power generation.

The calculation of the published BM Emission Factor is based on this approach and is described below:

First， we calculate the share of the CO_2 emission factors of the solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available.

Second, the calculated shares are the weights. Using the emission factor for advanced efficient technology we calculate the BM emission factor for thermal power;

Third, use the BM emission factor to multiply the emission factor of the thermal power with the share of the thermal power in 20% of the newly-added capacity of the power grid.

Detailed steps and formulas are as below:

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First, we calculate the share of CO_2 emissions of the solid, liquid and gas fuel in total emissions respectively.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

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

with:

- $F_{i,j,y}$ *the amount of the fuel* i *consumed in y year of j province* (measured in tce;
- $COEF_{i,j,y}$ the emission afctor of fuel i (measured in tCO_2/tce） while taking into account the carbon content and oxidation rate of the fuel *i* consumed in *y* year;
- *COAL,OIL* and *GAS subscripts standing for the solid fuel, liquid fuel and gas fuel*

Second, we calculate the emission factor of the thermal power

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (7)$$

While $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the emission factors of advanced coal-fired , oil-fired and gas-fired power generation technology, see detailed parameter and calculation in Annex 2.

Third, we calculate BM of the power grid

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

While CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity.

The detailed information of BM and OM calculation is listed in Annex 3 of this PDD.

Sub-step 1a3: Calculate the Combine Margin emission factor ($EF_{BL,CM}$)

The combined margin ($EF_{BL,CM}$) is calculated according to ACM0002, using a 50/50 OM/BM weight:

$$EF_{BL,CM} = 0.5 \times EF_{BL,BM} + 0.5 \times EF_{BL,CM} \quad (9)$$

Sub-step 1a4: Calculate the Baseline Emission Factor ($EF_{BL,CO2}$)

Then the baseline emission factor can be calculated as follows:

$$EF_{BL,CO_2} = \min(EF_{BL,BM}, EF_{BL,CM}, EF_{BL,CO_2,Option3}) \quad (10)$$

Sub-step 1b Calculate Baseline Emission (BE_y)

Once the baseline emission factor is determined, the baseline emissions can be calculated by multiplying the electricity generated in the project plant (EG_y) with the baseline emission factor $EF_{BL,CO2}$:

$$BE_y = EG_y \times EF_{BL,CO_2} \quad (11)$$

Step 2 Calculate Project Emission (PE_y)

According to the Methodology, the project activity is on-site combustion of natural gas to generate electricity, then the CO_2 emissions from electricity generation are calculated as follows:

$$PE_y = FC_{LNG,y} \times COEF_{LNG,y} + FC_{Diesel,y} \times COEF_{Diesel,y} \quad (12)$$

Where
$FC_{LNG,y}$: is the total volume of LNG combusted in the project plant (tons) in year y.
$FC_{Diesel,y}$: is the total volume of diesel combusted in the project plant (tons) for start-up fuel in year y. In the proposed project activity, the diesel consumption for start up is zero.
$COEF_{LNG,y}$: is the CO_2 emission coefficient (tCO_2/tons) in year y for LNG.
$COEF_{Diesel,y}$: is the CO_2 emission coefficient (tCO_2/tons) in year y for diesel.

The emission coefficients of LNG and diesel are calculated as follows:

$$COEF_{LNG,y} = NCV_{LNG,y} \times EF_{CO_2,Gas,y} \times OXID_{Gas} \quad (13)$$

$$COEF_{Diesel,y} = NCV_{Diesel,y} \times EF_{CO_2,Diesel,y} \times OXID_{Diesel} \quad (14)$$

Where:
$NCV_{LNG,y}$: is the net calorific value of LNG (GJ/ton), which is determined from the fuel supplier.
$NCV_{Diesel,y}$: is the net calorific value of diesel (GJ/ton), which is determined from the most recent "Chinese Energy Statistics Yearbook" available when the verification begins.
$EF_{CO2,Gas,y}$: is the CO_2 emission factor per unit of energy of LNG in year y (tCO_2/GJ), which is determined from the fuel supplier.
$EF_{CO2,Diesel,y}$: is the CO_2 emission factor per unit of energy of diesel in year y (tCO_2/GJ), the IPCC default value will be used.
$OXID_{Gas}$: is the oxidation factor of LNG, the IPCC default value will be used.
$OXID_{Diesel}$: is the oxidation factor of diesel, the IPCC default value will be used.

Step 3 Calculate Leakage (LE_y)

According to the Methodology, the following leakage emission sources are considered:

- Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, regasification, 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 emission from fuel combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system.

Thus, the leakage can be calculated based on following steps:

Sub step 3a Calculate the Upstream fugitive CH_4 emission factor ($EF_{BL,upstream,CH4}$)

According to the Methodology, the emission factor for upstream fugitive CH_4 emissions occurring in the absence of the project activity should be consistent with the baseline emission factor ($EF_{BL,CO2}$) in step 1 of this section. As described in Section B 6.3, the BM will be selected as the baseline emission factor, then the corresponding upstream fugitive CH_4 emission factor can be calculated as follows:

$$EF_{BL,upstream,CH_4} = \frac{FF_{Coal} \times EF_{Coal,upstream,CH_4} + FF_{Gas} \times EF_{Gas,upstream,CH_4} + FF_{Oil} \times EF_{Oil,upstream,CH_4}}{GEN_y} \quad (15)$$

Where:
$EF_{BL,upstream,CH4}$: is the emission factor for upstream fugitive methane emissions occurring in the absence of the project activity in tCH_4/MWh.
FF_{Coal}: Total quantity of coal type fuel combusted (tons raw coal) in power plants included in the build margin.
FF_{Gas}: Total quantity of gas type fuel combusted (GJ) in power plants included in the build margin.
FF_{Diesel}: Total quantity of diesel type fuel combusted (GJ) in power plants included in the build margin.
$EF_{Coal,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of coal in tCH_4/t coal. The Methodology suggested two default fugitive CH_4 associated with different source: underground mining and surface mining. Because 95% of the coal production in China are produced by underground mining, so the default value for underground mining 13.4 tCH_4/kt coal is used in this PDD.
$EF_{Gas,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of gas in tCH_4/GJ. The Methodology suggested several default fugitive CH_4 associated with different regions. In this PDD, the default value for other oil exporting countries/rest of world is adopted, which is higher than the value for USA and Canada, resulting in an upward estimate of the leakage. Thus it is conservative. The project might adopt the lower default value for USA and Canada because the new gas terminal and transmission and distribution network of this project is construed and operated by advance technology.
$EF_{Oil,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of oil in tCH_4/GJ. The default value suggested in the Methodology is used in this PDD.
GEN_y: Electricity generation in the plants included in the build margin in MWh/a.

For the BM is calculated based on a conservative way, we also use the following formula to estimate the upstream fugitive methane emissions as follows:

$$EF_{BL,upstream,CH_4} = \frac{FF_{Coal} \times EF_{Coal,upstream,CH_4} + FF_{Gas} \times EF_{Gas,upstream,CH_4} + FF_{Oil} \times EF_{Oil,upstream,CH_4}}{GEN_y}$$

$$= \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,upstream,CH4} = \frac{CAP_{Thermal}}{CAP_{Total}} \times (\lambda_{Coal} \times EF_{Coal,Adv,upstream,CH4} + \lambda_{Gas} \times EF_{Gas,Adv,upstream,CH4}$$

$$+ \lambda_{Oil} \times EF_{Oil,Adv,upstream,CH4}) > \frac{CAP_{Thermal}}{CAP_{Total}} \times \lambda_{Coal} \times EF_{Coal,Adv,upstream,CH4} \quad (1$$

$$= \lambda_{Coal} \times \frac{CAP_{Thermal}}{CAP_{Total}} \times PGCC_{Adv} \times EF_{Coal,upstream,CH_4} \times \frac{NCV_{Coal}}{NCV_{Rawcoal}}$$

Where,

$\lambda_{Coa,BMI}$: is the share of coal-fired generation in BM generation.
$PGCC_{Adv}$: is the power supply coal consumption of the most advance coal-fired generation technology within the grid boundary, which is estimated as 343.33 gce/kWh in this PDD.
NCV_{Coal}: is the net caloric value of standard coal equivalent in GJ/tce.
$NCV_{Rawcoal}$: is the net caloric value of raw coal which is used for power generation in GJ/tce.
While CAP_{Total} represents the total newly-added capacity and $CAP_{Thermal}$ represents newly-added thermal power capacity.

Sub step 3b Calculate Fugitive Methane Emissions ($LE_{CH4,y}$)

To estimated the fugitive methane emissions, one can multiply the quantity of LNG consumed by the project in year y with an emission factor for fugitive CH_4 emissions ($EF_{Gas,upstream,CH4}$) for LNG consumption and subtract the emissions occurring from fossil fuels used in the absence of the project activity, as follows:

$$LE_{CH_4,y} = \lfloor FC_{LNG,y} \times NCV_{LNG,y} \times EF_{Gas,upstream,CH_4} - EG_y \times EF_{BL,upstream,CH_4} \rfloor \times GWP_{CH_4} \quad (17)$$

Where:
$LE_{CH4,y}$: Leakage emissions due to fugitive upstream CH_4 emissions in the year y in tCO_2e.
$FC_{LNG,y}$: Total volume of LNG combusted in the project plant (tons) in year y.
$NCV_{LNG,y}$: Net calorific value of LNG (GJ/ton), which is determined from the fuel supplier.
$EF_{Gas,upstream,CH4}$: Emission factor for upstream fugitive methane emissions from production of gas in tCH_4/GJ. The Methodology suggested several default fugitive CH_4 associated with different regions. In this PDD, the default value for other oil exporting countries/rest of world is adopted.
EG_y: Electricity generation in the project plant during year y in MWh.
$EF_{BL,upstream,CH4}$: is the emission factor determined in sub step 3a for upstream fugitive methane emissions occurring in the absence of the project activity in tCH_4/MWh.
GWP_{CH4}: Global warming potential of methane valid for the relevant commitment period.

Sub step 3c Calculate CO_2 emissions from LNG ($LE_{LNG,CO2,y}$)

CO_2 emission from LNG combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system is estimated by multiplying the quantity of natural gas combusted in the project with an appropriate emission factor, as follows:

$$LE_{LNG,CO_2,y} = FC_{LNG,y} \times NCV_{LNG,y} \times EF_{CO_2,upstream,LNG} \quad (18)$$

Where,
$LE_{LNG,CO2,y}$: Leakage emissions due to LNG combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system in tCO_2e.
$FC_{LNG,y}$: Total volume of LNG combusted in the project plant (tons) in year y.
$NCV_{LNG,y}$: Net calorific value of LNG (GJ/ton), which is determined from the fuel supplier.
$EF_{CO2,upstream,LNG}$: Emission factor for upstream CO_2 emission due to LNG combustion/electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system in tCO_2/GJ. Because such data is unavailable in this project, the default value of 6 tCO_2/TJ suggested in the Methodology is adopted as a rough approximation.

Sub step 3d Calculate Leakage (LE_y)

Thus the leakage can be calculated as follows:

$$LE_y = LE_{CH_4,y} + LE_{LNG,CO_2,y} \quad (19)$$

Where:
LE_y: leakage emission during the year y in tCO_2e.
$LE_{CH4,y}$: leakage emission due to fugitive upstream CH_4 emissions in year y in tCO_2e.
$LE_{LNG,CO2,y}$: leakage emission 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 tCO_2e.

Step 4 Calculate Emission Reduction (ER_y)

The emission reduction of the proposed project can be calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (20)$$

Where:
ER_y: emission reduction in year y in tCO_2e.
BE_y: emission in the baseline scenario in year y in tCO_2e.
PE_y: emission in the project scenario in year y in tCO_2e.
LE_y: emission in the year y in tCO_2e.

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

Data / Parameter:	**$EF_{BL,BM}$**
Data unit:	tCO_2/MWh
Description:	The build margin emission factor calculated according to ACM0002
Source of data used:	Calculated
Value applied:	0.6748 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is calculated based on version 06 of ACM0002, relevant steps and parameters used for calculation are listed in Annex 3 of this PDD.
Any comment:	

Data / Parameter:	**$EF_{BL,OM}$**
Data unit:	tCO_2/MWh
Description:	The operational margin emission factor calculated according to ACM0002
Source of data used:	Calculated
Value applied:	1.0119 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is calculated based on version 06 of ACM0002, relevant steps and parameters used for calculation are listed in Annex 3 of this PDD.

Any comment:	

Data / Parameter:	**$PGCC_{BL}$**
Data unit:	tce/MWh
Description:	Power generation coal consumption per MWh generated by the most likely baseline technology identified in Section B5.
Source of data used:	Design reference cost index for thermal power project (2005), 2006 April, China Electrical Power Press
Value applied:	0.312
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is based on identification of most likely baseline scenario in section B5.
Any comment:	

Data / Parameter:	$r_{selfuse}$
Data unit:	%
Description:	Self usage rate of the power plant using the most likely baseline technology identified in Section B5.
Source of data used:	Design reference cost index for thermal power project (2005), 2006 April, China Electrical Power Press
Value applied:	6.4%
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is based on identification of most likely baseline scenario in section B5.
Any comment:	

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

Data / Parameter:	**$GEN_{i,y}$**
Data unit:	MWh

Description:	Electricity (MWh) delivered to the grid excluding low operation cost/must run power plants in year *y*
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	**NCV_i**
Data unit:	GJ/t(ce)
Description:	Net caloric value of fuel i
Source of data used:	China Energy Statistics Yearbook 2004, p535.
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data comes from an official statistics.
Any comment:	

Data / Parameter:	**$OXID_i$**
Data unit:	
Description:	The oxidation factor of fuel i
Source of data used:	IPCC default value in revised 2006 IPCC Guideline for National Greenhouse Gas Inventories.
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is based on IPCC default value because the national specific value is unavailable.
Any comment:	

Data / Parameter:	**$EF_{CO2,i}$**
Data unit:	tCO_2/GJ
Description:	The emission factor of fuel i
Source of data used:	IPCC default value in revised 2006 IPCC Guideline for National Greenhouse Gas Inventories.
Value applied:	See Annex 3
Justification of the choice of data or description of	This data is based on IPCC default value because the national specific value is unavailable.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**$COEF_i$**
Data unit:	$tCO_2/t\ (m^3)$
Description:	CO_2 emission coefficient of fuel *i*
Source of data used:	Calculated
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated according to the formula suggested by ACM0002.
Any comment:	

Data / Parameter:	**$PGCC_{Adv}$**
Data unit:	kgce/MWh
Description:	Fuel consumption per kWh electricity delivered of best available technologies in China
Source of data used:	Expert estimated and relevant statistics
Value applied:	343.33
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to EB guidance, the efficiency level of the best technology commercially available in the provincial/regional or national grid of China can be used as a conservative proxy for each fuel type in estimating the fuel consumption to estimate the build margin (BM).
Any comment:	

Data / Parameter:	e_i
Data unit:	%
Description:	Delivered generation efficiency the best commercially available technology fuelled by fuel type i in BM generation mix.
Source of data used:	Estimated and published by China DNA
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed information regarding fuel consumption and emission data of individual power plant is not publicly available, the values of the best commercially available technology are therefore adopted as the conservative proxy to calculate BM emission factor.
Any comment:	

Data / Parameter:	$\lambda_{i,BM}$

Data unit:	%
Description:	Share of generation by fuel type i in BM generation mix.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed information regarding construction and generation of individual power plant is not publicly available, the aggregated data of installed capacity by fuel types are used to identify and represent the build margin, which can be estimated as follows: $\lambda_{i,BM} = \lambda_i * CAP_{Thermal} / CAP_{Total}$
Any comment:	

Data / Parameter:	**$EF_{Coal,upstream,CH4}$**
Data unit:	t CH_4/kt coal
Description:	Fugitive CH_4 upstream emission of coal mining
Source of data used:	IPCC default value
Value applied:	13.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since 95% of the coal production in China are produced by underground mining, so the default value for underground mining 13.4 tCH_4/kt coal is used.
Any comment:	

Data / Parameter:	**$EF_{Gas,upstream,CH4}$**
Data unit:	t CH_4/PJ
Description:	Fugitive CH_4 upstream emission of natural gas production
Source of data used:	IPCC default value
Value applied:	296
Justification of the choice of data or description of measurement methods and procedures actually applied :	No country specific value, therefore IPCC default value is adopted
Any comment:	

Data / Parameter:	**$EF_{CO2,upstream,LNG}$**
Data unit:	t CO_2e/TJ
Description:	Emission factor for upstream CO_2 emission due to energy consumption associated with LNG process
Source of data used:	IPCC default value
Value applied:	6
Justification of the choice of data or description of measurement methods	Since there is no country or local specific value available, the IPCC default value recommended by the methodology AM0029 is adopted.

and procedures actually applied :	
Any comment:	

Data / Parameter:	$EF_{BL,upstream,CH4}$
Data unit:	T CH_4/MWh
Description:	Fugitive CH_4 upstream emission associated with per electricity generated
Source of data used:	Calculated according to formula (13) presented above
Value applied:	0.00426
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be conservative, only fugitive CH_4 emission by coal mining which will be avoided by the proposed project is considered.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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

Step 1 Calculated baseline emissions

Sub-step 1a Calculate baseline emission factor ($EF_{BL,CO2}$)

$EF_{BL,BM}$=0.6748 tCO_2/MWh, see also Section B.6.2
$EF_{BL,OM}$=1.0119 tCO_2/MWh, see also Section B.6.2
$EF_{BL,CM}=0.5\times EF_{BL,BM}+0.5\times EF_{BL,OM}=0.843$ tCO_2/MWh

$$EF_{BL,CO_2,Option3}=\frac{COEF_{BL}}{\eta_{BL}}\times 3.6GJ/MWh=\frac{\frac{25.8\times 44/12}{1000}}{39.42\%}\,^{91}\times 3.6=0.8639\ tCO_2/MWh.$$

Then $EF_{BL,CO_2}=\min(EF_{BL,BM},EF_{BL,CM},EF_{BL,CO_2,Option3})$ =0.6748 tCO_2/MWh. The build margin (Option 1) is selected as the baseline emission factor.

Sub-step 1b Calculate baseline emissions (BE_y)

$BE_y=EG_y\times EF_{BL,CO2}=3611000\times 0.6748=2{,}436{,}703\ tCO_2$

Step 2 Calculate Project Emission (PE_y)

$COEF_{LNG,y}=NCV_{LNG,y}\times EF_{CO_2,Gas,y}$ =49.39×56100/1000=2.771 tCO_2/t
$PE_y=FC_{LNG,y}\times COEF_{LNG,y}+FC_{Diesel,y}\times COEF_{Diesel,y}$ =505600×2.771=1,401,018 tCO_2

[91] The emission factor of coal is 25.8tC/GJ (see Annex 3), the efficiency of baseline plant is 39.42% (see footnote 3 of this PDD).

Step 3 Calculate Leakage (LE_y)

$EF_{BL,upstream,CH_4} = \lambda_{Coal} \times PGCC_{Adv} \times EF_{Coal,upstream,CH_4} = 0.6622 \times 343.33 \times 13.4 \times 29.27/20.91/10^6 = 0.00426$ t CH_4/MWh

$LE_{CH_4,y} = \lfloor FC_{LNG,y} \times NCV_{LNG,y} \times EF_{Gas,upstream,CH_4} - EG_y \times EF_{BL,upstream,CH_4} \rfloor \times GWP_{CH_4}$

= [505600×49.39×296/10⁶-3611000×0.00426] ×21= -167,817 tCO_2

$LE_{LNG,CO_2,y} = FC_{LNG,y} \times NCV_{LNG,y} \times EF_{CO_2,upstream,LNG}$ =505600×49.39×6/1000=149,830 tCO_2

$LE_y = LE_{CH_4,y} + LE_{LNG,CO_2,y}$ =149,830-167,817=-17,987 tCO_2, then $LE_y = 0$ tCO_2,

Step 4 Calculate Emission Reduction

$ER_y = BE_y - PE_y - LE_y$ =2,436,703-1,401,018=1,035,685 tCO_2

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2009(June 1-December 31)	817,260	1,421,410	0	604,150
2010	1,401,018	2,436,703	0	1,035,685
2011	1,401,018	2,436,703	0	1,035,685
2012	1,401,018	2,436,703	0	1,035,685
2013	1,401,018	2,436,703	0	1,035,685
2014	1,401,018	2,436,703	0	1,035,685
2015	1,401,018	2,436,703	0	1,035,685
2016(January 1- May 31)	583,758	1,015,293	0	431,535
Total (tonnes of CO_2e)	9,807,126	21,973	0	1046,005

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

B.7.1 Data and parameters monitored:

A. Monitoring parameters for the Build margin emission factor:

A1.

Data / Parameter:	Build Margin emission factor ($EF_{BL,CO2,y}$)
Data unit:	t CO_2/ MWh
Description:	Build Margin emission factor of the grid in tonnes of CO_2 per MWh.
Source of data to be used:	NDRC of China will update the BM every year, which has been thoroughly checked and has been compiled in the best possible manner and therefore is considered to be a reliable data resource. Such data if available in a timely manner shall be used. Otherwise, this parameter shall be calculated based on the procedures described in section

	B.6.1 and the relevant parameters should be monitored ex-post.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.6748 t/MWh.
Description of measurement methods and procedures to be applied:	The real BM will be determined ex-post.
QA/QC procedures to be applied:	The uncertainty level of this data is low. This is calculated based on data collected from official/ reliable data sources. No additional QA/QC procedures may need to be planned.
Any comment:	Data will be recorded as per Monitoring Plan. Data will be archived electronically/ paper as available. Archived data will be stored as per Monitoring Plan.

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mt, Mm^3
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data used:	China Energy Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	Official statistical data
QA/QC procedures to be applied:	Official data, no QA/QC needed.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	*TJ/ mass or volume unit of a fuel*
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook
Description of measurement methods and procedures to be applied:	See Annex 3 for details
QA/QC procedures to be applied:	National and official data
Value of data applied	Official data, no QA/QC needed.

for the purpose of calculating expected emission reductions in section B.5	
Any comment:	

Data / Parameter:	***$OXID_i$***
Data unit:	%
Description:	the oxidation factor of the fuel *i*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see Annex3 for details
Description of measurement methods and procedures to be applied:	National data not available, so IPCC default values are used.
QA/QC procedures to be applied:	IPCC data, no QA/QC needed
Any comment:	

Data / Parameter:	***$EF_{CO2,i}$***
Data unit:	tCO_2e/TJ
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see Annex3 for details
Description of measurement methods and procedures to be applied:	National data not available, so IPCC default values are used.
QA/QC procedures to be applied:	IPCC data, no QA/QC needed
Any comment:	

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	the amount of electricity generation by source *j* in year *y*
Source of data used:	China Electric Power Yearbook
Value of data applied for the purpose of calculating expected emission reductions in	See Annex 3 for details

section B.5	
Description of measurement methods and procedures to be applied:	Official statistical data
QA/QC procedures to be applied:	Official data, no QA/QC needed.
Any comment:	

Data / Parameter:	$e_{j,y}$
Data unit:	%
Description:	station service power consumption rate of source *j* in year *y*
Source of data used:	China Energy Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	Official statistical data
QA/QC procedures to be applied:	Official data, no other QA/QC needed.
Any comment:	

Data / Parameter:	$EE_{coal,adv}$
Data unit:	%
Description:	Efficiency of most advanced coal-fired power technology that is commercially available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA or other official statistics data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36.53
Description of measurement methods and procedures to be applied:	Official statistics of state power authority
QA/QC procedures to be applied:	Official data, no other QA/QC needed.
Any comment:	

Data / Parameter:	$EE_{oil,adv}$
Data unit:	%
Description:	Efficiency of most advanced oil-fired power technology that is commercially

	available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA or other official statistics data.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	45.87
Description of measurement methods and procedures to be applied:	Official statistics of state power authority
QA/QC procedures to be applied:	Official data, no QA/QC needed.
Any comment:	

Data / Parameter:	$EE_{gas,adv}$
Data unit:	%
Description:	Efficiency of most advanced gas-fired power technology that is commercially available
Source of data used:	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA or other official data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	45.87
Description of measurement methods and procedures to be applied:	Official statistics of state power authority
QA/QC procedures to be applied:	Official data, no QA/QC needed.
Any comment:	

Data / Parameter:	$CAP_{,j,y}$
Data unit:	MW
Description:	Installed capacity of source *j* in year *y* in CSPG
Source of data used:	China Energy Statistical Yearbook or other official statistical data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	See Annex 3 for details
Description of measurement methods and procedures to be applied:	Official statistical data
QA/QC procedures to	Official data, no QA/QC needed.

be applied:	
Any comment:	

B Monitoring parameters for project activity and Leakages

Data / Parameter:	$FC_{LNG,y}$
Data unit:	T
Description:	Annual quantity of LNG consumed in project activity
Source of data to be used:	LNG flow meter reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	505600
Description of measurement methods and procedures to be applied:	The LNG flow rate will be monitored through a ultrasonic flow meter continuously both by supplier and project owner. The LNG consumption will be aggregated automatically and recorded daily. These flow meters have an accuracy of 0.5% and will be calibrated in-site every month.
QA/QC procedures to be applied:	The total LNG consumption will be monitored both at supplier and project end for cross-verification. Natural gas supply metering to the project will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the gas supply company. The power plant will use the gas turbine generator control system to measure the gas fuel flow for cross-verification.
Any comment:	

Data / Parameter:	$NCV_{f,y}$
Data unit:	GJ/t
Description:	Net Calorific Value of LNG
Source of data to be used:	Supplier-provided data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	49.39
Description of measurement methods and procedures to be applied:	The data used for ex-ante estimation is the country specific value from Chinese Energy Statistical Yearbook. The supplier-provided data will be used instead of country specific value once the project is put into operation. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	No additional QA/QC procedures need to be planned.
Any comment:	

Data / Parameter:	$EF_{CO2,LNG,y}$
Data unit:	tCO_2/GJ
Description:	Emission factor for LNG consumed in the project activity
Source of data to be used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0561
Description of measurement methods and procedures to be applied:	The IPCC default value
QA/QC procedures to be applied:	No additional QA/QC procedures need to be planned.
Any comment:	

Data / Parameter:	$FC_{Diesel,y}$
Data unit:	T
Description:	Annual quantity of Diesel as startup fuel consumed in project activity
Source of data to be used:	Diesel flow meter reading for startup usage
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The diesel used for startup fuel will be recorded daily.
QA/QC procedures to be applied:	No additional QA/QC procedures need to be planned.
Any comment:	

Data / Parameter:	$NCV_{Diesel,y}$
Data unit:	GJ/t
Description:	Net Calorific Value of Diesel
Source of data to be used:	Country specific
Value of data applied for the purpose of calculating expected emission reductions in section B.5	42.65
Description of	The NCV of diesel available at Chinese Energy Statistical Yearbook (annually

measurement methods and procedures to be applied:	published) will be used country specific value.
QA/QC procedures to be applied:	No additional QA/QC procedures may need to be planned.
Any comment:	Supplier-provided data will be used if available.

Data / Parameter:	$EF_{CO2,Diesel,y}$
Data unit:	tCO_2/GJ
Description:	Emission factor for diesel consumed as startup fuel in the project activity
Source of data to be used:	IPCC default value
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0741
Description of measurement methods and procedures to be applied:	The IPCC default value
QA/QC procedures to be applied:	No additional QA/QC procedures need to be planned.
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project
Source of data to be used:	Electricity meter reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3611000
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 the crediting period by means of electronic and paper backup. The metering equipments are with an accuracy of 0.2s.
QA/QC procedures to be applied:	The electricity generation from each turbine will be monitored and recorded at the on-site control centre using a computer system. The project operator is responsible for recording this set of data. The electricity meters shall be calibrated once half a year by Guangdong Electric Power Science Institution according to the national calibration criterion 'JJG 596-1999' and 'JJG 307-2006'. Electricity sales invoices will also be obtained for double check.

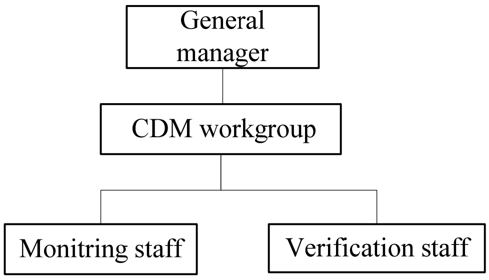
Any comment:	Electricity supplied by the project activity to the grid. Double check by receipt of sales.

B.7.2 Description of the monitoring plan:

The following steps will be taken to ensure accurate and consistent data is collected for monitoring and verification purposes:

Establish CDM workgroup

A CDM workgroup will be established to carry out the monitoring activity of the proposed project and other relevant tasks. The organization of the CDM workgroup is shown in the following chart. The monitoring staff is responsible for recording and archiving the monitoring data in line with the monitoring manual. The verification staff is responsible for rechecking the data and completing verification report for DOE.



Formulate CDM Monitoring Manual

A monitoring manual will be formulated as guidance for regular monitoring activity. The manual will cover the following contents:

1. Parameter to be monitored
2. Recording Frequency
3. Recording Format
4. Archive
5. Meter Calibration

Natural gas is supplied by Guangdong Dapeng Bay LNG through its pipeline from LNG terminal up to the power plant. Guangdong Dapeng Bay LNG has the necessary pressure regulation, conditioning and metering station at their gas supply terminal near power plant to ensure proper monitoring and quantification of gas intake in the power plant. LNG used in the gas turbine will be measured in the supplier's terminal near power plant through a Daniel® Ultrasonic Flow Mete. Two ultrasonic flow meters will be installed in the supply terminal near power plant, one is master meter and another is for backup. These flow meters have an accuracy of 0.5% and will be calibrated in-site every month.

The power plant will use the gas turbine generator control system to monitor the accurate gas fuel flow and such data will be recorded daily for cross-verification with the data from gas supplier.

The gas supplier will prepare a daily report to the power plant which includes the daily gas used and it relevant NCV.

Training Procedure

Specific training sessions regarding the operation and maintenance of measurement equipments will be organized to strengthen capacity of monitoring staff by equipment suppliers and Dapeng Bay LNG terminal. All the staff mentioned above will also participate training session on general operation and management issues in the context of the proposed project.

Emergency Preparedness for Unintended Emissions

The emergency plan for LNG leakage and fire has been prepared in line with "*Safety Production Law of the People's Republic of China*" and "*Fire Prevention and Control of the People's Republic of China*" to minimum damages as well as LNG emissions in the case of emergency. The plan has taken into effect since May 2006 and is available to be presented to DOE upon request.

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

The application of the baseline and monitoring methodology was completed on 29 Jan. 2006 by Global Climate Change Institute (GCCI) of Tsinghua University and Upper Horn Investments Ltd., Guangdong Yudean Group Co., Ltd.

The persons involved in baseline study are listed as follows:

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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:

>>
18/08/2004（Main Equipment Contract Effective Day）

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

>>
20

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:

>>
1/06/2009

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:

>>

The environmental impact assessment of the project was completed by China Environment Science Institute and approved by China State Environment Protection Administration. The EIA report of the proposed project shows that the project has no significant impacts on environment and is environmental feasible. The major conclusions are summarized as follows:

Construction Period

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

Operation Period

The major air pollutant of the proposed project during operation period is NOx, the emissions of SO2 and TSP is very slight and negligible comparing with conventional coal fired power plant. The proposed project will adopt dry-type low NOx emission combustion system, which could dramatically reduce NOx emissions. The NOx emission of the proposed project is expected to be 25ppmvd (with 15% oxygen concentration), which could meet the requirement of "Pollutant Emission Standard of Thermal Power Plant" (GB13223-1996).

A small quantity of solid waste generated during operation period will be collected, delivered to local solid waste treatment site.

During operation period, sea water will be used as cooling water. The maximal sea area is 0.04km^2 with temperature increase beyond 3℃, 0.25km2 with 0.01mg/l of chlorine-remaining and 0.06km2 with 0.01mg/l chlorine-remaining due to warm water discharge. The influenced area is very small and only has slight impacts on plankton and no impacts on creatures living in deeper water such as fish and crab. The cooling water intake will has impacts on little creatures without independent moving capacity. However, the impact is negligible comparing the total biological resources of oceanic creature in Pearl River Estuary.

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:

>>

Not applicable, since the construction and operation of the proposed project have no significant environmental impacts.

SECTION E. Stakeholders’ comments

>>

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

>>

In order to take the comments of local stakeholders into consideration, a survey has been carried out in the stage of environment impacts assessment. 250 copies of questionnaires have been distributed to local community, characteristics of targeted stakeholders is summarized as follows:

Total	Gender		Career			
	Male	Female	Civil servant	Residents	Other	Unknown
210	145	55	131	60	19	15

E.2. Summary of the comments received:

>>

Totally 210 questionnaires were collected, of which the major conclusions are summarized as follows:

	Yes	No	Unknown/Indifferent
Familiar with the proposed project	191	19	0
Support the proposed project	203	7	0
Significant impacts on local environment	7	157	46
Significant impacts on living and working condition	21	155	40
Concerns on implementation of environment protection measures undertaken by the proposed project	20	72	118

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

>>

There is no negative comment on development of the proposed project, therefore it doesn’t need to make any adjustment on design, construction and operation of the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public fund involved in the proposed project.

Annex 3

BASELINE INFORMATION

Table A 3-1 Calculate the OM of Southern China Grid in 2003

Fuel Type	Unit	NCV	Unit for NCV	EF (tC/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G) *A*B*C*44/12
Raw Coal	Mt	20908	MJ/t	25.8	1	44.9179	8.3184	21.6911	14.0527	175993455.05
Clean Coal	Mt	26344	MJ/t	25.8	1	0.0005				1246.07
Other washed	Mt	8363	MJ/t	25.8	1			0.3638	0.2037	448971.84
Coke	Mt	28435	MJ/t	25.8	1				0.005	13449.76
Coke Oven Gas	Gm^3	17354	kJ/m^3	12.1	1				0.004	2968.31
Other Coal Gas	Gm^3	16970	kJ/m^3	12.1	1	0.321			1.127	335797.81
Crude Oil	Mt	41816	MJ/t	20.0	1	0.0685				210055.71
Gasoline	Mt	43070	MJ/t	18.9	1	0.0002				596.95
Diesel	Mt	42652	MJ/t	20.2	1	0.319			0.0076	1031759.27
Fuel Oil	Mt	41816	MJ/t	21.1	1	6.2722	0.003			20301304.48
LPG	Mt	50179	MJ/t	17.2	1					0.00
Refinery Gas	Mt	46055	MJ/t	18.2	1	0.0285				87592.00
Natural Gas	Mm^3	38931	kJ/m^3	15.3	1					0.00
Other petroleum products	Mt	41816	MJ/t	20.0	1	0.1135				319357.98
Total		*a*								**198747172**
Generation	GWh	***b***				143351	17079	43295	19055	222780
Self Consumption rate		***c***				5.50%	8.43%	7.40%	8.01%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				135467	15639	40091	17529	208726
The Calculation of OM: ***a*** : The total emissions of CSPG: **198746555.23 tCO_2**										

d: The electricity delivered to CSPG by thermal power plants: 208726 **GWh** ***e***: The net import from CCPG to CSPG is 11100 MWh in 2003 ***f:*** the average emission factor of CCPG is 0.7843 tCO_2/MWh **OM=(a+e*f)/(d+e/1000)*10^{-6}=0.9522**
Data Sources: China Energy Statistical Yearbook 2004, China Statistics Press, 2005. China Electric Power Yearbook 2004, China Electric Power Press, 2004 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.

Table A 3-2 Calculate the OM of Southern China Grid in 2004

Fuel Type	Unit	NCV	Unit for NCV	EF (tC/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G)*A*B*C*44/12
Raw Coal	Mt	20908	MJ/t	25.8	1	60.1770	13.05	26.4392	17.5128	231767573.55
Clean Coal	Mt	26344	MJ/t	25.8	1	0.0021				5233.50
Other washed	Mt	8363	MJ/t	25.8	1					0.00
Coke	Mt	28435	MJ/t	25.8	1					0.00
Coke Oven Gas	Gm^3	17354	kJ/m^3	12.1	1					0.00
Other Coal Gas	Gm^3	16970	kJ/m^3	12.1	1	0.258				59831.38
Crude Oil	Mt	41816	MJ/t	20.0	1	0.1689				517932.98
Gasoline	Mt	43070	MJ/t	18.9	1					0.00
Diesel	Mt	42652	MJ/t	20.2	1	0.4888			0.0183	1601975.28
Fuel Oil	Mt	41816	MJ/t	21.1	1	9.5771				30983494.25
LPG	Mt	50179	MJ/t	17.2	1					0.00
Refinery Gas	Mt	46055	MJ/t	18.2	1	0.286				87899.34
Natural Gas	Gm^3	38931	kJ/m^3	15.3	1	0.048				104833.40
Other petroleum products	Mt	41816	MJ/t	20.0	1	0.0166				46707.86
Total		*a*								**265175931**
Generation	GWh	***b***				169389	20143	49720	24320	263572

Self Consumption rate		*c*				5.42%	8.33%	7.06%	7.56%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				160208	18465	46210	22481	247364

The Calculation of OM:
a : The total emissions of CSPG: **265175481.54 tCO_2**
d: The electricity delivered to CSPG by thermal power plants: 247364 **GWh**
e: The net import from CCPG to CSPG is 10951240 MWh in 2003
f: the average emission factor of CCPG is 0.8274 tCO_2/MWh
$OM=(a+e*f)/(d+e/1000)*10^{-6}=1.0616$

Data Sources:
China Energy Statistical Yearbook 2005, China Statistics Press, 2006.
China Electric Power Yearbook 2005, China Electric Power Press, 2005
2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.

Table A 3-3 Calculate the OM of Southern China Grid in 2005

Fuel Type	Unit	NCV	Unit for NCV	EF (tC/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G)*A*B*C*44/12
Raw Coal	Mt	20908	MJ/t	25.8	1	66.9647	14.35	32.1231	19.7555	263,442,602
Clean Coal	Mt	26344	MJ/t	25.8	1				0.0015	3,738
Other washed	Mt	8363	MJ/t	25.8	1			0.1039	0.3388	350,238
Coke	Mt	28435	MJ/t	29.2	1	0.0479			0.0805	345,390
Coal Total										**264,141,967**
Crude Oil	Mt	41816	MJ/t	20.0	1	0.1091				334,556
Gasoline	Mt	43070	MJ/t	18.9	1	0.0068				20,296
Diesel	Mt	42652	MJ/t	20.2	1	0.3196	0.0202		0.0181	0
Fuel Oil	Mt	41816	MJ/t	21.1	1	8.8721				1,130,639

LPG	Mt	50179	MJ/t	17.2	1					28,702,703
Refinery Gas	Mt	46055	MJ/t	18.2	1	0.0492				47,833
										30,236,028
Other petroleum products	Mt	41816	MJ/t	20.0	1	0.017				203,115
Oil Total										58,624
Natural Gas	Gm^3	38931	kJ/m^3	15.3	1	0.093				413,486
Coke Oven Gas	Gm^3	17354	kJ/m^3	12.1	1				0.079	0
Other Coal Gas	Gm^3	16970	kJ/m^3	12.1	1	0.187			1.596	151,211
Gas Total										**826,436**
Total		*a*								**295,204,431**
Generation	GWh	***b***				176453	25023	58430	27281	287187
Self Consumption rate		***c***				5.58%	7.95%	7.34%	6.94%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				166607	23034	54141	25388	269170

The Calculation of OM:
a : The total emissions of CSPG: 2952044731 **tCO_2**
d: The electricity delivered to CSPG by thermal power plants: 269170 **GWh**
e: The net import from CCPG to CSPG is 96363000 MWh in 2003
f: the average emission factor of CCPG is 0.7712 tCO_2/MWh
$OM=(a+e*f)/(d+e/1000)*10^{-6}=1.0109$
λcoal=89.48%
λoil=10.24%
λgas=0.28%

Data Sources:
China Energy Statistical Yearbook 2006, China Statistics Press, 2007.
China Electric Power Yearbook 2006, China Electric Power Press, 2007
2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.

Table A3-4 Calculate the Simple OM (3 year generation weighted average)

	Year 2002	Year 2003	Year 2004	OM (tCO2/MWh)

OM(tCO_2/MWh)	0.9522	1.0616	1.0109	1.0119
Electricity delivered (GWh)	208736.9	258317.47	365532.53	

Table A3-5 Installed Capacity and generation of CSPG in 2005

	Guangdong	Guangxi	Yunnan	Guizhou	Total
	A	B	C	D	G=A+B+C+D
Thermal Capacity (MW)	35182. 6	4931. 2	4758. 4	9634. 8	54525
Hydro Capacity (MW)	9035. 7	6085. 3	7993. 1	7233	7233
Nuclear Capacity (MW)	3780	0	0	0	3780
Other Capacity (MW)	83. 4	0	0	0	0
Total Capacity (MW)	3867	0	0	7233	11100

Data Sources:
China Electric Power Yearbook 2006, China Electric Power Press, 2007

Table A3-6 Installed Capacity and generation of CSPG in 2004

	Guangdong	Guangxi	Yunnan	Yunnan	Total
	A	B	C	D	G=A+B+C+D
Thermal Capacity (MW)	30172. 9	4378. 1	4306. 9	7801. 8	46684
Hydro Capacity (MW)	8584. 6	5040. 4	7058. 6	6896. 5	27580. 1
Nuclear Capacity (MW)	3780	0	0	0	3780
Other Capacity (MW)	83. 4	0	0	0	0
Total Capacity (MW)	42621	9418. 5	11365. 5	14698. 3	78103. 3

Data Sources:
China Electric Power Yearbook 2005, China Electric Power Press, 2006

Table A3-7 Installed Capacity and generation of CSPG in 2003

	Guangdong	Guangxi	Yunnan	Guizhou	Total
	A	B	C	D	G=A+B+C+D
Thermal Capacity (MW)	27231. 4	3190. 1	3556. 8	6465. 8	40463
Hydro Capacity (MW)	8107. 2	4525. 2	6543. 2	6233. 7	25421

Nuclear Capacity (MW)	3780	0	0	0	3780
Other Capacity (MW)	83. 4	0	0	0	0
Total Capacity (MW)	39202	7715. 3	10100	12699. 5	69664

Data Sources:
China Electric Power Yearbook 2002, China Electric Power Press, 2003

Table A3-8 Calculation of COEF

Fuel	Efficiency (%) A	Carbon coefficient (tc/TJ) B	Oxidation factor C	EF_{adv} (tCO2/MWh) D=(3.6/(A*1000))*B*C*44/12
Coal	35.82%	25.8	1	0.9508
Gas	47.67%	15.3	1	0.4237
Oil	47.67%	21.1	1	0.5843

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9117$$

Table A3-9 Calculation of BM in CSPG

	Installed Capacity in year 2003 (MW)	Installed Capacity in year 2004 (MW)	Installed Capacity in year 2005 (MW)	Newly added capacity from 2003-2005 (**Build Margin**) (MW)	Share of new added capacity fuelled by fuel type *i*.
	A	B	C	D=C-A	
Thermal Capacity	40444.1	46659.7	54507	14062.9	74.01%
Hydro Capacity	25409.3	27580.1	30347.1	4937.8	25.99%
Nuclear Capacity	3780	3780	3780	0	0.00%
Other Capacity	83.4	83.4	83.4	0	0.00%
Total Capacity	69716.8	78103.3	88717.5	**19000.7**	**100.00%**
Percentage as installed capacity in 2004	78.58%	88.04%	100%		

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} = 74.01\% * 0.9117 = 0.6748$$

$$\lambda_{Coal,BM} = \lambda_{Coal} * CAP_{Thermal} / CAP_{Total} = 0.8948 * 0.7401 = 0.6622$$

Annex 4

MONITORING INFORMATION

No additional information.

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