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:

>>
Guizhou Qianxi Qinglong Coal Mine Methane Utilization Project
Version: 01
Date: 01/04/2007

A.2. Description of the project activity:

>>
The proposed project is located in Qinglong coal mine of Qianxi County, which belongs to Bijie Area of Guizhou Province. Coal geographic reserve of Qinglong mine arrives at approximately 190.21Mt leading to 2.72 billion m^3 CMM reverse. The coal mine methane (CMM) is currently extracted from the underground. Before the proposed project is carried out, all the extracted CMM is released into atmosphere which causes not only great waste of resources but also air pollution.

Based on the flow rate and concentration of the extracted CMM, the total designed installation capacity is 4.2MW in the proposed project. 2*500 kW generators have already been in operation since February of 2006. Other 2*800kW generators will be installed and operated in July 2007. It is designed that the last 2*800kW generators will start operation in July 2008. All the gensets will be fixed with compressors and waste heat recovery systems.

When the project is fully operated, the annual electricity generated is 20,160MWh. It's estimated that 10% of the generated electricity will be consumed by the project. The rest will be connected to the coal mine substation then used by Qinglong mine. The anticipated annual methane consumed by generators will be up to 5.78Mm^3/y. Moreover, the project could recover approximately 41,472GJ waste heat annually, which will replace the thermal energy supplied from coal-fired boilers. In the 7 years of crediting period, the proposed project could reduce a total of 592,664tCO_2e of green house gas (GHG) emissions.

The contribution of the proposed project to local sustainable development includes:

- Taking full advantage of clean energy that would have been released into the atmosphere for power generation;
- Guarantee of coal mine production safety;
- Decrease of the coal consumption by substituting coal fired heat supply and power generation from South China Power Grid;
- Increase of job opportunities in the coalmine area.

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)
People's Republic of China	Qianxi Energy Development	No

(Host)	Co., Ltd.	
The Netherlands	Energy Systems International B.V.	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):

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The People's Republic of China

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

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Guizhou Province

A.4.1.3. City/Town/Community etc:

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Qianxi County, Bijie Area

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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Qinglong mine is located in the Qianxi County, which is 14km away from the county centre. Qianxi County is in the midland of Bijie Area, Guizhou Province. The coordinate of Qinglong mine is east longitude 106°05′00″-106°10′00″ , north latitude 26°57′51″-27°01′30″.

Figure A-1 Geographic position of the proposed project.

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

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10: fugitive emissions from fuels
8: mining mineral production

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

>>
The proposed project will employ the following technologies:

1）Gas-fired Reciprocating Engines to Generate Electricity

The gensets with unit capacity of 500kW and 800kW are all domestic made. Automatic temperature alarm will guarantee that the engine operates in safe condition when the temperature of motor oil and cooling water exceeds the rated value. In addition, the pressure alarm and brake can control the engine operating at rated parameters automatically. Moreover, overflow and short circuit protection function of the engine can ensure that the current is cut off and the alarm is turned on. Finally, the gensets are fixed with reverse-power relay which could automatically be switched off when power consumption from the grid happens. Then the alarm will be turned on.

2) Recovery of Power Engines Waste Heat

The exhaust gas from power generators will be sent to the waste heat utilization equipment. Thermal energy of the exhaust gas will be utilized for hot water supply for miners' showers, which will replace the coal combustion of traditional boilers. The waste heat recovery equipment is homemade.

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

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Years	Annual estimation of emission reductions in tonnes of CO_2e
2008	70,457
2009	87,035
2010	87,035
2011	87,035
2012	87,035
2013	87,035
2014	87,035
Total estimated reductions (tonnes of CO_2e)	592,664
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	84,666

A.4.5. Public funding of the project activity:

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No public funding from Annex I Parties has been provided for this CDM project.

SECTION B. Application of a baseline and monitoring methodology:

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

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ACM0008 "Consolidated baseline methodology for coal bed methane and coal mine methane capture and use for power (electrical and motive) and heat and/or destruction by flaring" (Version 03).
(http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html)

ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 06) is adopted for calculation of emission factor of South China Power Grid.

"Tool for the demonstration and assessment of additionality" (Version 03) is adopted to demonstrate the additionality of the proposed project.

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

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ACM0008 defines the applicability of this methodology. The following tables B-1 and B-2 explain the reason why the methodology applies to this project:

Table B-1 Comparison of the extraction activities with applicability of the methodology

ACM0008 Applicability	Proposed extraction activities
Underground boreholes in the mine to capture pre mining CMM	Included
Surface goaf wells, underground boreholes, gas drainage galleries or other goaf gas capture techniques, including gas from sealed areas, to capture post mining CMM	Underground boreholes, gas drainage galleries and other technologies are adopted to capture post mining CMM
Ventilation CMM that would normally be vented	Included

Table B-2 Comparison of the utilization activities with applicability of the methodology

ACM0008 Applicability	Proposed CMM utilization activities
The methane is captured and destroyed through utilization to produce electricity, motive power and/or thermal energy; emission reductions may or may not be claimed for displacing or avoiding energy from other sources	The methane is captured and destroyed by power generators.
The remaining share of the methane to be diluted for safety reason may still be vented	Part of CMM is still vented in the proposed project
All the CBM or CMM captured by the project should either be used or destroyed, and cannot be vented	CMM captured in the project will be utilized for power generation

Besides the applicability, ACM0008 also defines the types of activities that could not be applied to this methodology. The proposed project does not involve any of those activities (Table B-3):

Table B-3 Comparison of the project with inapplicable activities stated in the methodology

ACM0008 Inapplicability	**Proposed project activities**
Operate in opencast mines	Underground operating coal mines
Capture methane from abandoned/decommissioned coalmines	Both coal production and CMM extraction are under way in the coal mines
Capture/use of virgin coal-bed methane, e.g. methane of high quality extracted from coal seams independently of any mining activities	Extraction activities are concomitant with coal production
Use CO_2 or any other fluid/gas to enhance CBM drainage before mining takes place	No CBM extraction activities are involved in the project
Are not able to monitor the necessary parameters, as indicated in the relevant monitoring methodology, to provide a conservative and transparent estimate of emissions reductions achieved;	All necessary parameters can be monitored

It can be concluded from the above analysis that the proposed project complies with both the baseline and the monitoring methodologies of ACM0008. Besides, ACM0008 refers to ACM0002 for Emission Factor calculation of South China Power Grid and the “Tool for the demonstration and assessment of additionality” (version 03) for demonstration of project additionality.

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

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GHG emissions included in the project boundary：

	Source	**Gas**	**Included?**	**Justification / Explanation**
Baseline	Emissions of methane as a result of venting	CH_4	Included	Main emission source
	Emissions from destruction of methane in the baseline	CO_2	Excluded	No CMM utilization in the baseline scenario of this project
		CH_4	Excluded	According to ACM0008
		N_2O	Excluded	According to ACM0008
	Grid electricity generation (electricity provided to the grid)	CO_2	Included	Electricity generated from the project activity will substitute electricity purchasing from South China Power Grid
		CH_4	Excluded	According to ACM0008
		N_2O	Excluded	According to ACM0008
	Captive power and/or heat, and vehicle fuel use	CO_2	Included	Waste heat recovered from power generators will replace heat supply from coal combustion..
		CH_4	Excluded	According to ACM0008
		N_2O	Excluded	According to ACM0008
Project activitie s	Emissions of methane as a result of continued venting	CH_4	Excluded	According to ACM0008
	On-site fuel consumption due to the project activity, including transport of	CO_2	Included	Additional equipment used in the project such as compressors will lead to this part of emissions.
		CH_4	Excluded	According to ACM0008

	the gas	N_2O	Excluded	According to ACM0008
	Emission from methane destruction	CO_2	Included	Emissions of methane combustion in power generators.
	Emission from NMHC destruction	CO_2	Excluded	In this project, NMHC accounts for less than 1% by volume of extracted coal mine gas.
	Fugitive emissions of unburned methane	CH_4	Included	Small amount of methane will remain unburned in power generation and gas boilers.
	Fugitive methane emissions from on-site equipment	CH_4	Excluded	According to ACM0008
	Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH_4	Excluded	According to ACM0008
	Accidental methane release	CH_4	Excluded	According to ACM0008

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

>>
ACM0008 baseline methodology is applied to identify baseline scenario.

Step 1. Identify technically feasible options for capturing and/or using CMM

Step 1a. Options for CMM extraction

A. Ventilation air methane;
B. Pre mining CMM extraction;
C. Post mining CMM extraction;
D. Combination of ventilation, pre mining and post mining extraction, with ventilation accounting for approximately 82%, pre mining extraction accounting for approximately 6% and post mining extraction accounting for approximately 12%. This is the continuation of current CMM extraction practice in Qinglong mine.

Step 1b. Options for extracted CMM treatment

The CMM treatment options in the proposed coal mines include:
i. Venting. This it the continuation of existing CMM treatment practice;
ii. Using/destroying ventilation air methane rather than venting it;
iii. Flaring of CMM;
iv. Use for additional grid power generation;
v. Use for additional captive power generation;
vi. Use for additional heat generation;
vii. Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation);

Step 1c. Options for energy production

The alternatives for power generation include:

1. Electricity supply from South China Power Grid;
2. Electricity supply from captive coal-fired power generation of same scale;
3. CMM power generation for coal mine self use. This is the project activity not implemented as a CDM project.

The alternatives for heat production include:
4. Continuation of existing heat supply by coal-fired boilers;
5. Heat supply by gas boilers; this is project activities not implemented as a CDM project;
6. Waste heat recovery from CMM-fueled engine. This is project activity not implemented as a CDM project.

Step 2. Eliminate baseline options that do not comply with legal or regulatory requirements

Currently, methane control measures only come under the requirements of health and safety regulations governing the maximum methane concentration at various locations within an underground coal mine. It is only required that methane concentrations in the air to be below 1% to avoid the risk of explosion. (*National Coalmine Safety Regulation* 2001 version and 2005 version, Section Two item 100 –150[1]). In CMM drainage process, solely adopting pre mining or post mining could not meet the underground safety requirements. Usually they are combined adopted with ventilation. Thus, alternative B and C do not comply with the legal requirements. At present, solely adopting ventilation could not satisfy the 1% requirement, thus option A does not comply with the legal requirements either.

Total volumes of methane released by the coalmines are not regulated in China. While the Chinese government promotes the utilization of CMM, especially in June 2005, NDRC announced the *Coalmine Methane Treatment and Utilization Macro Plan* to encourage the CMM drainage and utilization; it specifically called on the incentives from CDM to overcome barriers in the country to take such action. Therefore, we can deem it as an E- national policy according to EB 22 Annex 3. In China no legislation is known or is being considered to make CMM usage mandatory at coalmines, thus all of the options meet local and regulatory requirements.

According to the Chinese power regulation, the construction of coal-fired power plant with a capacity of 135MW or below is prohibited in the national grid coverage area.[2] It also strictly controls the construction of coal fired power plant with unit capacity less than 100MW.[3] Thus, alternative 2 in energy generation stage does not comply with the local and regulatory requirements.

Step 3. Formulate optional baseline scenario alternatives

Baseline scenarios meet the regulatory requirements include:

Step 3a. Alternatives for CMM extraction

<u>*Alternative Scenario D*</u>

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[1] http://www.chinasafety.gov.cn/files/2004-12/09/F_42cd456f6a924f7f8d36815edaa3e531.pdf

[2] "*Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with Capacity of 135 MW or below issued by the General Office of the State Council*", decree no. 2002-6.。

[3] "*Temporary regulation of small scale coal fired units construction management"*(Aug, 1997)

Combination of ventilation, pre mining and post mining extraction, with ventilation accounting for approximately 82%, pre mining extraction accounting for approximately 6% and post mining extraction accounting for approximately 12%.

Step 3b. Alternatives for CMM treatment

Alternative Scenario i
CMM ventilation.

Alternative Scenario ii
VAM Utilization (methane concentration at $< 0.75\%$).

Alternative Scenario iii
Recovered CMM could simply be destroyed through flaring, while this option has not gained widespread acceptance in the coal mining community in China.

Alternative Scenario iv
Recovered CMM could be combusted in reciprocating engines or gas turbines that generates electricity for the regional grid.

Alternative Scenario v
Recovered CMM could be combusted in reciprocating engines or gas turbines that generates electricity for use directly at the coalmine.

Alternative Scenario vi
Recovered CMM could be combusted in gas boilers to produce thermal energy or heat at the coal mine. This thermal energy could be in the form of hot water, hot air or steam.

Alternative Scenario vii
Extracted CMM could be delivered to the local pipeline for residential or commercial use. The low pressure-type system usually requires the delivered gas to be $>30\%$ CH_4.

Step 3c. Alternatives for energy production

Scenarios for power generation include:
Alternative Scenario 1
Electricity supply from South China Power Grid.

Alternative Scenario 3
CMM power generation. This is the project activity not carried out as a CDM project.

Scenarios for heat production include:
Alternative Scenario 4
Continuation of existing situation - coal fired boilers for heat supply.

Alternative Scenario 5
Heat supply by gas boilers.

Alternative Scenario 6

Waste heat recovery from CMM-fueled engine. This is the project activity not carried out as a CDM project.

Step 4. Eliminate baseline scenario alternatives that face prohibitive barriers

Step4a. Barrier analysis of the alternatives for CMM extraction:

<u>*Alternative scenario D*</u>
This is the continuation of CMM extraction practice at the project site, thus it has no barriers.

Step4b. Barrier analysis of the alternatives for CMM treatment:

The barriers analyses of CMM treatment alternatives listed in Step 3b are as follows:

<u>*Alternative Scenario i*</u>
BAU, no barriers exist.

<u>*Alternative Scenario ii*</u>
Utilization of VAM is just on pilot stage. The technology is immature.

<u>*Alternative Scenario iii*</u>
Flaring does not utilize the energy potential of CMM, but requires great investment without any revenues. Chinese government does not regulate the extracted CMM to be treated, which lead to the fact that most of coal mines in China release the extracted CMM into the atmosphere directly. The investment and prevailing practice barriers above prevent flaring from being widely adopted in coal mining industry.

<u>*Alternative Scenario vi*</u>
In Qinglong mine, unmarketable waste coal is currently supplied for boilers. The replacement of coal boilers will not bring revenues but require additional investment. This is not a good choice for the coal mine owner. Thus, the scenario is eliminated.

<u>*Alternative Scenario vii*</u>
It requires a huge investment to build residential pipeline network. Additionally, in order to implement residential or commercial CMM usage, the project owner has to obtain permission from local authorities. Moreover, the coalmines are not capable to fulfil the gas fee charging and project management work. All these barriers make this option not a plausible one.

Step 4c. Barrier analysis of the alternatives for energy production:

<u>*Alternative Scenario 1*</u>
Electricity supply by South China Power Grid. No barrier exits.

<u>*Alternative Scenario 4*</u>
Continuation of existing practice – coal fired boilers for heat supply. No barrier exits.

<u>*Alternative Scenario 5*</u>
The barrier of this option is similar to the scenario *vi*. So it can not be the baseline scenario.

It is concluded from the discussion above that Alternative D in CMM extraction process complies with regulatory requirements and does not face any barriers. In CMM treatment step, Option *i*, *iv* and *v* meet the regulatory requirements and face no barriers. The economic analyses of those options will be carried out in step 5. In energy production stage, energy supply by South China Power Grid and heat supply by coal-fired boilers are the existing power and heat production approaches without any barriers. In the following step, the option of waste recovery from the power engines will be discussed.

Step 5. Identify most economically attractive baseline scenario alternative

Sub-step 5b Investment comparison analysis

The benchmark or hurdle internal rate of return (IRR) is determined by individual project development or investment companies. This rate of return can be influenced by perceived technical and/or political risk and by the cost of money. International project developers or investors will not invest in projects that do not meet a minimum IRR, often referred to as hurdle rates. Internationally accepted hurdle rates in the energy industry vary but range from a low of 11% up to 24% and expected payout periods range from two to five years. The Confederation of British Industry (CBI) conducted a poll of 337 industrial investors in year 2001 and found that the average large industry used 13.5% for its hurdle rate[4].

Another commonly used practice is to add a risk related factor to the prevailing cost of capital. New York University produced a survey that included the cost of capital in the energy related sectors (coal, petroleum, electric utilities). The average for this aggregate of energy industries is approximately 10.4% while the average cost of equity is approximately 9.0%[5]. A survey found in the magazine Corporate Finance suggests that a risk premium that should be added to project investment in China should average to approximately five percent, which indicates the IRR requirements for such projects would be 14.0%, or considering the cost of equity, at 15.4%.

Thus a hurdle rate that might be assumed for this project using this method is 14.0%.

In this step, economic evaluation will be carried out to the alternative scenarios that were not analyzed in the steps above:

According to the feasibility study of the proposed project, basic data required for financial indicators calculation are:

Table B-4 IRR comparison of scenario i and *v*

	alternative v
Total investment	2,183,300$
Annual operation, maintenance cost	95,600$/y
City Construction Tax & Additional Charge for Education	2,500$/y
Life of project	20 years
Revenue	780,200$/y
IRR	6.03%
Benchmark IRR	14%

[4] Department of Trade and Industry and HM Treasury. *2004. Productivity in the UK* 5: Benchmarking UK productivity performance. DTI Economics Papers Series: 27-28.

[5] Damodaran, Aswath. 2005. *Cost of Capital by Sector*.

The IRRs of alternative *v* is much lower than the BAU benchmark IRR, so it can not be the baseline alternative. Since the power tariff is lower than the price of power purchased, the scenario *iv* has a lower IRR than scenario *v*. All the facts mean that neither scenario *iv* nor *v* can be the baseline scenario.

Alternatives for heat production:

Alternative Scenario 3
This option faces the barriers of scenario *v*, so it can not be the baseline scenario.

Alternative Scenario 6
The barriers prevent the CMM power generation from being implemented, which leads to the fact that recovery of waste heat can not be realistic. This option could not be the baseline scenario.

Sub-step 5c. Sensitive Analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

The following key parameters have been selected as sensitive elements to test the financial attractiveness for the proposed project.

i. Total investment
ii. Operation cost
iii. Annual power supply
iv. Electricity price

The effect of Electricity price on IRR is same as that of Annual power supply. Electricity price in Chinese market will not be changed largely in the foreseen future. So the parameter of Annual power supply is selected for sensitivity analysis. The effect of changes in Total investment, Operation cost and Annual power supply will be examined on the internal return rate (IRR). Assuming these three parameters to change within the range between (-10%~+10%), the outcomes of IRR sensitivity are presented in the following table.

Table B-5: Sensitive analysis of alternative *v*

	-10%	-5%	0%	5%	10%
Investment	8.35%	7.13%	6.03%	5.03%	4.13%
Operation Cost	7.01%	6.53%	6.03%	5.52%	4.99%
Annual Power Supply	-5.74%	1.60%	6.03%	9.47%	12.38%

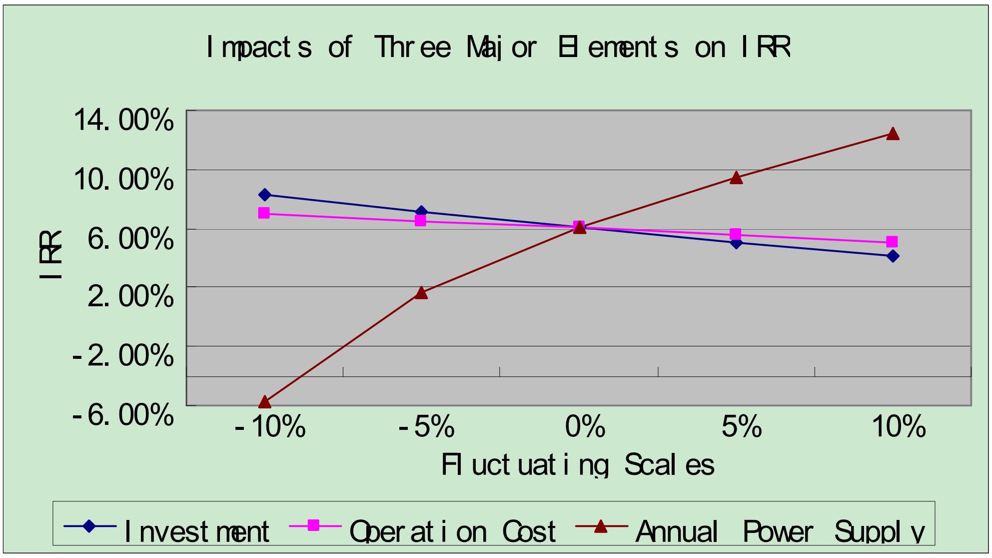

Figure B-1 Impacts of three major uncertain elements on IRR (alternative v)

From the calculation outcomes as shown in the Table above, the IRR of alternative *v* will vary to different degrees with these three uncertain parameters changing between -10% and +10%. It can be seen from Figure B-1that the highest IRR of the alternative do not exceed the benchmark value of 14% when the investment and operational cost decrease by 10% and annual power generation increases by 10%. Therefore, a conclusion can be made that none of those alternatives can be the baseline scenario even considering the key parameters sensitivity.

In conclusion, only alternative scenario D can be implemented in the CMM drainage stage. Except for BAU options, the rest alternatives in the CMM treatment stage and energy production stage all face great barriers. Therefore, only business as usual scenario – continuation of the current CMM extraction practice with all the extracted CMM released into atmosphere, power purchase from South China Power Grid and heat supply by coal combustion is the baseline scenario.

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

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The proposed project activity will not occur without CDM assistance. *"Tools for the Demonstration and Assessment of Additionality" (version 03)* will be used to test the additionality of the proposed project. Based on ACM0008, Step 1 can be omitted.

Step 2. Investment Analysis

The purpose of investment analysis is to determine whether the proposed project is economically attractive. The following sub steps are adopted to assess the investment analysis:

Sub-step 2a. Determine appropriate analysis method

Tools for Demonstration and Assessment of Additionality provides three analysis methods: "Simple cost analysis" (option I), "Investment comparison analysis" (option II), and "Benchmark analysis" (option III). Considering that there are not only CDM revenues but also the power sale revenues, option I is not adopted here. "Investment comparison analysis" method is not applicable either because the baseline is not an investment project. Thus the method of "Benchmark analysis" is applied to assess the economic attractiveness of the proposed project.

Sub-step 2b. Apply benchmark analysis

As discussed in step 5 of B.4, it is considered that only is the IRR of proposed project equal to or higher than the benchmark IRR, can the project be economically feasible.

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

IRR for the proposed project without CDM assistance is 6.03%, which is lower than the benchmark value of 14%. With CDM assistance, assuming the price of CERs is 10$/t$CO_2$e, the project IRR will reach 31.94% that is much higher than benchmark. Therefore, a conclusion can be made that the proposed project is not economically attractive without revenues from CDM.

Table B-6 Project IRR with and without CDM

	IRR without CDM	IRR with CDM
Qianxi Project	6.03%	31.64%

Sub-step 2d. Sensitivity analysis

Refer to step 5 of B.4.

Step 4. Common Practice Analysis

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

China is the largest coal producer in the world, and the country is the biggest mine methane emission country in the world due to coal mining. By the year 2004, the annual mine methane recovery of state important mines is up to 1.866 billion m^3. However, due to the complicated situation of geology, coal mine methane drainage was less than 23% and utilization was less than 50% as the result of shortage of methane utilization facilities in China.[6] The utilisation of methane is mainly in household, accounting for nearly 70%. For the mines normally using underground drainage system to acquire methane, the concentration and production is unstable. Thus it does not form big-scale commercial utilisation area of methane.[7]

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

The proposed project is the first CMM power generation project in Jiangxi province. Currently, similar projects that are being proposed at coalmines in China such as Huainan, Yangquan, Jincheng, Hegang,

[6] China Coal Information Institute (CCII), *New Development of CMM Projects in China*, The 5th International Symposium on CBM/CMM in China, Beijing, China, November 30 – December 2, 2005

[7] China Coal Information Institute (CCII), *New Development of CMM Projects in China*, The 5th International Symposium on CBM/CMM in China, Beijing, China, November 30 – December 2, 2005

Tiefa, Songzao and Pingdingshan are only with CDM incentives[8]. So a conclusion can be made that the proposed project activity is not a common practice in China and it could be carried out only with CDM assistance.

In conclusion, it is obvious that the proposed project activity is not part of baseline scenario. Without additional support from CDM, the proposed scenario will not occur. The proposed project has strong additionality and will reduce the greenhouse gas emissions. If the proposed project fails to be registered as a CDM project, this emission reduction can not be realized.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The emission reduction ER_y by the project activity during a given year *y* is the difference between the baseline emissions (BE_y) and project emissions (PE_y), and also eliminates the leakage of CDM project activities (LE_y) as follows:

$ER_y = BE_y - PE_y - LE_y$

where:
ER_y: Emissions reductions of the project activity during the year y (tCO_2e)
BE_y: Baseline emissions during the year y (tCO_2e)
PE_y: Project emissions during the year y (tCO_2e)
LE_y: Leakage emissions in year y (tCO_2e)

In order to determine this value, we should firstly to determine the baseline emissions, the project emissions and the leakage emissions.

1. Project Emissions

Project emissions are defined by the following equation:

$PE_y = PE_{ME} + PE_{MD} + PE_{UM}$

where:
PE_y: Project emissions in year y (tCO_2e)
PE_{ME}: Project emissions from energy use to capture and use methane (tCO_2e)
PE_{MD}: Project emissions from methane destroyed (tCO_2e)
PE_{UM}: Project emissions from un-combusted methane (tCO_2e)

1.1 Combustion emissions from additional energy required for CMM capture and use PE_{ME}

Additional power energy may be used to capture, transport, compress and use the CMM. Emissions from this energy use should be treated as project emissions. The formula is as follows:

$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC}$

[8] China Coal Information Institute, *New Development of CMM Projects in China*, page 190, The 5th International Symposium on CBM/CMM in China & "Methane to Markets Partnership" Regional Workshop in China, November – December 2005

PE_{ME}: Project emissions from energy use to capture and use methane (tCO_2e)
$CONS_{ELEC, PJ}$: Additional electricity consumption for capture and use of methane (MWh)
CEF_{ELEC}: Carbon emissions factor of electricity used by coal mine, which is the emission factor of South China Power Grid in this project (tCO_2e/MWh)

1.2 Combustion emissions from use of captured methane PE_{MD}

When the captured methane is burned in a power plant, combustion emissions are released. In addition, if NMHC accounts for more than 1% of the coalmine gas, combustion emissions from these gases should also be included. In each end-use, the amount of gas destroyed depends on the efficiency of combustion of each end use. The proposed project activity doesn't involve CMM fuelled boilers, gas for residential or vehicle utilization, or flaring. Therefore, the formula will be as following:

$$PE_{MD} = MD_{ELEC} \times (CEF_{CH4} + r \times CEF_{NMHC})$$

with:
$$r = PC_{NMHC} / PC_{CH4}$$

where:
PE_{MD}: Project emissions from CMM destroyed (tCO_2e)
MD_{ELEC}: Methane destroyed through power generation (tCH_4)
CEF_{CH4}: Carbon emission factor for combusted methane ($2.75tCO_2e/tCH_4$)
CEF_{NMHC}: Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) ($tCO_2e/tNMHC$)
r: Relative proportion of NMHC compared to methane
PC_{CH4}: Concentration (in mass) of methane in extracted gas (%)
PC_{NMHC}: NMHC concentration (in mass) in extracted gas (%)

$$MD_{ELEC} = MM_{ELEC} \times Eff_{ELEC}$$

where:
MD_{ELEC}: Methane destroyed through power generation (tCH_4)
MM_{ELEC}: Methane measured sent to power plant (tCH_4)
Eff_{ELEC}: Efficiency of methane destruction/oxidation in power plant (taken as 99.5% from IPCC)

1.3 Un-combusted methane from end uses PE_{UM}

Not all of the methane sent to generate power and gas boiler will be combusted, so a small amount will escape to the atmosphere. Use the following equation to calculate PE_{UM}:

$$PE_{UM} = GWP_{CH4} \times MM_{ELEC} \times (1 - Eff_{ELEC})$$

where:
PE_{UM}: Project emissions from un-combusted methane (tCO_2e)
GWP_{CH4}: Global warming potential of methane ($21tCO_2e/tCH_4$)
MM_{ELEC}: Methane measured sent to power generation (tCH_4)
Eff_{ELEC}: Efficiency of methane destruction/oxidation in power generation (taken as 99.5% from IPCC)

2. Baseline Emissions

Baseline emissions are given by the following equation:

$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y}$

where:
BE_y: Baseline emissions in year y (tCO_2e)
$BE_{MD,y}$: Baseline emissions from destruction of methane in the baseline scenario in year y (tCO_2e)
$BE_{MR,y}$: Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO_2e)
$BE_{Use,y}$: Baseline emissions from the production of power or heat replaced by the project activity in year y (tCO_2e)

2.1 Methane destruction in the Baseline $BE_{MD,y}$

In baseline scenario, all the drained gas is vented without any utilization, thus $BE_{MD,y} = 0$.

2.2 Methane released into the atmosphere $BE_{MR,y}$

All the extracted gas before implementing project activity was released into the atmosphere. However, only the portion of CMM sent to the project activity is accounted for in this calculation. The methane that still vented in the project scenario is not included in either the project emissions or the baseline emissions calculations, since it is vented in both scenarios.

Because there is no pre-mining drainage in the proposed project, only post-mining drainage gas is considered. Using the following equation to calculate $BE_{MR,y}$.

$BE_{MR,y} = GWP_{CH4} \times (CMM_{PJ,ELEC,y} + PMM_{PJ,ELEC,y}) = GWP_{CH4} \times MM_{ELEC}$

where:
$BE_{MR,y}$: Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO_2e)
GWP_{CH4}: Global warming potential of methane ($21 tCO_2e/tCH_4$)
$CMM_{PJ,ELEC,y}$: Pre-mining CMM captured, sent to and destroyed by power generation in the project activity in year y (tCH_4)
$PMM_{PJ,ELEC,y}$: Post-mining CMM captured, sent to and destroyed by power generation in the project activity in year y (tCH_4)

2.3 Emissions from power and heat cogeneration replaced by project $BE_{Use,y}$

The power generation in the proposed project will avoid the grid-connected electricity consumption. The utilization of thermal energy produced in the power generation process will replace the coal consumption in the baseline scenario. The following equation is used to calculate $BE_{Use,y}$:

$BE_{Use,y} = GEN_y \times EF_{ELEC} + HEAT_y \times EF_{HEAT}$

where:
$BE_{Use,y}$: Baseline emissions from the production of power or heat replaced by the project activity in year y (tCO_2e)
GEN_y: Electricity generated by project activity in year y (MWh)

EF_{ELEC}: Emissions factor of electricity (grid) replaced by project (tCO_2/MWh)
$HEAT_y$: Waste heat recovered by project activity in year y (GJ)
EF_{HEAT}: Emissions factor for heat production replaced by project activity (tCO_2/GJ)

2.3.1 Grid power emissions factor EF_{ELEC}

The emission factor for displaced electricity is ex-ante calculated using methodology ACM0002. The equation is:

$EF_{ELEC,y} = 0.5 \times EF_{OM,y} + 0.5 \times EF_{BM,y}$

1) Operating Margin (OM)

ACM0002 provides the following 4 methods to calculate OM:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

According to the *Notification on Determining Baseline Emission Factor of China Grid*, Method (a) Simple OM is adopted for the calculation of the operating margin emission factor(s) ($EF_{OM,y}$) of the project. In accordance with the consolidated baseline methodology ACM0002, the Simple OM emission factor ($EF_{OM,simple,y}$) is calculated ex ante. The formula of $EF_{OM,simple,y}$ calculation is:

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

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

Where CO_2 emission coefficient $COEF_{i,j,y}$ can be calculated by following equation:

$COEF_i = NCV_i * EF_{CO2,i} * OXID_i$

where:
NCV_i: The net calorific value of fuel i per unit mass or unit volume (energy content).
$OXID_i$: Oxidation factor of the fuel.
$EF_{CO2,I}$: CO_2 emission factor per unit of energy.

2) Build Margin (BM)

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

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}}$$

where:
$F_{i,m,y}$ is the amount of fuel *i* consumed by plant *m* in year y (tce);
$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/tce), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in plant *m*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the South China Power Grid by plant *m* in year *y*. It is the difference between power generation and self-consumption.

Option 1, calculate the Build Margin emission factor ($EF_{BM,y}$) ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission was selected for the Project.

According to the consolidated baseline methodology ACM0002, the sample group *m* consists of either (1) the five power plants that have been built most recently, or (2) 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. It is suggested that the sample group that comprises the larger annual generation should be used.

Considering the data availability, CDM EB accepts the following deviation[9]:
1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.
2) Use of weights estimated using installed capacity in place of annual electricity generation.

It is also suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

So for the project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. Finally, calculate the emission factor use the efficiency level of the best technology commercially available in China.

2.3.2 Heat generation emissions factor EF_{HEAT}

$$EF_{heat,y} = \frac{EF_{CO2,i}}{Eff_{heat}} \times \frac{44}{12} \times \frac{1\,TJ}{1000\,GJ}$$

where:
$EF_{heat,y}$: Emissions factor for heat generation (tCO_2/GJ)
$EF_{CO2,i}$: CO_2 emissions factor of coal used in heat generation (tC/TJ)
Eff_{heat}: Boiler efficiency of the heat generation (%)
44/12: Carbon to Carbon Dioxide conversion factor
1/1000: TJ to GJ conversion factor

9 Http://cdm.unfccc.int/Projects/Deviations.

3. Leakage

Leakage is given by the following equation:

$LE_y = LE_{d,y} + LE_{o,y}$

where:
LE_y: Leakage emissions in year y (tCO_2e)
$LE_{d,y}$: Leakage emissions due to displacement of other baseline thermal energy use of methane in year y (tCO_2e)
$LE_{o,y}$: Leakage emissions due to other uncertainties in year y (tCO_2e)

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	Tce
Description:	Amount of fuel *i* consumed by power sources *j* in year y
Source of data used:	*"China Energy Statistical Yearbook"*
Value applied:	See Annex 3 calculation of emission factor
Justification of the choice of data or description of measurement methods and procedures actually applied :	*"China Energy Statistical Yearbook"*
Any comment:	-

Data / Parameter:	$F_{i,m,y}$
Data unit:	Tce
Description:	Amount of fuel *i* consumed by plant *m* in year y
Source of data used:	*"China Energy Statistical Yearbook"*
Value applied:	See Annex 3 calculation of emission factor
Justification of the choice of data or description of measurement methods and procedures actually applied :	*"China Energy Statistical Yearbook"*
Any comment:	-

Data / Parameter:	NCV_i
Data unit:	$MJ/t,km^3$
Description:	Net calorific value (energy content) of fuel *i* per mass or volume
Source of data used:	*"China Energy Statistical Yearbook"*
Value applied:	See Annex 3 calculation of emission factor
Justification of the choice of data or description of	*"China Energy Statistical Yearbook"*

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation rate of different energy
Source of data used:	*IPCC 1996*
Value applied:	Different energy has different Oxidation rate value
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from IPCC 1996
Any comment:	

Data / Parameter:	EF_i
Data unit:	-
Description:	Oxidation factor of the fuel
Source of data used:	*"China Energy Statistical Yearbook"*
Value applied:	See Annex 3 calculation of emission factor
Justification of the choice of data or description of measurement methods and procedures actually applied :	*"China Energy Statistical Yearbook"*
Any comment:	-

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ
Description:	CO_2 emission factor of coal used in heat generation
Source of data used:	IPCC default value
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from IPCC 1996
Any comment:	-

Data / Parameter:	Eff_{heat}
Data unit:	%
Description:	Boiler efficiency of heat plant
Source of data used:	ACM0008 Option B of Section 7.4.4
Value applied:	100
Justification of the choice of data or description of measurement methods and procedures actually applied :	Assuming a boiler efficiency of 100% as a conservative approach
Any comment:	-

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

1. Project Emissions

1.1 Combustion emissions from additional energy required for CMM capture and use PE_{ME}

1.1.1 Grid power emissions factor EF_{ELEC}

As stated in Annex 3, the OM of South China Power Grid is 0.9853tCO_2/MWh. The BM of South China Power Grid is 0.5628tCO_2/MWh. The following formula is used for calculation:

EF_{ELEC} = 0.5* EF_{OM} + 0.5* EF_{BM} = 0.5*0.9853 + 0.5*0.5628 = 0.7741tCO_2e/MWh

1.1.2 Calculation of PE_{ME}

Self power consumption of the proposed project accounts for 10% of the total power generated, thus the value of $CONS_{ELEC,PJ}$ can be estimated by the total power generation. Total power generated is calculated based on the parameters shown in the feasibility study of the project. The actual power generation and consumption by the proposed project in the crediting period will be monitored by power meters.

After the project is fully operated:

PE_{ME} = $CONS_{ELEC,PJ}$ x CEF_{ELEC} = 20,160*10%*0.7741 = 1,561tCO_2e/y

1.2 Combustion emissions from use of captured methane PE_{MD}

According to gas sample analysis in the proposed coalmine, the NMHC concentration is too low to be measured, thus the combustion emissions from non-methane hydrocarbons will be ignored. The NMHC concentration will be monitored annually in Qinglong coalmine to checkout whether its concentration is below or above 1% to determine whether NMHC combustion is to be included in the project emissions.

PE_{MD} = MD_{ELEC} x CEF_{CH4}

According to ACM0008, the concentration of CH_4 is 0.00067 t/m^3(IPCC default value).The value of MD_{ELEC} is given in the feasibility study of the proposed project: MD_{ELEC} = 5.78Mm^3/y = 3,870t/y
Thus:

PE_{MD} = 3,870*2.75 = 10,642tCO_2e/y

1.3 Un-combusted methane from end uses PE_{UM}

MM_{ELEC} in the formula of PE_{UM} is calculated based on the value of MD_{ELEC} and the Eff_{ELEC}:

$MM_{ELEC} = MD_{ELEC}/Eff_{ELEC}$ = 3,870/99.5% = 3,889t/y

$PE_{UM} = GWP_{CH4}$ x MM_{ELEC} x $(1 - Eff_{ELEC})$ = 21*3,889*(1-99.5%) = 408tCO_2e/y

1.4 The calculation results of project emissions

Table B-7 Project emissions at the proposed coalmines (tCO_2e)

Year	PE_{ME}	PE_{MD}	PE_{UM}	PE_y
2008	1,236	8,615	331	10,209
2009	1,561	10,642	408	12,611
2010	1,561	10,642	408	12,611
2011	1,561	10,642	408	12,611
2012	1,561	10,642	408	12,611
2013	1,561	10,642	408	12,611
2014	1,561	10,642	408	12,611
Total	10,627	72,469	2,781	85,877

2. Baseline Emissions

2.1 Methane destruction in the Baseline $BE_{MD,y}$

In baseline scenario, all the drained gas is vented without any utilization, thus $BE_{MD,y}$ = 0.

2.2 Methane released into the atmosphere $BE_{MR,y}$

$BE_{MR,y} = GWP_{CH4}$ x MM_{ELEC} = 21*3,889 = 81,677tCO_2e/y

2.3 Emissions from power and heat generation replaced by project $BE_{Use,y}$

2.3.1 Grid power emissions factor EF_{ELEC}

As stated in 1.1.1, EF_{ELEC} = 0.7741tCO_2e/MWh

2.3.2 Heat generation emissions factor EF_{HEAT}

Ex-ante identified $EF_{CO2,coal}$ and Eff_{heat} have been given in B.6.2.

$EF_{heat,y}$ = 25.8*44/12/1000 = 0.0946tCO_2e/GJ

The value of GEN_y and $HEAT_y$ are given in feasibility study of the proposed project. In crediting period, they will be obtained by monitoring.

After the project is fully operated:

$BE_{Use,y} = GEN_y$ x EF_{ELEC} + $HEAT_y$ x EF_{HEAT} = 20,160*90%*0.7741 + 41,472*0.0946 = 17,969tCO_2e/y

2.4 The calculation results of baseline emissions

Table B-8 Baseline emissions of proposed project（ tCO_2e ）

Year	BE_{MD}	BE_{MR}	BE_{Use}	BE_y
2008	0	66,120	14,546	80,666
2009	0	81,677	17,969	99,646
2010	0	81,677	17,969	99,646
2011	0	81,677	17,969	99,646
2012	0	81,677	17,969	99,646
2013	0	81,677	17,969	99,646
2014	0	81,677	17,969	99,646
Total	0	556,184	122,357	678,541

3. Leakage

There is not any CMM utilisation in the baseline scenario, so no displacement of baseline thermal energy uses would occur; no CBM drainage involves; no noticeable impact of CDM project activity on coal production since the baseline scenario is not ventilation only; no reliable scientific information is currently available to assess the risk of impact of CDM project activity on coal prices and market dynamics. Therefore, no leakage effects need to be accounted for under this proposed project. $LE_y = 0$.

4. Emission Reductions

No leakage occurs outside the project boundary, so the emission reduction (ER_y) by the project activity during a given year y is the difference between the baseline emissions (BE_y) and project emissions (PE_y).

After the project is fully operated:

$ER_y = BE_y - PE_y$ = 678,541- 85,877 = 592,664tCO_2e/y

The relevant parameters used for the calculation are shown in Annex 3.
>>

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2008	10,209	80,666	0	70,457
2009	12,611	99,646	0	87,035
2010	12,611	99,646	0	87,035

2011	12,611	99,646	0	87,035
2012	12,611	99,646	0	87,035
2013	12,611	99,646	0	87,035
2014	12,611	99,646	0	87,035
Total (tonnes of CO_2e)	**85,877**	**678,541**	**0**	**592,664**

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

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	MM_{ELEC}
Data unit:	tCH_4/y
Description:	Methane sent to power plant
Source of data to be used:	The volume value is given in feasibility study. The mass value is calculated based on the concentration of methane.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3,889 (After the project is fully operated)
Description of measurement methods and procedures to be applied:	Continuously monitored by gas flow meters adjusted by temperature and pressure
QA/QC procedures to be applied:	Flow meters will be subject to a regular maintenance regime to ensure accuracy.
Any comment:	-

Data / Parameter:	CEF_{NMHC}
Data unit:	$tCO_2e/tNMHC$
Description:	Carbon emission factor for combusted non methane hydrocarbons
Source of data to be used:	To be obtained through annual analysis of the fractional composition of captured gas. If the NHMC concentration is less than 1%, its emissions can be ignored.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Annually monitoring and analyzing NHMC concentration. If it is above 1%, determining each carbon emission factor of different components.
QA/QC procedures to be applied:	Instruments will be subject to a regular maintenance regime before analysing gas components to ensure accuracy.
Any comment:	-

Data / Parameter:	PC_{CH4}
Data unit:	%
Description:	Concentration of methane in extracted gas
Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Continuously monitoring concentration using optical and calorific meters.
QA/QC procedures to be	Concentration meters will be subject to a regular maintenance regime to

applied:	ensure accuracy.
Any comment:	-

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration in coal mine gas
Source of data to be used:	To be obtained through annual analysis of the fractional composition of captured gas. If NMHC concentration is less than 1%, it is not accounted.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not accounted
Description of measurement methods and procedures to be applied:	Annually monitoring NHMC concentration to determine whether its emissions to be included in the calculation.
QA/QC procedures to be applied:	Instruments will be subject to a regular maintenance regime before analysing gas components to ensure accuracy.
Any comment:	-

Data / Parameter:	GEN_y
Data unit:	MWh/y
Description:	Net power supplied
Source of data to be used:	The value is provided by feasibility study
Value of data applied for the purpose of calculating expected emission reductions in section B.5	18,144 (After the project is fully operated)
Description of measurement methods and procedures to be applied:	Continuous measured by electricity meters
QA/QC procedures to be applied:	Power meters will be subject to a regular maintenance regime to ensure accuracy.
Any comment:	

Data / Parameter:	$HEAT_y$
Data unit:	GJ/y
Description:	Total waste heat recovered by the project
Source of data to be used:	Provided by feasibility study
Value of data applied for the purpose of calculating expected emission reductions in section B.5	41,472 (After the project is fully operated)
Description of measurement methods and procedures to be applied:	Thermometer and flow meter are adopted to continuously monitor the temperature difference of the heated medium and its flow rate to determine the amount of waste heat recovery.
QA/QC procedures to be applied:	Thermometer and flow meter are adopted to continuously monitor the temperature difference of heated medium and its flow rate to determine the amount of waste heat recovery.

Any comment:	

B.7.2. Description of the monitoring plan:

>>
The implementation of the monitoring plan is to ensure that real, measurable, long-term Greenhouse Gas Emissions Reduction can be monitored, recorded and reported. It is a crucial procedure to identify the final CERs of the proposed project. This monitoring plan for the proposed project activity will be implemented by the project owner, Qianxi Energy Development Co., Ltd. and supervised by the CDM project developer, Millennium Capital Services.

1. What data will be monitored?

As is shown in Section B7.1, the detailed meters installation is illustrated in the following figure:

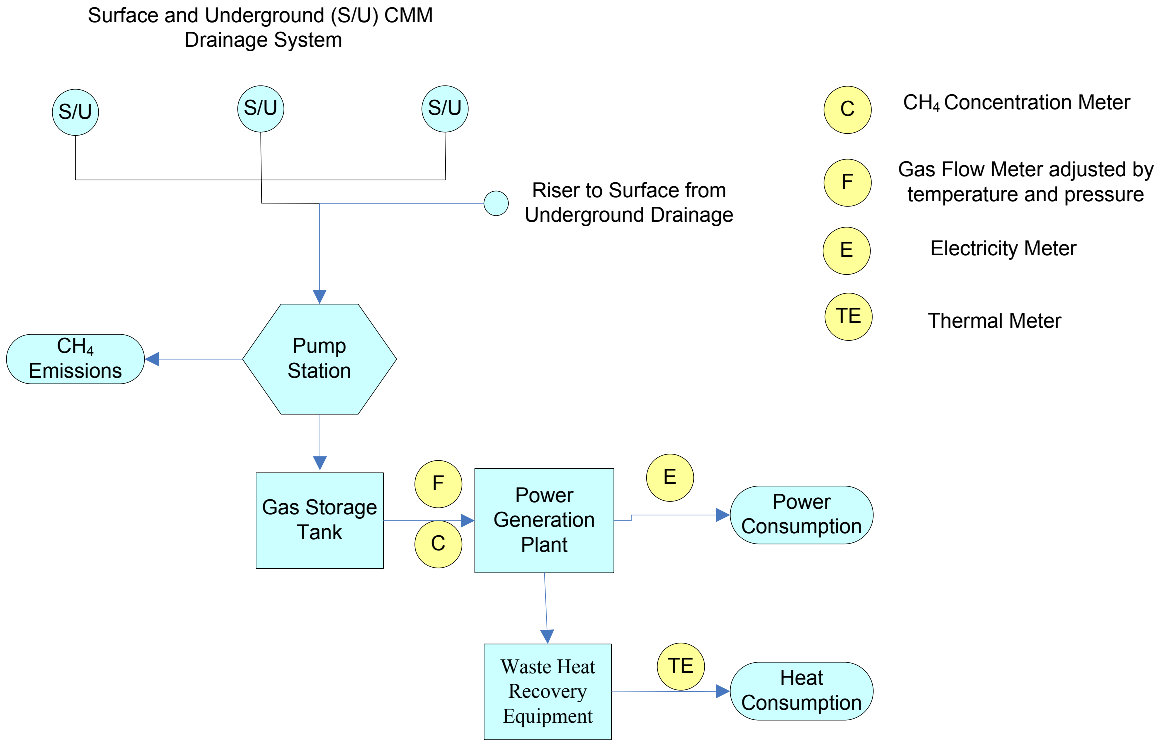

Figure B-2 Monitoring plan of Proposed Project Activity

2. How will the data be monitored, recorded and managed?

All meters installed in the proposed project should be accorded with national standard. All the equipment used should be serviced, calibrated and maintained in accordance with the original manufacturers' instructions and complete records preservation. Data storage and filing system is to be established.

Record preservation is the most important process in the monitoring plan. Without accurate and efficient record keeping, project emission reductions can not be verified. The responsible personnel for monitoring CDM related data and tracking CDM related information would be appointed by the proposed project owner and supervised by the CDM developer, Millennium Capital Services.

The data are analyzed on a daily basis by the operator. In case of a drift of one parameter the operator can react quickly and fix any potential problems. All data required for the emission reduction calculations will be kept in the onsite-monitoring database. On a regular basis, all monitoring information is analyzed following the formulae in Section B.6. The management structure is as follows:

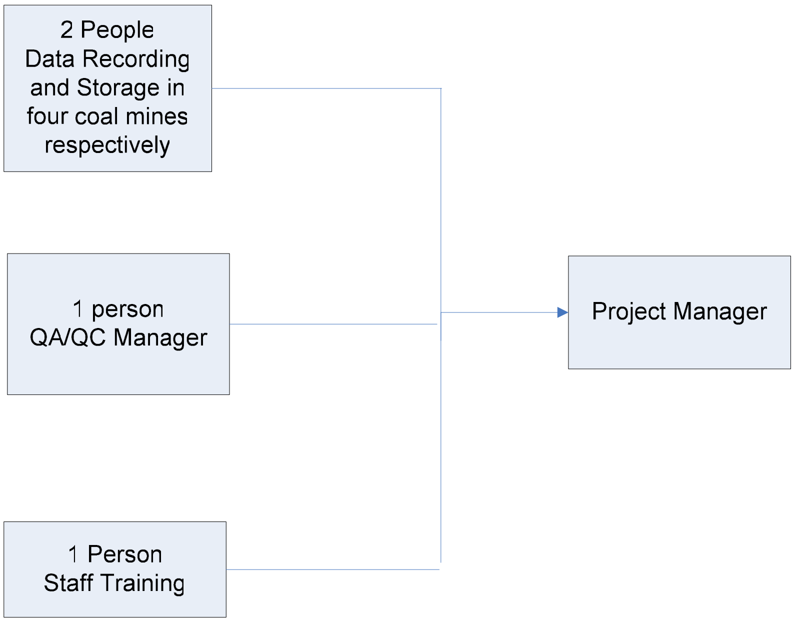

Figure B-3 Operational management structure chart of the project

3. Calibration of Meters and Metering

The following procedures will be undertaken to calibrate the equipment used in the proposed project:
1) The metering equipment shall have sufficient accuracy so that error resulting from such equipment shall not exceed national standard requirements;
2) The metering equipment will be properly calibrated and checked annually for accuracy;
3) The electricity meters will be tested by the local grid company.

4. Verification Procedure

The main objective of the verification is to independently verify whether the emission reductions reported in the PDD has been achieved by the proposed project. It is expected that the verification could be done annually.

Main verification activities for the proposed project include:
1) The project owner, Qianxi Energy Development Co., Ltd. will sign a verification service agreement with specific DOE in accordance with relevant EB regulations;
2) The project owner will provide the completed data records and other CDM related information to DOE during verification;
3) The project owner will cooperate with DOE to implement the verification process, i.e. the personnel in charge of monitoring and data handling should be available for interviews and answer questions honestly;

To be summarized, the project owner of Qianxi Energy Development Co., Ltd., under supervision of Millennium Capital Services, will implement a proper monitoring plan to make sure that the emission reductions for the proposed project would be measured accurately.

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 baseline and monitoring study was completed on: 20/03/2007

The entity determining the methodology is:

Name/origination	Project participate Yes/No
Millennium Capital Services 1202 Jinbao Office Building, 89 Jinbao Street, Beijing 100005 P.R.China Tel: +86(10) 85221916 Fax: +86(10) 85221906	No

SECTION C. Duration of the project activity / Crediting period

C.1 . Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/03/2006

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

>>
20 years

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

>>
Renewable crediting period

C.2.1. Renewable crediting period

>>

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

>>
01/01/2008

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

>>
Not applied.

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

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

>>
The purpose of the environmental impacts assessment is to evaluate whether the proposed project could have potentially adverse impacts on the environment. The EIA statement for the proposed project was approved by Guizhou Environmental Protection Bureau in December 2006. In the assessment, the proposed project has been considered with respect to potential impacts on air quality, water quality, solid waste, noise and traffic. The findings of this evaluation are summarised below.

AIR QUALITY
In construction period, construction equipment and transport activities as well as raw construction materials will bring air pollution. Dust is mainly brought by construction materials, dust piling up, loading activities, etc. Some measures will be adopted in order to mitigate the air pollution. They are: 1) reducing the height of pulverous materials and frequently watering them; 2) covering the transportation trucks or adopting special tight trucks in case of necessity.

Based on the air quality impact assessment, the maximum ground concentration of NO_2 is far lower than the requirement of secondary standard of "Ambient air quality standard" (GB3095-1996), which only brings slight effects to the environment. As a clean fuel, CMM power generation will result in obvious environmental benefits.

WATER QUALITY
The wastewater pollutants mainly come from drained water of construction site, equipment cleaning water, and municipal water of workers in construction period. The drained wastewater will be clarified first and then discharged. The oily waster from equipment cleaning will be treated in wastewater treatment plant of Qinglong mine. The municipal wastewater will be transmitted to the municipal wastewater treatment station of the mine. Once all the above measures are adopted, the adverse effects on the water environment will be greatly mitigated.

In operation period, municipal wastewater is the main source of the pollution. It is estimated that the volume of discharged water will be $2.0m^3/d$, which only accounts for 0.16% of the designed capacity of the municipal wastewater station of Qinglong mine. This will not greatly affect the water treatment system. Thus, it can be concluded that the wastewater from the power generation will not bring adverse effects to the surrounding water environment.

NOISE
Potential sources of noise during construction include construction equipment and transporting. There are no sensitive receptors such as residents within 200m area. When the noise level of construction equipment is 100dB (A), it has the 54.0dB (A) of noise level at the place 200m away from the equipment. When noise level from the equipment is 105dB (A), it is 59.0dB (A) at the place of 200m away. Thus, the noise pollution from the construction site can not affect the residents.

In operation period, the noise sources are power engines and the circulating cooling tower. It will adopt sound proof doors and windows, denoised PVC boards and other sound proof materials to reduce the noise level. In addition, intake and outtake pipelines are all sound proof to mitigate the noise level. No residents will be affected since the power station is located in the middle of hillside without any residents living nearby.

SOLID WASTE

The construction and municipal solid waste will be carried to rubbish dump for storage and recover the valuable components. Once management is effectively adopted, the solid waste will not lead to adverse effects on the environment.

In operation period, the municipal waste will be centralized treated so that no adverse effects will be left to the environment.

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

>>

No significant negative environmental impacts are expected to result in from the project activity. On the contrary, the project will lead to a significant reduction of local pollution along with a great decrease of GHG emissions.

SECTION E. Stakeholders' comments

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

>>

During the environmental impact assessment process, the public participation is organised by the project owner and supported by the EIA operator. The interviewees are mainly the villagers nearby and workers who probably be directly affected by the proposed power generation. Public participation process adopted the method of sending "Public Opinion Questionnaires" and publishing documents on the billboard of the village.

The questionnaire was mainly focused on the economic development, water quality, air quality, noise and other hot issues. 30 questionnaires were sent out during the investigation with replied number of 29 (rate 96.7%).

E.2. Summary of the comments received:

>>

The results show that most of people think that the local economy is good and agree that the proposed project could stimulate the economic development. No one denied the stimulation effects of the project on economic development.

For environmental problems, most of people agree that the construction of the project would not bring adverse effects to the water quality, air quality and residential health. Part of publics has no idea of the effects on the environment. All the public think that there is no effect on the local transportation and agree that the benefits of the proposed project will overwhelm the flaws. 96.6% of the interviewees support the implementation of the project while 1 person has no idea.

In addition, the investigators also widely communicated with the residents about the project construction. Most of people think that the project could bring benefits to local economic development. It will also bring more working opportunities, increase public incomes and effectively avoid the accidents of CMM explosion.

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

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From the survey it could be concluded that the majority of public in the mining area is supportive to the construction and operation of the project activity. They think that the proposed project will promote local economic development, improve the local residential daily life and environmental quality, etc. However, the local public also give some suggestions and hopes for the proposed project.

For noise pollution in construction period, properly arranging working time can avoid high noise equipment running at the same time. Night working time should be reduced. In addition, the construction site should be reasonably arranged to fix the high noise equipment in the centre and add sound panel around the fixed equipment. Moreover, low noise equipment is adopted to reduce the sound level. Continuous maintenance of the equipment will make sure that additional noise caused by broken accessories and mufflers to be mitigated.

The noise in operation period mainly comes from power engines. The corresponding measures can be: 1) fixing mufflers at the intake and outtake pipelines; 2) installing noise protection windows and doors; 3) obturating the plant to avoid noise leak; 4) distinguishing areas by different functions and; 5) selectively planting.

For the problem of dust pollution, the project owner will adopt the following measures: 1) periodically watering the construction site and increasing the frequency in windy days; 2) flushing construction site and road in time to avoid the dust emissions from trucks; 3) covering trucks carrying construction rubbish to avoid dropping off; 4) avoiding exposure of dusty materials; 5) covering all the dusty materials passing the project site.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding has been provided for this CDM project.

Annex 3

BASELINE INFORMATION

South China Power Grid Emission Factor Calculation

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

Table A1. Electricity generation of the South China Power Grid in 2002

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	123081000	5.58	116213080
Guangxi	13069000	8.31	11982966
Guizhou	33231000	7.9	30605751
Yunnan	15787000	8.21	14490887
Total			173292685

Data source: China Electric Power Yearbook 2003.

Table A2. Electricity generation of the South China Power Grid in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	143351000	4.99	136197785
Guangxi	17079000	4.09	16380469
Guizhou	43295000	6.57	40450519
Yunnan	19055000	3.77	18336627
Total			211365399

Data source: China Electric Power Yearbook 2004.

Table A3. Electricity generation of the South China Power Grid in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	169389000	5.42	160208116
Guangxi	20143000	8.33	18465088
Guizhou	49720000	7.06	46209768
Yunnan	24322000	7.56	22483257
Total			247366229

Data source: China Electric Power Yearbook 2005.

Table A4. Calculation of simple OM emission factor of the South China Power Grid in 2002

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or 1000m^3) H	Emission[10] (tCO_2e) I
Coal	10^4t	4121.06	711.35	1430.68	1144.39	**7407.48**	25.8	98	20908	143582063.7
Other washed coal	10^4t	0	0	35.26	13.58	**48.84**	25.8	98	8363	378664.8248
Coke	10^4t	0	0	0	6.44	**6.44**	29.5	98	28435	194114.788
Other gas	10^8m^3	0.63	0	0	0	**0.63**	13	99.5	5227	15618.1976
Crude oil	10^4t	5.8	0	0	0	**5.8**	20	99	41816	176078.8128
Gasoline	10^4t	0.01	0	0	0	**0.01**	18.9	99	43070	295.490349
Diesel	10^4t	73.07	0.67	0	0.5	**74.24**	20.2	99	42652	2321856.41
Fuel oil	10^4t	701.41	0.2	0	0	**701.61**	21.1	99	41816	22471255.5
LPG	10^4t	0.09	0	0	0	**0.09**	17.2	99.5	50179	2833.91924
Refinery gas	10^4t	1.42	0	0	0	**1.42**	18.2	99.5	46055	43424.12041
Other oil products	10^4t	7.91	0	0	0	**7.91**	20	99	38369	220340.1215

Total emission of the South China Power Grid (tCO_2e)	169406545.9
Fossil power supply of the South China Power Grid (MWh)	173292684.6
OM emission factor of the South China Power Grid (tCO_2e/MWh)	**0.97757471**

Data sources: China Energy Statistical Yearbook (2000-2002).

[10] If the unit of the fuel is 10^4 t, then I=E×F×G×H×44/12/10^4; if the unit of the fuel is 10^8 m^3, then I=E×F×G×H×44/12/10^3. The same about the calculation of I in Table A5 and Table A6.

Table A5. Calculation of simple OM emission factor of the South China Power Grid in 2003

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or $1000m^3$) H	Emission (tCO_2e) I
Coal	10^4t	4491.79	831.84	2169.11	1405.27	**8898.01**	25.8	98	20908	172473586
Cleaned coal	10^4t	0.05	0	0	0	**0.05**	25.8	98	26344	1221.149776
Other washed coal	10^4t	0	0	36.38	20.37	**56.75**	25.8	98	8363	439992.3998
Coke	10^4t	0	0	0	0.5	**0.5**	29.5	98	28435	15071.02392
coke oven gas	10^8m^3	0	0	0	0.04	**0.04**	13	99.5	16726	3173.145213
Other gas	10^8m^3	3.21	0	0	11.27	**14.48**	13	99.5	5227	358970.6368
Crude oil	10^4t	6.85	0	0	0	**6.85**	20	99	41816	207955.1496
Gasoline	10^4t	0.02	0	0	0	**0.02**	18.9	99	43070	590.980698
Diesel	10^4t	31.9	0	0	0.76	**32.66**	20.2	99	42652	1021441.68
Fuel oil	10^4t	627.22	0.3	0	0	**627.52**	21.1	99	41816	20098291.43
Refinery gas	10^4t	2.85	0	0	0	**2.85**	18.2	99.5	46055	87154.04448
Other oil products	10^4t	11.35	0	0	0	**11.35**	20	99	38369	316164.3969

Net electricity import from the Central China Grid (MWh)	11100
Average emission factor of the Central China Grid (tCO_2e/MWh)	0.7686583
Total emission of the South China Power Grid (tCO_2e)	195032144.1
Fossil power supply of the South China Power Grid (MWh)	211376499
OM emission factor of the South China Power Grid (tCO_2e/MWh)	**0.922676575**

Data sources: China Energy Statistical Yearbook 2004.

Table A6. Calculation of simple OM emission factor of the South China Power Grid in 2004

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tC/TJ) F	Oxidation rate (%) G	NCV (MJ/t or $1000m^3$) H	Emission (tCO_2e) I
Coal	10^4t	6017.7	1305	2643.9	1751.28	**11717.88**	25.8	98	20908	227132222.1
Cleaned coal	10^4t	0.21	0	0	0	**0.21**	25.8	98	26344	5128.829059
Other gas	10^4t	2.58	0	0	0	**2.58**	13	99.5	5227	63960.23777
Crude oil	10^4t	16.89	0	0	0	**16.89**	20	99	41816	512753.6462
Diesel	10^4t	48.88	0	0	1.83	**50.71**	20.2	99	42652	1585955.53
Fuel oil	10^4t	957.71	0	0	0	**957.71**	21.1	99	41816	30673659.31
Refinery gas	10^4t	2.86	0	0	0	**2.86**	18.2	99.5	46055	87459.84814
Natural gas	10^4t	0.48	0	0	0	**0.48**	15.3	99.5	38931	104309.2298
Other oil products	10^4t	1.66	0	0	0	**1.66**	20	99	38369	46240.78404
Net electricity import from the Central China Grid (MWh)						10951240				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.810997462				
Total emission of the South China Power Grid (tCO_2e)						269093117.3				
Fossil power supply of the South China Power Grid (MWh)						258317469.1				
OM emission factor of the South China Power Grid (tCO_2e/MWh)						**1.041714748**				

Data sources: China Energy Statistical Yearbook 2005.

Table A7. Generation Weighted Average OM factor

Year	2002	2003	2004	Generation weighted average OM
OM (tCO_2e/MWh)	0.97757471	0.922676575	1.041714748	0.9852954

Table A8. Installed capacity of the South China Power Grid in 2004

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	30172.9	4378.1	4306.9	7801.8	46659.7
Hydro power (MW)	8584.6	5040.4	7058.6	6896.5	27580.1
Nuclear power (MW)	3780	0	0	0	3780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	42621	9418.5	11365.5	14698.3	78103.3

Data source: China Electric Power Yearbook 2005, of which the Tianshengqiao Power Plant is involved in the data of Guizhou.

Table A9. Installed capacity of the South China Power Grid in 2003

	Guangdong	Guangxi	Yunnan	Guizhou	Tianshengqiao	Total
Thermal power (MW)	27231.4	3190.1	3556.8	6465.8	0	40444.1
Hydro power (MW)	8107.2	4525.2	6543.2	3713.7	2520	25409.3
Nuclear power (MW)	3780	0	0	0	0	3780
Wind power and Other (MW)	83.4	0	0	0	0	83.4
Total (MW)	39202	7715.3	10100	10179.5	2520	69716.8

Data source: China Electric Power Yearbook 2004.

Table A10. Installed capacity of the South China Power Grid in 2002

	Guangdong	Guangxi	Yunnan	Guizhou	Tianshengqiao	Total
Thermal power (MW)	25237.8	3156.2	2932.7	4642.5	0	35969.2
Hydro power (MW)	7775.3	4363.3	5836.3	2426.1	2520	22921
Nuclear power (MW)	2790	0	0	0	0	2790
Wind power and Other (MW)	76.8	0	0	0	0	76.8
Total (MW)	35879.9	7519.5	8769.1	7068.6	2520	61757.1

Data source: China Electric Power Yearbook 2003.

Table A11. Calculation of generation capacity addition

	Installed capacity in 2002 (MW) A	Installed capacity in 2003 (MW) B	Installed capacity in 2004 (MW) C	Capacity additions from 2002 to 2004 (MW) D=C-A	Share in total capacity additions
Thermal power	35969.2	40444.1	46659.7	10690.5	65.40%
Hydro power	22921	25409.3	27580.1	4659.1	28.50%
Nuclear power	2790	3780	3780	990	6.06%
Wind power and Other	76.8	83.4	83.4	6.6	0.04%
Total	61757	69716.8	78103.2	16346.2	100.00%
Share in total installed capacity of 2004	79.07%	89.26%	100%		

Table A12.Calulation of the weighted average of new added capacity of fuel i based power plant

Fuel Type	Installed Capacity (MW) as of 2002	Installed Capacity (MW) as of 2004	Increased Capacity from 2002 to 2004 (MW)	Percentage
Coal	26,335.20	35,111.17	8,776	83%
Fuel oil/Diesel	9,634.00	11,427.70	1,793	17%
Natural Gas	0	0	0	0%
Landfill Gas	0	0	0	0%

Data source:
Installed capacity by fuel of 2004: Page 504, China Electric Power Yearbook, edition 2005
Installed oil-based power plant in CSPG as of 2002:
http://biz.finance.sina.com.cn/stock/company/bulletin_detail.php?id=%7B4942E9E4-0B79-11D8-9AFE-0001029688B6%7D
Installed oil-based power plant in CSPG as of 2002: the yearbook of Guangdong Power Group Co. Ltd.

Table A13.calulation of the CO_2 emissions factor of fuel *i* (tCO2/MWh)

		Efficiency level	Emission factor (tC/TJ)	Oxidation rate (%)	Emission Factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power generators	$EF_{Coal,Adv}$	36.53%	25.8	0.98	0.9136

Gas-fired power generators	$EF_{Gas,Adv}$	45.87%	15.3	0.995	0.4381
Oil-fired power generators	$EF_{Oil,Adv}$	45.87%	21.1	0.99	0.6011

Reference: Notification on Determining Baseline Emission Factor of China's Grid, issued by China's DNA on 15th, Dec, 2006, refer to http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf,

Using the formulae in B6.1, $EF_{BM,y}$ is 0.5628tCO2/MWh.

Annex 4

MONITORING INFORMATION

There is no other related monitoring information.

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