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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title: Jiangxi Fengcheng CMM Distribution Project
Version: 06
Date: 05/06/2009

Revision history:

Version	Date	Description
Version 01	January, 2008	PDD prepared for Host Country DNA approval
Version 02	March, 2008	PDD prepared for GSP Publication by DOE and Validation
Version 03	December, 2008	PDD revised in response to DOE CAR/CL
Version 04	February, 2009	PDD revised in response to DOE CAR/CL
Version 05	May, 2009	PDD revised in response to DOE Technical revision
Version 06	June, 2009	PDD revised in response to DOE Technical revision

A.2. Description of the project activity:

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The Jiangxi Fengcheng CMM Distribution project (hereinafter referred to as the "Project" or 'the proposed project activity") developed by Fengcheng Pipeline Gas Co., Ltd is a Coal Mine Methane (CMM) distribution project located in Fengcheng city, Jiangxi Province, China.

The proposed project activity will construct a new CMM collection, storage, concentration and distribution station that will collect CMM from two existing coalmines and supply CMM for heating and cooking uses to 50,000 households of the old area, new area and industrial area, mainly for residential users and commercial users in Fencheng city. The Project will destroy methane that would be otherwise vented in the baseline scenario.

Before the implementation of this project activity all the CMM extracted from the two coalmines was vented to the atmosphere; coal and liquefied petroleum gas (LPG) were used by residential households for heating and cooking.

The project will capture CMM with 33% CH_4 concentration from two operating coalmines (i.e. Shangzhuang and Fenglong Dajing) located in Fengcheng city. To comply with national regulation mandating the drainage of CMM for safety reasons, Shangzhuang coal mine had equipped with CMM drainage system since the year 1979. For the same compliance purposes, a CMM drainage system is currently under construction in Fenglong Dajing coal mine; completion of construction is expected to be October, 2009. Shangzhuang's current extraction of CMM is at 26,000,000 m^3 per year with a methane content of 33%, equivalent to 8,580,000 m^3 of pure methane. Fenglong Dajing's planned extraction of CMM is at 72,000,000 m^3 per year with a methane content of 33%, equivalent to 23,760,000 m^3 of pure methane. Methane extracted from Shangzhuang coal mine and Fenglong Dajing coal mine are vented into the atmosphere in the absence of the Project.

Besides auxiliary equipment (e.g. pumps, compressors, monitoring devices, etc.), the Project will:

- Set up two sets of Wet Helix Gas Storage Tanks with storage volume of 30000m^3 each
- Build 18km medium-pressure main gas pipeline for collection of CMM from the coalmines and supply to the residential area
- Retrofit the existing 8.8 km pipeline delivering coal gas to 10,000 households of Fencheng city for CMM utilisation.
- Build 30km branch pipeline network from main pipeline to residents' houses.

The baseline scenario is the same as the existing scenario before the implementation of this project activity.

The Project will have a fully daily gas supply capacity of 90,000 m^3. The gas pipeline distribution system serves 50,000 households and it is estimated to consume 32,400,000m^3 of CMM per year. Therefore the Project will destruct and avoid the venting into the atmosphere of around 10.7 million m^3 of CH_4 annually.

The estimated annual GHG reduction of the proposed project activity over the crediting period is 118,789 tCO_2e. The total estimated Project GHG emission reduction in the 10 years crediting period is 1,187,888 tCO_2e.

The Environmental Impact Assessment of the Project was approved by Jiangxi Environment Protection Bureau on 19th, Semptember 2006. The project will contribute to the sustainable development of Jiangxi province in general and Fengcheng city in particular, by improving CMM capture at the mine, providing a clean source of energy for households by replacing the use of coal and liquefied petroleum gas (LPG), as well as providing investment and job opportunities to the local community.

Specifically, the project will:

- Reduce CMM concentrations in working areas of the coal mines, improve safety conditions by minimising explosion risk.
- Reduce coal and LPG use by households, where coal contributes to severe indoor and outdoor air pollution leading to severe respiratory infections and general ill-health.
- Generate additional jobs for 72 people for the project regular works of gas storage and distribution.
- Reduce emissions of greenhouse gases, contributing to the sustainable development goals of the People's Republic of China.

A.3. Project participants:

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Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Fengcheng Pipeline Gas Co.,Ltd	No

The Netherlands	CEZ a.s.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Jiangxi Province

A.4.1.3. City/Town/Community etc:

>>
Fengcheng 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 Project is located in Fengcheng city, in the center of Jiangxi province, along the Gan River. The Project exact geographic coordinates are 28˚09'12'' north latitude and 115˚43'50'' east longitude. The project site is 6 km far away from Fengcheng city and 60 km from Nancheng city. Shangzhuang and Fenglong Dajing coalmines are 9 km and 2 km from the project site respectively.

The below three maps show the project location within China, Jiangxi province and Fengcheng city.

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

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According to the list of categories of project activities and of registered CDM project activities by category available on the UNFCCC web site, the proposed project falls into Sectoral scope 8 “Mining/mineral production” and Sectoral scope 10 “Fugitive emissions from fuels”

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

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The project activity involves the installation of a gas distribution and storage station along with a pipeline network collecting CMM from the existing extraction system and delivering to 50,000 households for residential uses.

Before the implementation of this project activity all the CMM extracted from the two coalmines was vented to the atmosphere; coal and liquefied petroleum gas (LPG) were used by residential households for heating and cooking.

The technology employed by the Project includes:

1. Construction of a new pipe network

18km of medium-pressure gas pipelines (medium pressure 0.01MPa≤P≤0.2MPa) connected to the existing CMM extraction systems at the two mine areas and channeling the CMM to the residential area via storage station. The pipeline is made of nodular cast iron with diameter DN400.

2. Retrofitting of the existing pipe network

The 8.8 km existing pipeline grid (set pressure 1,500 – 1,700 Pa) used to dispatch coal gas from coal gas plant to 10,000 household of Fengcheng city before the local coal gas plant closed in June, 2006. It will be retrofitted for use by the proposed project activity.

3. Storage and distribution station

Storage tanks

If the pressure of CMM from these two coal mines is not enough to transmit CMM gas to household pipeline, the extracted CMM will be first piped to two Wet Helix 30,000 m3 capacity storage tanks through air-inlet Water Seal Well, before being supplied to households via the pump station. The tanks will store excess CMM and offer a form of buffer to ensure that the household systems will receive a steady supply.

Technical detail of the storage tanks are given below:

Wet helix storage tank	
Volume	30000m^3
Inlet pressure	>500mmH_2O
Inlet temperature	Normal temperature
Design pressure	100/160/210mmH_2O

Reciprocating compressors

Reciprocating compressor	
Type	L-60/1.5^{-a}
Generator	YB355L-10
Rotational Speed	585r/min

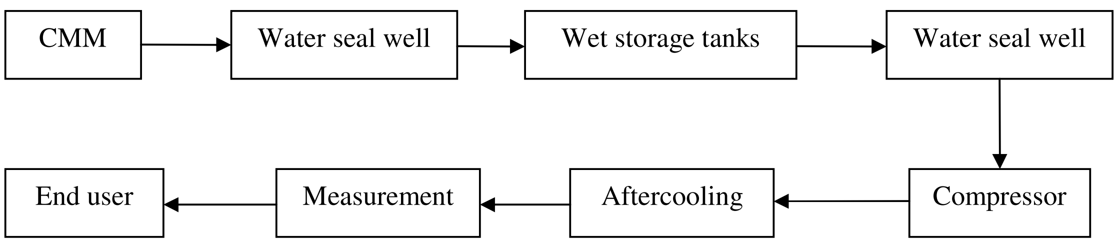
Discharge Capacity	60.63m^3/min
End Stage Discharge Pressure(G)	0.1MPa
I-stage Discharge Temperature	95℃
End Stage Discharge Temperature	94℃
Specific Power	1.78kW/(m^3·min^{-1})

The adopted reciprocating compressors are manufactured by Liuzhou General Compressor Works. This technology is widely used in China for pipeline gas systems.

4. Installation of the monitoring Equipment

The monitoring of the project will be conducted using equipment and meters that will comply with the national and international relevant standard. Proper spaces will be built and equipped at the storage station. More details on monitoring equipment are given in section B.7.2 of this PDD.

As visualised in the diagram below, the CMM extracted by the mine area compressor station is transmitted through air-inlet Water Seal Well into the two 30,000 m^3 storage tanks. When the pressure in the gas pipeline decreases or need adjusting, the outlet of the wet storage tank is opened and the CMM sent to the compressors. After the adjustment of gas pressure, de-pressed gas reaches 0.15MPa and finally transmitted to various end users by pipelines.



Experienced technical experts will monitor and coordinate project operations, monitoring and maintenance. As the used technology is well known in China, there is no need for an extensive initial training on safety and maintenance operations.

The project will capture CMM with 33% CH_4 concentration from two operating coalmines (i.e. Shangzhuang and Fenglong Dajing) located in Fengcheng city, and supply the gas to for heating and cooking in households. The Project will have a fully daily gas supply capacity of 90,000 m^3. The gas pipeline distribution system will serve 50,000 households and it is estimated to consume 32,400,000m^3 of CMM per year. Therefore the Project will destruct and avoid the venting into the atmosphere of around 10.7 million m^3 of CH_4 annually.

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

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The project activity uses a fixed crediting period (10 years).

The estimation of the emission reductions during the crediting period (September 1, 2009 – August 30, 2019) is provided in Table A.1. The estimated annual and total GHG emission reductions over the crediting period are 118,789 tCO_2e and 1,187,888 tCO_2e respectively.

Table A.1 Estimated emission reductions from the project during the crediting period

Years	Annual estimation of emission reductions in tonnes of CO_2e
2009.9-2009.12	**25177**
2010	**92686**
2011	**123417**
2012	**123417**
2013	**123417**
2014	**123417**
2015	**123417**
2016	**123417**
2017	**123417**
2018	**123417**
2019.1-2019.8	**82689**
Total estimated reductions (tonnes of CO_2e)	**1187888**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**118,789**

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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The project used the methodology ACM0008 "(Version 04) "Consolidated baseline methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical and motive) and heat and /or destruction by flaring or catalytic oxidation". The used methodology can be found at: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.
ACM0008 Ver. 4 is employed together with "Tool for the demonstration and assessment of additionality" (Version 4) as in Annex 13 of the EB 36 Report.
The "Tool for demonstration and assessment of additionality" can be found at:
http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

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

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The Project meets all the applicability criteria as set out in the methodology ACM0008 version 4, as shown in Table B-1 below.

Table B.1 ACM0008 applicability criteria met by the proposed project activity

ACM0008 Applicability Criteria	Proposed project activities
Extraction activities	
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 is adopted to capture pre mining in proposed project
Ventilation air methane that would normally be vented	Included

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	CMM is captured and destroyed through utilization of distributing to gas grid for households.
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	All the CMM collected by the Project will be used and destroyed for household cooking and heating.

Non-applicable features	
Operate in opencast mines	Underground operating coal mines
Capture methane from abandoned/decommissioned coalmines	Both coal production and CMM extraction are ongoing 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	The Project does not relate to extraction of CBM. In any case, CMM extraction activities are not independent of any mining activity.
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

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

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According to the methodology ACM0008 version 4, the *spatial extent* of the Project boundary comprises of:

- All equipments installed and used as part of the project activity for the extraction, compression, and storage of CMM and CBM at the project site, and transport to an off-site user.
- Flaring, catalytic oxidation, captive power and heat generation facilities installed and used as part of the project activity.

The GHG and emission sources included in or excluded from the Project boundary are shown in Table B.2 below.

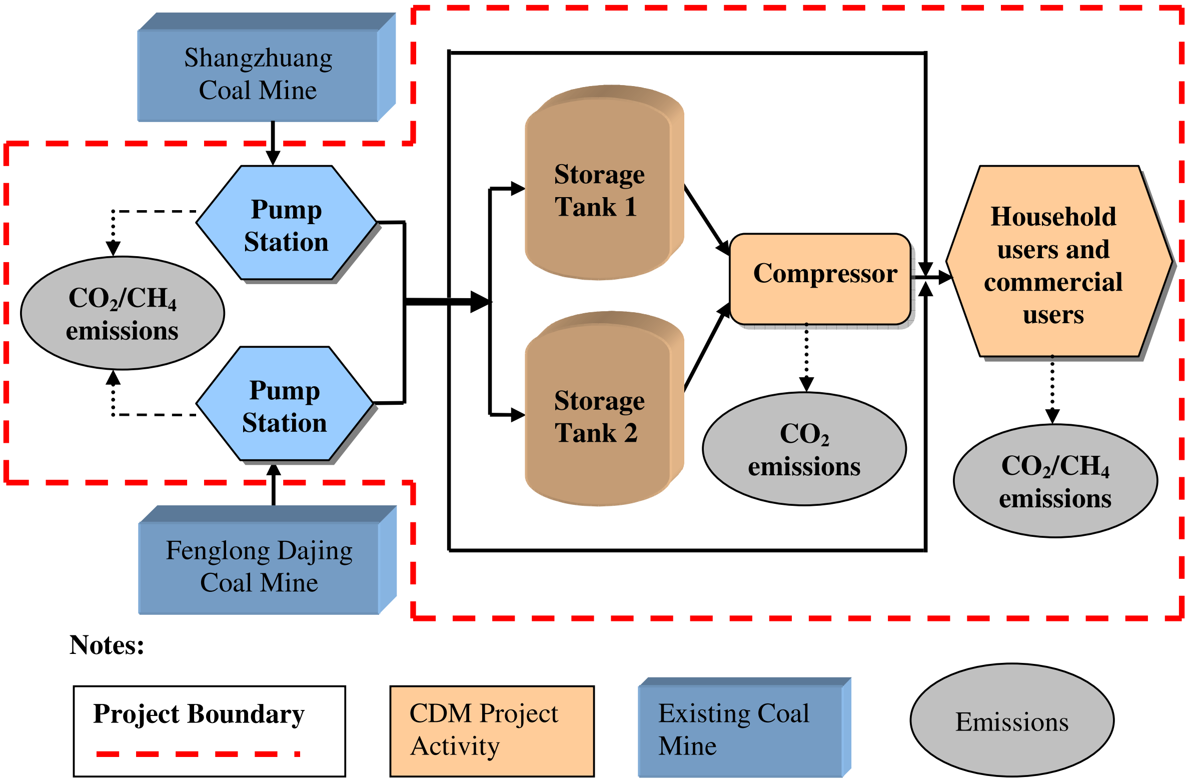
Table B.2 GHG and emission sources included in or excluded from the Project boundary

	Source	Gas	Included or not	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 activity happened in baseline scenario
		CH_4	Excluded	Not involved
		N_2O	Excluded	Not involved
	Grid electricity generation(electricity provided to the grid)	CO_2	Excluded	No power generation take place in the baseline scenario
		CH_4	Excluded	Not involved
		N_2O	Excluded	Not involved
	Captive power and/or heat, and vehicle fuel use	CO_2	Excluded	Not involve this usage
		CH_4	Excluded	Not involved
		N_2O	Excluded	Not involved
Project Activity	Emissions of methane as a result of continued venting	CH_4	Excluded	Only the change in CMM emissions release will be taken into account, by monitoring the methane used or destroyed by the project activity.
	On-site fuel consumption due to the project activity, including transport of the gas	CO_2	Included	Additional equipment such as compressors and pump station lead to this part of emissions.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from methane destruction	CO_2	Included	Emissions from use of CMM for heat by residential users.
	Emissions 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 heat generation process.
	Fugitive methane emissions from on-site equipment	CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH_4	Excluded	Excluded for simplification.
	Accidental methane	CH_4	Excluded	Excluded for simplification. This emission

	release			source is assumed to be very small.

A full diagram of the project boundaries and components is presented in Figure B.1 below.

Figure B.1 Diagram of project layout and boundaries



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

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The following steps are applied to identify baseline scenario in accordance with the ACM0008 version 4 baseline methodology:

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

Step 1a. Options for CMM extraction

Available options for CMM extraction are technically feasible could be:

A. Pre mining CMM extraction using underground drainage systems;
B. Post mining CMM extraction using underground drainage systems;
C. Combination of Option A and B. This is also the continuation of current CMM extraction practice in the proposed coal mines.

Using any of options A or B alone is not technically feasible for the two Project coal mines. In CMM drainage process, the only adoption of pre mining or post mining extraction system could not reduce air methane concentration below 0.75%, thus meet safety requirements for underground mining activities.

Currently, CMM is extracted from Shangzhuang and Fenglong Dajing coal mines using a combination of Options A and B.

Step 1b. Options for extracted CMM treatment

Technically feasible options for treatment of the extracted CMM in the Project's coal mines include:

i. Venting. This is 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);
viii. Combination of i and vii above. This is the proposed project activity not implemented as a CDM project

Step 1c. Options for energy production

In order to meet energy demand, the alternatives for heat production include:

1. Continuation of existing heat supply by coal and LPG;
2. CMM piped to household small boilers and/or cooking systems using CMM as alternative fuel. This is the project activity not undertaken as a CDM project.

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

In China, control measures on methane extraction are set only under the national health and safety regulations, governing the maximum methane concentration at various locations within an underground coal mine. The only requirement is that methane concentration in the coalmine is below 0.75%, to avoid risks of explosion (*National Coalmine Safety Regulation* 2005 , Section Two item 100 –150[1]). In CMM drainage process, solely adopting pre mining or post mining extraction methods could not meet safety requirements. For this reason, they are adopted in combination with ventilation. Thus, options A and B for CMM extraction cannot comply with the legal requirements. Therefore, they are eliminated from further consideration. Option C is in compliance with mandatory law and regulations; that is the current extraction method.

The obligation affecting CMM utilization is the minimum methane concentration level of the extracted CMM set by the *National Coalmine Safety Regulation* (11/2005) item 148[1], i.e. 30%. This was also emphasized in the *Coalmine Methane Treatment and Utilization Macro Plan* published by National Development and Reform Committee (NDRC) in June 2005.

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

While the Chinese government promotes the utilization of CMM, NDRC had 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.[2]

In April 2008, the Ministry of Environmental Protection issued an Emission Standard of CBM/CMM, which became effective on 1 July 2008 for new coal mines and surface drainage systems, and will become effective on 1 January 2010 for existing mines/systems. These new Standards set the following:

1. CBM drainage systems are prohibited from emitting CBM;
2. Coal mine drainage systems with a gas concentration having 30% methane or higher are prohibited from emitting CMM;
3. If the methane concentration is less than 30%, the methane is allowed to be released;
4. High concentration methane should be used, where feasible, for gas supply, power generation, chemical uses, etc. Where not feasible, the high concentration methane should be liquefied or flared.

While not affecting the Project for the time being, the Emission Standards may affect the Project additionality from January 2010 onwards, as the individuated alternative scenario for CMM treatment, i.e. CMM venting, will not comply with the Standards. However, given the current and forecast volume of CMM utilization in China together with technical barriers and the lack of incentive for the sector, no condition appears for the Emission Standards systematically enforced; therefore is not taken into account for the development of the baseline scenario.

It is also noticed that the Standards entered into force after the CDM decision for the Project has been taken and after the starting date of the project implementation. The Project also received the Host Country LOA in August 2008 that is later the publication of the Standards. It also noticed that exist CDM project in a similar situation that have been registered by the EB after the entry into force of the Standards (e.g. Ref. 1880, 1887, 1900, 1918, 1926, 1929, 1931). It is therefore assumes correct not considering the Standards for the development of the baseline scenario.

In conclusion all the 8 options for extracted CMM treatment and the 2 options for heat production are compliant with mandatory laws and regulations.

Step 3. Formulate baseline scenario alternatives

Baseline scenarios meet the regulatory requirements include:

Step 3a. Alternatives for CMM extraction
Alternative Scenario C - Combination of pre mining and post mining extraction systems with certain ventilation.

Step 3b. Alternatives for CMM treatment
Alternative Scenario i - CMM venting.

This scenario is the continuation of the current practice at Shangzhuang and Fenglong Dajing coal mines, where they emit all of the CMM to the atmosphere through ventilation fans and the drainage systems. It is extremely likely that this situation will be maintained as long as safety regulations are met.

Alternative Scenario ii - Using/destroying ventilation air methane rather than venting it;

[2] *http://en.ndrc.gov.cn/newsrelease/P020070604561191006823.pdf*

Alternative Scenario iii - Flaring of CMM
Extracted 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 - Use of CMM for additional grid power generation
Extracted CMM could be combusted in reciprocating engines or gas turbines that generates electricity for the regional grid.

Alternative Scenario v - Use of CMM for additional captive power generation
Extracted CMM could be combusted in reciprocating engines or gas turbines that generates electricity for use directly at the coalmine.

Alternative Scenario vi - Use for additional heat generation
Extracted 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 - Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation)
Extracted CMM could be delivered to the existing local pipeline for residential or commercial use. The low pressure-type system usually requires the delivered gas to be >30% CH_4.

Alternative Scenario viii - Combination of *i* and *vii.*
This is the proposed project activity not implemented as a CDM project

Step 3c. Alternatives for energy production

Scenarios (left in step 1c) for heat supply include:

Alternative Scenario 1 - Continuation of existing energy supply by coal and LPG
The residents continue to use coal or LPG for heating and cooking.

Alternative Scenario 2 - CMM piped to household small boilers and/or cooking systems using CMM as alternative fuel
Transmitting CMM to residential gas pipeline; this is the project activity not undertaken as a CDM project.

Step 4. Eliminate baseline scenario alternatives that face prohibitive barriers

Step 4a. Barrier analysis of the alternatives for CMM extraction:

The barriers analyses of CMM extraction alternatives listed in step 3a are as follows:

Alternative scenario C:
Combination of pre mining and post mining extraction with certain ventilation.
This is the continuation of CMM extraction practice at the project site, thus it has no barriers.

Step 4b. Barrier analysis of the alternatives for CMM treatment:

The barriers analyses of CMM treatment alternatives listed in Sub-step 3b are as follows:

Alternative Scenario i – Venting.
Continuation of the current situation of the proposed project.
The drained CMM gas is vented to the atmosphere directly. It is the business as usual scenario and therefore will not face any prohibitive barriers.

Alternative Scenario ii - Use/destruction of VAM
Use/destruction of VAM faces considerable technological barriers in China because it employs technology that is unfamiliar to the Chinese mining companies, who along with companies from many other countries have expressed reservations regarding VAM plants, such as physical impracticality, safety, technical uncertainty etc. Currently there are no mature VAM utilization projects in China, only few pilot-scale demonstration of VAM catalytic project is undergoing. It will add risk to this project if we try in this way.[3] The only commercially operated project in the world is in Australia, which itself is not yet fully operational.[4] Therefore there is technology barrier to this option. It should be eliminated from the baseline scenario.

Alternative Scenario iii - Flaring
Flaring does not utilize the energy potential of CMM, but requires great investment for the construction of the proper infrastructure for flaring the gas without any revenues. Since Chinese government does not regulate the extracted CMM to be flared and given the huge investment required, CMM flaring is not widely adopted in coal mine in China. In facts, most of coal mines in China release the extracted CMM into the atmosphere directly. Therefore, this alternative is eliminated from the baseline scenario.

Alternative Scenario iv - Use of CMM for additional grid power generation
There is a biggest coal-fire power plant within Jiangnan region located in Fengcheng city with a total installed capacity of 1,200MW. Moreover, in Fengcheng area another CDM project (already registered and in operation) is using CMM for grid-connected power generation. Therefore, the electricity demand of the area is considered temporarily met. In this regard, the local government stressed this project to be implemented for meeting the high demand of gas for cooking and heating, due to the closure in 2006 of a nearby coke plant supplying Fengcheng households with coal gas. Hence, it is very difficult for Fengcheng pipeline gas Co., Ltd to execute a power generation project and sell electricity to the said Grid at a profitable price[5]. This situation represents a big barrier for the project to enter into the power generation business. Therefore, this option cannot be the baseline scenario and is eliminated.

Alternative Scenario v - Use of CMM for additional captive power generation
As explained above there is same barrier as alternative scenario iv for the utilization of CMM for captive power generation. Therefore it should be eliminated from the baseline scenario.

Alternative Scenario vi - Use for additional heat generation
Currently, the coal-fired boilers are operating in Fengcheng to supply heat to the mining area. The fuel for the boilers is waste coal that could not be sold to the market. There is no reason for the project owner to put additional investment to install gas-fuelled boilers. Therefore, this alternative scenario should be eliminated.

Alternative Scenario vii - Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation)

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[3] *http://www.chinarhvac.com/news/documents/200604/6896.asp*
[4] *http://www.epa.gov/cmop/docs/summer_2006.pdf*
[5] *http://www.sdpc.gov.cn/nyjt/nyzywx/t20060626_74591.htm*

No legislative or technological barriers exist for this option. In the past years, coal was the main energy source, this result in serious air pollution. The local government is eager to switch part of the energy source to CMM gas, which can not only make good use of CMM but also dramatically reduce pollution. However, as showed in section B.5 below, this alternative scenarios faces investment barrier if not considering CDM revenues. The IRR of the proposed project without CDM revenue is 7.14%, which is much lower than the benchmark of 12%. Thus, the low IRR makes the implementation of the proposed project financially not feasible if without CDM. Therefore, this option should be eliminated.

Alternative Scenario viii
This is the combination of alternative scenarios i and vii above (venting and feeding into gas pipeline).This is the Project implemented not as a CDM project. It faces similar barriers to those identified for alternative vii. Therefore, also this alternative scenario should be eliminated.

Sub-step 4c. Barrier analysis of the alternatives for energy production:

The barriers analyses of CMM treatment alternatives listed in Sub-step 3c are as follows:

Alternative Scenario 1 - Gas supply by coal and liquefied petroleum gas.
This is the BAU scenario, therefore no barrier exists.

Alternative Scenario 2 - CMM piped to household small boilers and/or cooking systems using CMM as alternative fuel
This alternative scenario faces the same barriers of alternative scenario vii above, therefore it cannot be considered a feasible and credible alternative scenario, and it is eliminated.

Conclusion
Alternative C is the only feasible and credible alternative scenario for CMM extraction.

Alternative *i* is the only feasible and credible scenario for extracted CMM treatment.

Alternative 1 is the only feasible and credible scenario for energy production.

Therefore, the Project baseline scenario is:
Continuation of the current CMM extraction practice with all the extracted CMM to be released into atmosphere, residential energy supply by coal and liquefied petroleum gas.

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 *“Tools for the Demonstration and Assessment of Additionality” (version 04)* – hereinafter referred to as the Tools - is used to test the additionality of the proposed project.

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

According to methodology ACM0008 version 4, Step 1 of the Tools can be ignored.

Step 2 – Investment Analysis

The purpose of investment analysis is to determine whether the proposed project is economically less attractive than the alternative identified in Section B.4 above without revenues from the sale of CERs. The following sub steps are adopted to perform the investment analysis:

Sub-step 2a Determine appropriate analysis method
The investment analysis will be performed applying Option III (i.e. benchmark analysis) as indicated in the "Tool for the demonstration and assessment of the additionality (version 04)". This method is applicable because option I (Simple cost analysis) does not apply as the project generates economic benefits other than CDM-related income, through the sales of gas to the grid.
Option III (benchmark analysis is appropriate) provides the simplest method of analysis which is more appropriate for assessing the financial attractiveness of the project activity.

Sub-step 2b. Apply benchmark analysis
The internal rate of return (IRR) will be used as the most appropriate financial indicator for comparison. The benchmark or hurdle internal rate of return (IRR) is determined by individual project development or investment companies. IRR can be influenced by perceived technical and/or political risk and by the cost of money. No investors will invest on projects that do not meet a minimum IRR, often referred to as hurdle rates. The Economic evaluation method and parameters for project construction (Version 3), issued by the National Development and Reform Commission and the Ministry of Construction, provides a guideline for projects in a range of industries. This official document provides a reference benchmark for the coal industry, which states a minimum Internal Rate of Return (IRR) of 12%[6]. Therefore, the investment analysis of the proposed project activity (Option viii) uses an IRR hurdle rate of 12%.

Sub-step 2c. Calculation and comparison of financial indicators
The project faces a barrier to implementation due to poor returns on investment. Without CDM revenues, the project's returns on investment are below the benchmark of 12%. To illustrate this, we performed a benchmark analysis. Table B.3 summarizes the data used in the calculation of the IRR of the Project.

Table B.3 Basic Financial Parameter of the Project used for calculating the IRR

Total investment:	55,123,900 RMB
Annual operation cost:	21,252,500 RMB/y
Annual CMM supplied:	32,400,000m^3 (33% concentration)
CMM purchase price:	0.44 RMB/ m^3
CMM gas sale price:	0.9 RMB/ m^3
Estimated CER price:	8Euro/tCO_2e
Project lifetime:	30years

[6] *NDRC and National Construction Committee, 2006, Economic Evaluation Code and Parameter for Construction Projects (Version 03), p. 204.*

Income tax rate:	33%
Education subsidies	3%
City construction taxes	7%

As shown in Table B.4 below, the calculated Project IRR without CDM revenues is 7.14%; therefore the project is economically and financially unattractive, its IRR being below the minimum acceptable benchmark value of 12%. However with CDM revenues - based on a CER price of 8€/tCO_2e[7] - the same calculation shows a Project IRR of 20.25%, i.e. above the acceptable benchmark.

Table B.4 Project IRR with and without CDM after tax

	IRR of total investment
Without CDM	7.14%
With CDM	20.25%

Sub-step 2d. Sensitivity analysis

A sensitivity analysis is conducted in order to examine whether or not the results of the IRR analysis remain robust under the reasonable variations of selected key parameters. The following key parameters have been selected

i. Total investment
ii. Annual operation cost
iii. Revenues from gas supply

The required alteration needed in each parameter in order to reach the benchmark was assessed. Table B.5 summarizes the results of the sensitivity analysis, showing the variations needed to reach the benchmark (12%).

Table B.5 IRR sensitivity analysis

Sensitivity analysis	
	Variation of the parameter needed to reach the benchmark
Total investment	-37.72%
Annual O&M cost	-12.60%

[7] *The Chinese DNA has set a minimum price necessary to obtain host country approval for CDM projects. Although the minimum price has not been published, commonly 8 EUR/tCO_2 is regarded as the minimum price the NDRC will accept. The CER price agreed for this project is either equal to or above 8 EUR/tCO_2 , but is considered confidential.*

Annual gas supply	9.36%

	Variation of the parameter needed to reach the benchmark （12%）
Total investment	-37.72%
Annual O&M cost	-12.60%
Revenues from gas supply	+ 9.36%

Total investment: As we can see from the above table, only when total investment decrease 37.72% will the project IRR reach benchmark, however, this assumption is unrealistic as the price of equipment, material etc have been increasing, and likely to continue doing so, thus it is impossible improve the economic attraction by lowering the total investment to such an extent.

Annual O&M cost: The results of the sensitivity analysis demonstrate that annual O&M cost has to decrease 12.60% in order to reach the benchmark. Again, this is not a realistic assumption, with labour cost and maintenance fee increasing, it is unrealistic to adjust annual O&M cost to such low extent.

Revenues from gas supply: The IRR will reach benchmark when the sale price of gas increases 9.36%. However, as in the case of static cost regulated by the government, also this assumption is unrealistic, because the project lacks the ability to increase its supply prices beyond the present values.

On the other hand, the total investment IRR will increase greatly when CERs revenues are included (see Table B.4). If we take into account a price of 8 Euro/tCO_2e, the IRR of the project reaches 20.25% .Under these conditions, the repayment of capital and interest will be facilitates and the project financial situation will be improved. It is thus clear that the benefits from the CDM help to reduce financial barriers, making the project activity attractive to investors.

In conclusion, the sensitivity analysis shows that our IRR computations are robust: the project is not economically and financially attractive, without the revenues from the sale of CERs through CDM.

Project owner has seriously considered CDM before project construction, evidences are described below:

1. Fengcheng government executive meeting summary (20th, Feb 2006)
2. Fengcheng pipeline gas Co., Ltd board meeting (21st, Feb 2006)
3. Cooperation intent agreement with New Resources Investment Management Co., Ltd. (28th, Feb,2006)

The first FSR was made by the government at the end of 2005 in view of replacement of gas supply guaranteed till then by an existing coal gas plant that was shut down in Oct 2005 due to serious pollution problem. Since government had no money to conduct this CMM project, appointed Fengcheng pipeline gas Co. Ltd to its development. When the project owner received the project and relevant FSR, he investigated further and asked Jiangxi Light Industry Design Institute to make another financial assessment base on current situation. Finally found that the financial situation of this project was not attractive as demonstrated above, IRR was lower than benchmark, but considering CDM revenue, the project owner decided to take this project. Due to the shortage of gas supply at the beginning of 2006, the

government pushed the project owner to start construction before approval considering this project has very little negative effect to the local environment. In the draft revised economy analysis performed by Jiangxi Light Industry Design Institute, CDM benefit was suggested as a good option to overcome the economy barrier. (17th Feb 2006)

Table B.6 History of Fengcheng CMM distribution project

2005-10	Fengcheng Government prepare the CMM distribution project and FSR
2005-10	Fengcheng Government signed agreement with Local Mine Bureau
2006-1	FSR of the proposed project finished
2006-2	Fengcheng pipeline gas Co., Ltd establishment
2006-2	Fengcheng pipeline gas Co., Ltd took over this project from government
2006-2	Fengcheng pipeline gas Co., Ltd signed Gas Purchase Intent with coalmine owner
2006-2	Jiangxi Light Industry Design Institute make a draft financial assessment on this project
2006-2-20	Fengcheng government executive meeting suggests the PO applies for CDM due to poor financial condition
2006-2-21	Fengcheng pipeline gas Co., Ltd board meeting decide to apply for CDM
2006-2-28	Signed Cooperation intent agreement with New Resources Investment Management Co., Ltd (NRIM) for the CDM development of the project and its placement to a buyer.
2006-3	Project start construction
2006-6-28	Start gas supply to local residents
2006-8	EIA of the proposed project finished
2006-9-19	EIA of the proposed project approved
2006-9-29	Sign gas purchase agreement with coalmine owner
2006-10-9	FSR of the proposed project approved
2007-1	Formal financial assessment made by Jiangxi Light Industry Design Institute finished, which suggests PO apply for CDM to improve the financial condition
2007-2	signed LOI with CCC
2007-3	Got approval of revised financial assessment From local DRC
2007-8	The LOI with previous buyer (CCC) expired with no progress on CDM development. NRIM goes in search of a new buyer.
2007-10-16	Loan from bank
2007-10-18	Signed CDM development cooperation agreement with Enecore
2007-10-30	Signed LOI with CEZ
2008-5-26	Signed ERPA with CEZ

The project thus faces significant economic and financial barriers without CDM support.

Step 4. Common Practice Analysis

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

All major coal mine operators focus on coal production and on mine safety and are not interested in exploiting the CMM resource since that is not their core business. Thus, they are satisfied to comply with the existing rules and regulations, and continue to emit CMM to the atmosphere. As already explain above, the Chinese government encourages the coal mining industry to use CMM, but no legislation is in place to mandate CMM utilization at coal mines.

Table B.7 List of similar projects in China

Project Name	Location	Utilization method	Comments
Fengcheng Mining Administration	Fengcheng City	Power generation	Registered as CDM project

According to our investigation, in Jiangxi province there is only one CMM utilization project beside the proposed project activity, that is Jiangxi Fengcheng Mining Administration CMM Utilization Project, using extracted CMM for power generation. This project has been registered as CDM project in Sep, 2007 (UNFCCC Ref. N. 1135).

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

The proposed project is the first CMM gas distribution project in Jiangxi province. Currently, similar gas supply projects in China, if not subsidized by the government, can be implemented only exploiting CDM incentives such as Nantong, Tiefa, and Zhongliangshan [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 clear that without additional financial support from CDM, the proposed project will not be implemented. The Project is additional.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

The emissions reductions are the difference between the baseline emissions and the project emissions for a given year. In order to calculate the difference, the baseline and project emissions must first be determined.

1. Project Emissions

Project emissions are defined by the following equation:

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad (1)$$

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})

[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*

According to ACM008 ver.4, additional energy may be used for the capture, transport, compression and use or destruction of CMM. Emissions from this energy use should be included as project emissions. The following equation is used to calculate PE_{ME} :

$$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC} + CONS_{HEAT,PJ} \times CEF_{HEAT} + CONS_{FossFuel,Pj} \times CEF_{Foss\ Fuel} \quad (2)$$

Where:
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, if any (MWh)
CEF_{ELEC}: Carbon emissions factor of electricity used by coal mine, which is the emission factor of Central China Power Grid in this project (tCO_2e/MWh)
$CONS_{HEAT,PJ}$: Additional heat consumption for capture and use or destruction of methane, if any (GJ)
CEF_{HEAT}: Carbon emissions factor of heat used by coal mine (tCO2e/GJ)
$CONS_{FossFuel,PJ}$: Additional fossil fuel consumption for capture and use or destruction of methane, if any (GJ)
$CEF_{FossFuel}$: Carbon emissions factor of fossil fuel used by coal mine (tCO2/GJ)

The proposed project does not use any fossil fuel or heat to capture and transmit the CMM, therefore, equation 2 above for calculating combustion emissions from additional energy required for CMM capture and use (PE_{ME}) is reduced to:

$$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC} \quad (2a)$$

Fengcheng city is located in Jiangxi province and the regional grid that the project connected into is Central China Power Grid. The CEF_{ELEC} mentioned in equation 2a will be calculated based on Operating Margin Emission Factor and Build Margin Emission Factor as calculated and published on July 2008 by NDRC (Chinese DNA) for the Central China Power Grid.

Calculation of C*EF*$_{ELEC}$

The calculation can be conducted according to "Tool to calculate the emission factor for an electricity system" (Version 01.1). It also refers to *Bulletin on Baseline Emission Factor of China Region Grid* as published by the Office of National Coordination Committee on Climate Change (i.e. the national DNA)[9], which calculate the Operating Margin (OM) Emission Factor and the Build Margin (BM) Emission Factor for the Chinese regional power grids.

The full process of the calculation of the emission factors and all underlying data are presented in Annex 3.

Step 1. Identify the relevant electric power system

The delineation of the Project electricity system and connected electricity system as defined by the Host Country DNA has been used to define the relevant electric power system. The power generated by the project activity will be transferred to the CCPG, comprising the provincial electric systems of Henan Province, Hunan Province, Hubei Province, Jiangxi Province, Sichuan Province and Chongqing municipality. Therefore the CCPG is identified as the Project electric power system.

Step 2. Select an operating margin (OM) method

[9] http://cdm.ccchina.gov.cn/web/index.asp

According to the "Tool to calculate the emission factor for an electricity system (Version 01.1)", one of the following options can be applied for the EF_{OM} calculation:

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

The simple OM method is used for this Project. The selected method is applicable to this Project because low cost/ must run resources constitute less than 50% of the total grid generation in average of the five most recent years. Detailed calculation is listed as:

Table B.8 Power generation mix of Central China Power Grid

Year	Electricity generation (GWh)				
	Thermal	Hydro	Others	Total	Low cost/must run (%)
2002	200,347	112,440	n.a.	312,787	35.95%
2003	240,839	126,448	n.a.	367,287	34.43%
2004	270,846	169,094	725	440,665	38.37%
2005	303,976	187,734	10	491,720	38.59%
2006	355,453	192,296	102	547,859	35.10%

Data Source: China Electric Power Yearbook (2003 - 2007)

In accordance with the "Tool to calculate the emission factor for an electricity system (Version 01.1)", the Ex-ante option is selected to calculate the simple OM emission factor, Therefore, the latest three years for which data are available in CCPG, and the most recent 3 years (2004-2006) generation-weighted average value is taken for the OM Emission Factor.

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

According to "Tool to calculate the emission factor for an electricity system (Version 01.1) ", the Simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

Option A. Based on data on fuel consumption and net electricity generation of each power plant / unit, or
Option B. Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, or
Option C. Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The Project selected Option C for the following 2 reasons:

1. Options A and B are not applicable as fuel consumption data for each power plant are commercially confidential and not available to the public in China;
2. Nuclear and renewable power generations are considered low-cost / must-run power plants / units within the CCPG, and the quantity of electricity supplied to the CCPG is known.

According to Option C, the calculation follows the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{co_2,i,y}}{EG_y} \qquad (3)$$

Where:

- $EF_{grid,OMsimple,y}$: Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
- $FC_{i,y}$: Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit);
- $NCV_{i,y}$: Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit);
- $EF_{CO2,i,y}$: CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ), using 2006 IPCC values;
- EG_y: Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh);
- i: All fossil fuel types combusted in power sources in the project electricity system in year *y*;
- y: Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

In accordance with the "Tool to calculate the emission factor for an electricity system" Version 01.1, the Ex-ante option is selected to calculate the OM emission factor, Therefore, Equation 3 is applied to the three latest years for which data are available, and a 3-year generation-weighted average value is taken for the OM Emission Factor.

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the CO_2 emission factor and the oxidation rate. Aggregated generation and fuel consumption data have been used for the calculation of the emission factors, since more disaggregated data are not publicly available in China.

On the basis of these data, the Operating Margin emission factors for 2004, 2005 and 2006 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Annex 3. We calculate the Operation Margin Emission Factor as:

$EF_{gird,OMsimple,y}$ =1.2899 tCO_2/MWh.

The operating margin emission factor of the baseline is calculated ex-ante and will not be updated during the crediting period of the project activity.

Step 4. Identify the cohort of power units to be included in the build margin

To the purpose of this Project, the sample group of power units *m* used to calculate the build margin is the set of the power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

In terms of the vintage data, the "Tool to calculate the emission factor for an electricity system (Version 01.1)" indicate two options for the calculation of $EF_{BM,y.}$ The Project selected Option 1: during the crediting period, 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 CDM-PDD submission to the DOE for validation.

Step 5. Calculate the build margin emission factor(s) (EF_{BM})

The Build Margin Emission Factor is calculated as the generation-weighted average emission factor (tCO_2e/MWh) of all power unites *m* during the most recent year *y* for which power generation data is available, calculated as follows;

$$EF_{gird,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (4)$$

Where:

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

However, a direct application of this approach is difficult in China, as data on either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation are classified as business confidential and are not publicly available. As the data required cannot be obtained in China, the EB has provided guidance and allowed for deviation[10]. The following deviation has been indicated by the EB:

a. Use of capacity addition from one year to another as basis for determining the build margin, i.e. the capacity addition over five years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
b. Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above instead of power generation, using plant efficiencies and emission factors of commercially available best practice technology.

Executive Board (EB) also suggests using the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin.

The calculations of build margin emission factor are derived from the "Bulletin on the Baseline Emission Factor of the China's Regional Grids", which is renewed and published by the DNA (Office of National Coordination Committee on Climate Change) in China.

First we calculated the newly–added installed capacity and the share of each power generation technology in the total capacity.

[10] *"Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.*

Second, the weights of newly-added installed capacity for each power generation technology have been calculated. Since the exact data are aggregated and is not possible to distinguish among the different thermal power generation technology capacities (e.g. coal, oil, gas, etc), the calculation applied the following method: calculation of shares of CO_2 emissions from solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights. Shares of CO_2 emissions from solid fuel, liquid fuel and gas fuel in total emissions are calculated using the below formulas:

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (6)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (7)$$

Where:

- $F_{i,j,y}$: is the amount of fuel *i* (in a mass or volume unit) consumed by power sources *j* in year(s) *y*;
- $NCV_{i,y}$: is net calorific value of fossil fuel type *i* in year *y* (GJ / t or volume unit GJ / m^3);
- $EF_{CO2i,j,y}$, is emission factor of fuel *i* (tCO_2e/GJ) in year(s) *y*;
- *Coal, Oil and Gas*, is solid, liquid and gas fuels respectively.

Third, the Emission Factor for thermal power generation is calculated multiplying the emission factor for advanced efficient technology by the weights calculated above.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (8)$$

Where:

- $EF_{Coal,Adv,y}$, $EF_{Coal,Adv,y}$, $EF_{Gas,Adv,y}$, are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.

Fourth, the BM emission factor of the power grid was calculated by multiplying 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.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (9)$$

Where:

CAP_{Total}, is the total capacity addition;

$CAP_{Thermal,}$ is the total thermal power capacity addition.

The calculation result of the Building Margin emission factor is**:**

$EF_{BM,y}$ = 0.6592 tCO_2e/MWh, which is published by the bulletin from DNA, and the details can be found in the bulletin.

The build margin emission factor of the baseline is calculated ex-ante and will not be updated during the fixed crediting period of the project activity.

Step 6. Calculate the combined margin emissions factor (EF_y)

The combined margin emission factor is calculated as weighted average of the operating margin and build margin.

$$EF_{gird,CM,y} = EF_{gird,OMSimple,y} \times w_{OM} + EF_{gird,BM,y} \times w_{BM} \quad (10)$$

Where:

- $EF_{grid,BM,y}$: Build margin CO_2 emission factor in year y (tCO_2/MWh)
- $EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year y (tCO_2/MWh)
- w_{OM}: Weighting of operating margin emissions factor (%)
- w_{BM}: Weighting of build margin emissions factor (%)

According to steps above and the *Bulletin on Baseline Emission Factor of China Region Grid* published by the Office of National Coordination Committee on Climate Change, the build margin emission factor of the CCPG is **$EF_{gird,BM,y}$=0.6592 tCO_2/MWh**. The value of the defaults weights of the operating margin (w_{OM}) and the build margin (w_{BM}) as specified in the "Tool to calculate the emission factor of an electricity system" are w_{OM}= 0.5 and w_{BM} = 0.5.

Applying above values the combined baseline emission factor of the CCPG is**:**

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

EF_{OM}	1.2899 tCO_2/MWh
EF_{BM}	0.6592 tCO_2/MWh
CEF_{ELEC}	0.97455 tCO_2/MWh

Source: Office of National Coordination Committee on Climate Change,
Emission factors of the Central China Power Grid (CCPG)

$CEF_{ELEC,y} = 0.5 \times EF_{OM,y} + 0.5 \times EF_{BM,y} = 0.5 \times 1.2899 + 0.5 \times 0.6592 =$ **0.97455 tCO_2/MWh**

The combined emission factor of the baseline is calculated ex-ante and will not be updated during the fixed crediting period of the project activity.

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

When the captured methane is burned in a flare, heat or power plant, or oxidized in a catalytic oxidation unit, combustion emissions are released. In addition, if NMHC account for more than 1% by volume of the extracted CMM, combustion emission from these gases should also be included.

$PE_{MD} = (MD_{FL} + MD_{OX} + MD_{ELEC} + MD_{HEAT} + MD_{GAS}) \times (CEF_{CH4} + r \times CEF_{NMHC})$ (11)

with:
$r = PC_{NMHC} / PC_{CH4}$ (12)

where:
PE_{MD}: Project emissions from CMM destroyed (tCO_2e)
MD_{FL}: Methane destroyed through flaring (tCH_4)
MD_{OX}: Methane destroyed through catalytic oxidation (tCH_4)
MD_{ELEC}: Methane destroyed through power generation (tCH_4)
MD_{HEAT}: Methane destroyed through heat generation (tCH_4)
MD_{GAS}: Methane destroyed after being supplied to gas grid or for vehicle use (tCH_4)
CEF_{CH4}: Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4 According to ACM0008 ver4)
CEF_{NMHC}: Carbon emission factor for combusted non methane hydrocarbons (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 (%)

The proposed project activity doesn't involve the use of CMM for boilers as fuel, for power generation, flaring or oxidation. Therefore, equation 11 above is reduced as follows:

$PE_{MD} = MD_{GAS} \times (CEF_{CH4} + r \times CEF_{NMHC})$ (11a)

In each end-use, the amount of gas destroyed depends on the efficiency of combustion of each end use.

$MD_{GAS} = MM_{GAS} \times Eff_{GAS}$ (13)

Where:
MD_{GAS}: Methane destroyed after being supplied to gas grid (tCH_4)
MM_{GAS}: Methane measured supplied to gas grid (tCH_4)
Eff_{GAS}: Overall efficiency of methane destruction through gas grid to various combustion end uses, combining fugitive emissions from the gas grid and combustion efficiency at end user (taken as 98.5% from IPCC)

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

Not all of the methane sent to the flare, to the catalytic oxidizer or used to generate power and heat will be combusted, so a small amount will escape to the atmosphere. These emissions are calculated using the following:

$$PE_{UM} = [GWP_{CH4} \times \sum_i MM_i \times (1 - Eff_i)] + PE_{flare} + PE_{OX} \times GWP_{CH4} \quad (14)$$

Where:
PE_{UM}: Project emissions from un-combusted methane (tCO_2e)
GWP_{CH4}: Global warming potential of methane (21 tCO_2e)
i: Use of methane(power generation, heat generation, supply to gas grid to various combustion end uses)
MM_i: Methane measured sent to use i (tCH_4)
Eff_i: Efficiency of methane destruction in use i (%)
PE_{flare}: Project emissions of non-combusted CH_4 expressed in terms of CO_2e from flaring of the residual

gas stream (tCO_2e)
PE_{OX}: Project emissions of non oxidized CH_4 from catalytic oxidation of the VAM stream (tCH_4)

The proposed project activity involves only CMM gas supply, without CMM fuel boilers, power generation, flaring or oxidation, therefore, the formula is reduced to:

$$PE_{UM} = GWP_{CH4} \times MM_{GAS} \times (1 - Eff_{GAS}) \quad (14a)$$

Where:
MM_{GAS}: Methane measured supplied to gas grid
Eff_{GAS}: Overall efficiency of methane destruction through gas grid to various combustion end uses, combining fugitive emissions from the gas grid and combustion efficiency at end user (taken as 98.5% from IPCC)

2. Baseline Emissions

Baseline emissions are given by the following equation:

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y} \quad (15)$$

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 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 ($BE_{MD,y}$)

The following equations are used to calculate baseline thermal demand.

$$BE_{MD,y} = (CEF_{CH4} + r \times CEF_{NMHC}) \times \sum_i (CBM_{BL,i,y} + VAM_{BL,i,y} + CMM_{BL,i,y} + PMM_{BL,i,y}) \quad (16)$$

Where:
$BE_{MD,y}$: Baseline emissions from destruction of methane in the baseline scenario in year y (tCO_2e)
i: Use of methane (flaring, power generation, heat generation, supply to gas grid to various combustion end uses)
$CBM_{BL,i,y}$: CBM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (expressed in tCH_4)
$VAM_{BL,i,y}$: VAM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (expressed in tCH_4)
$CMM_{BL,i,y}$: Pre-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (expressed in tCH_4)
$PMM_{BL,i,y}$: Post-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (expressed in tCH_4)
CEF_{CH4}: Carbon emission factor for combusted methane ($2.75tCO_2/tCH_4$)
CEF_{NMHC}: Carbon emission factor for combusted non methane hydrocarbons (various. To be obtained

through periodical analysis of captured methane) ($tCO_2eq/tNMHC$)
r: Relative proportion of NMHC compared to methane

With:
$r = PC_{NMHC}/PC_{CH4}$
PC_{CH4}: Concentration (in mass) of methane in extracted gas (%), to be measured on wet basis.
PC_{NMHC}: NMHC concentration (in mass) in extracted gas (%)

In baseline scenario, CMM is only venting to atmosphere without any destruction usage, therefore, $BE_{MD,y} = 0$.

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

All the extracted gas before implementing project activity was released into the atmosphere. The following equation will be employed to calculate $BE_{MR,y}$

$$BE_{MR,y} = GWP_{CH4} \times [\sum_i (CBMe_{i,y} - CBM_{BLi,y}) + \sum_i (CMM_{PJ,i,y} - CMM_{BLi,y}) + \sum_i (PMM_{PJ,i,y} - PMM_{BLi,y}) + \sum_i (VAM_{PJ,i,y} - VAM_{BLi,y})]$$

(17)
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)
i: Use of methane (flaring, power generation, heat generation, supply to gas grid to various combustion end uses)
$CBMe_{i,y}$: Eligible CBM captured, sent to and destroyed by use i in the project for year y (tCH_4)
$CBM_{BL,i,y}$: CBM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (tCH_4)
$CMM_{PJ,i,y}$: Pre-mining CMM captured, sent to and destroyed by use i in the project activity in year y (tCH_4)
$CMM_{BL,i,y}$: Pre-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH_4)
$PMM_{PJ,i,y}$: Post-mining CMM captured, sent to and destroyed by use i in the project activity in year y (tCH_4)
$PMM_{BLi,y}$: Post-mining CMM captured, sent to and destroyed by use i in the project activity in year y (tCH_4)
$VAM_{PJ,i,y}$: VAM sent to and destroyed by use i in the project activity in year y (tCH_4)
$VAM_{BL,i,y}$: VAM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH_4)
GWP_{CH4}: Global warming potential of methane (21 tCO_2e/tCH_4)
CEF_{CH4}: Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)
CEF_{NMHC}: Carbon emission factor for combusted non methane hydrocarbons (various. To be obtained through periodical analysis of captured methane) ($tCO_2eq/tNMHC$)
r: Relative proportion of NMHC compared to methane

with:
$r=PC_{NMHC}/PC_{CH4}$
PC_{CH4}: Concentration (in mass) of methane in extracted gas (%)
PC_{NMHC}: NMHC concentration (in mass) in extracted gas (%)

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. This project does not relate to CBM, VAM and PMM, therefore, equation (17) will be reduced to:

$$BE_{MR,y} = GWP_{CH4} \times CMM_{PJ,GAS,y} = GWP_{CH4} \times MM_{GAS} \quad (17a)$$

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 ($21tCO_2e/tCH_4$)
$CMM_{PJ,GAS,y}$: Pre-mining CMM destruction/oxidation through gas grid to various combustion end uses in the project activity in year y (tCH4)

2.3 Emissions from power/heat generation and vehicle fuel replaced by project ($BE_{Use,y}$)

Fuel replacement of this project only takes place in households heating and cooking. This project does not claim CERs from displacement of fossil fuel consumed by residence in baseline scenario as methodology ACM0008 required.

Therefore,

$BE_{Use,y} = 0$

3. Leakage

The formula for leakage given by ACM008 ver. 4 is as follows:

$$LE_y = LE_{d,y} + LE_{o,y} \quad (18)$$

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

Leakage need only be accounted for when there is either (1) a displacement of baseline thermal energy uses, (2) CBM drainage occurring outside the distressed zone, or (3) CDM project activity that impacts coal production, coal prices, or other market dynamics.

In the case of the proposed project activity, there is no displacement of baseline thermal demands, no CBM drainage and no noticeable impact on coal production. Moreover, the Project and involved coal mines are not large enough to impact coal prices or market dynamics in China. Therefore, this project does not need to account for leakage.

4. Emission Reductions

The emission reduction (ER_y) is calculated using the below equation:

$$ER_y = BE_y - PE_y - LE_y \quad (19)$$

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)

Since no obvious leakage occurs outside the project boundary, Project leakage (LE_y) is equal to zero, the above equation is reduced to:

$$ER_y = BE_y - PE_y \quad (19a)$$

The construction starting date of the project is 04/03/2006. The validation will be carried out after the starting date. The project owner has provided the evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

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

Data / Parameter:	Density of Methane
Data unit:	t/m^3
Description:	Density of Methane
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Inventories
Value applied:	0.00067
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value set by the methodology
Any comment:	

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Operating margin emission factor of Central China Power Grid
Source of data used:	"The Clarification of Determining Baseline Emission Factor for China Regional Grid" by NCCC
Value applied:	1.2899
Justification of the choice of data or description of measurement methods and procedures actually applied :	China DNA's official data.
Any comment:	

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2e/MWh
Description:	CO_2 Build margin emission factor of Central China Power Grid
Source of data used:	"The Clarification of Determining Baseline Emission Factor for China

	Regional Grid" by NCCC
Value applied:	0.6592
Justification of the choice of data or description of measurement methods and procedures actually applied :	China DNA's official data.
Any comment:	

Data / Parameter:	CEF_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Carbon emission factor for combusted methane
Source of data used:	ACM0008/Version 04
Value applied:	2.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0008 / version 04.
Any comment:	

Data / Parameter:	Eff_{GAS}
Data unit:	%
Description:	Efficiency of methane destruction in use gas grid
Source of data used:	ACM0008/Version 04
Value applied:	98.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0008 / version 04.
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane
Source of data:	IPCC 2006
Value applied	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0008 / version 04.
Any comment:	

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

>>
1. Project Emissions

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

Fengcheng city is located in Jiangxi province and the regional grid that the project connected into is Central China Power Grid.

We refer the method in "Notification on Determining Baseline Emission Factor of China's Grid[11]" published by Chinese DNA to ex-ante determine the emission factor of Central China Power Grid.

Table B.9 OM and BM for Central China Power Grid

OM (tCO_2/MWh)	1.2899
BM (tCO_2/MWh)	0.6592

As shown in Table B.9, the OM of Central China Power Grid is 1.2899 tCO_2/MWh; the BM of Central China Power Grid is 0.6592 tCO_2/MWh. Therefore,

$CEF_{ELEC} = 0.5 \times EF_{OM} + 0.5 \times EF_{BM} = 0.5\times1.2899 + 0.5\times0.6592 = 0.97455$ tCO_2/MWh

The value of $CONS_{ELEC,\ PJ}$ includes two parts, one is electricity consumption for daily operation in Fengcheng pipeline gas Co.,Ltd, which is calculated based on the parameters shown in the feasibility study report of this project, the other one is electricity consumption due to pump systems in both coalmines. The installed capacity of pump system in Fenglong coalmine is 250kW, while Shangzhuang coalmine is 90kW. For conservative reason, these two pump systems are assumed to operate all the time. The actual power consumption by the proposed project in the crediting period will be monitored by electricity meters.

After the project is fully operated:

$CONS_{ELEC,PJ}$ = 2,520MWh/y + (250kW+90kW)×24h/d×365d/y = 5498.4 MWh/y

$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC}$ = 5498.4MWh/y × 0.97455 tCO_2e/MWh = 5,358 tCO_2e/y

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

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

[11] *http://cdm.ccchina.gov.cn/web/main.asp?ColumnId=25*

According to the Feasibility Study Report of the project, the concentration of methane in CMM gas is 33%, the density of methane under normal conditions of temperature and pressure is 0.00067t/m^3 according to ACM0008 and 2006 IPCC.

In the first two years, CMM capacity is 50% and 70% respectively. After the project is fully operated from the third year, daily CMM volume will reach 90,000m^3. thus

$MD_{GAS} = MM_{GAS} \times Eff_{GAS}$ = 90000m^3/d×360d×33%×0.00067t/m^3×98.5% = 7,056 tCH_4/y

Therefore, ex-ante estimated PE_{MD} is given as follows:

$PE_{MD} = MD_{GAS} \times CEF_{CH4}$ = 7,056×2.75 = 19,405 tCO_2e/y

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

$PE_{UM} = GWP_{CH4} \times MM_{GAS} \times (1 - Eff_{GAS})$ = 21×7,163.6 × (1 − 98.5%) = 2,257 tCO_2e/y

1.4 The calculation results of Project Emissions

Table B.10 Project Emissions at Fengcheng Coalmine (tons CO_2e)

Year	PE_{ME}	PE_{MD}	PE_{UM}	PE_y
2009.9-2009.12	1093	3959	460	5512
2010	4024	14573	1695	20292
2011	5358	19405	2257	27020
2012	5358	19405	2257	27020
2013	5358	19405	2257	27020
2014	5358	19405	2257	27020
2015	5358	19405	2257	27020
2016	5358	19405	2257	27020
2017	5358	19405	2257	27020
2018	5358	19405	2257	27020
2019.1-2019.8	3590	13001	1512	18103
Total	**51575**	**186768**	**21719**	**260063**

2. Baseline Emissions

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

As mentioned in B.6.1, $BE_{MD,y} = 0$.

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

$BE_{MR,y} = GWP_{CH4} \times CMM_{PJ,GAS,y} = GWP_{CH4} \times MM_{GAS}$= 21×7,163.6 =150,436 tCO_2e/y

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

As mentioned in B.6.1,, $BE_{Use,y} = 0$

2.4 The calculation results of baseline emissions

Table B.11 Baseline Emissions at Fengcheng Coalmine(tones CO_2e)

Year	$BE_{MD,y}$	$BE_{MR,y}$	$BE_{Use,y}$	BE_y
2009.9-2009.12	0	30689	0	30689
2010	0	112978	0	112978
2011	0	150436	0	150436
2012	0	150436	0	150436
2013	0	150436	0	150436
2014	0	150436	0	150436
2015	0	150436	0	150436
2016	0	150436	0	150436
2017	0	150436	0	150436
2018	0	150436	0	150436
2019.1-2019.8	0	100792	0	100792
Total	**0**	**1447951**	**0**	**1447951**

3. Leakage

The proposed project will not prevent CMM from being used to meet baseline thermal energy demand, so no displacement of baseline thermal energy uses would occur; no CBM drainage is involved; no noticeable impact of CDM project activity on coal production since the baseline scenario is not ventilation only; besides, 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

Since there is no leakage occurs outside the project boundary, 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).

$ER_y = BE_y - PE_y = 150,436 – 27,020 = 123,417\ tCO_2e/y$

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 emission reductions (tonnes of CO_2e)
2009.9-2009.12	5512	30689	0	**25177**
2010	20292	112978	0	**92686**
2011	27020	150436	0	**123417**
2012	27020	150436	0	**123417**
2013	27020	150436	0	**123417**
2014	27020	150436	0	**123417**
2015	27020	150436	0	**123417**

2016	27020	150436	0	**123417**
2017	27020	150436	0	**123417**
2018	27020	150436	0	**123417**
2019.1-2019.8	18103	100792	0	**82689**
Total (tonnes of CO_2e)	**260063**	**1447951**	0	**1187888**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	$CONS_{ELEC, PJ}$
Data unit:	MWh/y
Description:	Additional electricity consumption by project
Source of data:	Monitoring data provided by Fengcheng pipeline Co., Ltd
Measurement procedures (if any):	
Monitoring frequency:	Continuously monitored by electricity meter
QA/QC procedures:	Power meters will be subject to a regular maintenance regime to ensure accuracy. Power consumption from pump system in two coalmines can not be measured separately. Therefore, for conservativeness, we consider pumps operating 24 hours a day per 365 days a year More procedures can be seen in CDM manual.
Any comment:	-

Data / Parameter:	MM_{GAS}
Data unit:	tCH_4
Description:	Methane sent to grid for end users
Source of data:	Calculate by the amount of CMM gas
Measurement procedures (if any):	
Monitoring frequency:	Continuously monitored by gas flow meters adjusted by temperature and pressure.
QA/QC procedures:	Flow meters will be subject to a regular maintenance regime to ensure accuracy. More procedures can be seen in CDM manual.
Any comment:	Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is $0.67kg/m^3$ (Revised 1996 IPCC Reference manual p 1.24 and 1.16)

Data / Parameter:	CEF_{NMHC}
Data unit:	-
Description:	Carbon emission factor for combusted non methane hydrocarbons (various)
Source of data:	
Measurement procedures	

(if any):	
Monitoring frequency:	Annually monitoring and analyzing NHMC concentration. If it is above 1%, determining each carbon emission factor of different components.
QA/QC procedures:	Instruments will be subject to a regular maintenance regime before analyzing gas components to ensure accuracy. More procedures can be seen in CDM manual.
Any comment:	To be obtained through periodical analysis of the fractional composition of captured

Data / Parameter:	PC_{CH4}
Data unit:	%
Description:	Concentration (in mass) of methane in extracted gas (%) , measured on wet basis
Source of data:	Concentration meters, optical and calorific
Measurement procedures (if any)	The concentration of the coal mine methane is higher than 30%. In the emission reduction calculation, the amount of the pure methane will be used, not the concentration of the drained coal mine methane.
Monitoring frequency:	Daily
QA/QC procedures:	Concentration meters will be subject to a regular maintenance regime to ensure accuracy. More procedures can be seen in CDM manual.
Any comment:	To be measured on wet basis.

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration(in mass) in extracted gas
Source of data:	Concentration meters, optical and calorific
Measurement procedures (if any)	
Monitoring frequency:	Annually monitoring NHMC concentration to check out whether it is less than 1% to determine whether its emissions to be included in the calculation.
QA/QC procedures:	The fractional composition analysis instruments will be subject to a regular maintenance regime before analyzing gas components to ensure accuracy.
Any comment:	-

Data / Parameter:	Enforcement of the Emission Standards of Coalbed Methane/Coal Mine Gas
Data unit:	- volumes of CMM extracted and used in Jiangxi Province and in China - number of coalmine using high concentration CMM in the South China Region (R3) [12] and utilisation rate - number of coalmines punished for non compliance with the Emission Standards in China and in the South China Region (R3)
Description:	Level of enforcement of the Emission Standards of Coalbed

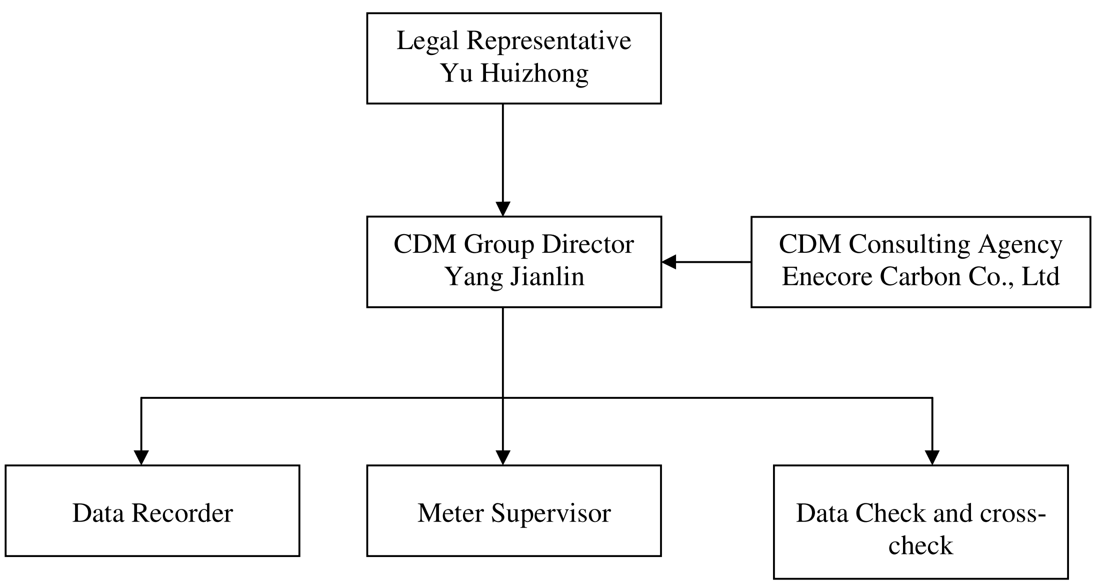
[12] Feasibility Study of CBM production in China, China Energy and Environment Programme, Ref. EuropeAid/120723/D/SV/CN

	Methane/Coal Mine Gas within China.
Source of data:	- Official statistics from central and provincial competent authority - Technical reports from CMM and Coalmine research institutes - Sample group of coalmines in South China Region (R3)
Measurement procedures (if any)	If public data and statistics are not available, a back-up sample group of CMM projects will be selected within the South China Region (R3). The sample group will be randomly selected according to criteria of similarity with the project activity, including a methane concentration equal or greater than 30%. A number of projects equal to the square root of the total number of applicable projects in the selected zone will be selected.
Monitoring frequency:	Once a year, starting from January 1, 2010.
QA/QC procedures:	-
Any comment:	-

B.7.2. Description of the monitoring plan:

The monitoring plan for the proposed project will be responsibly implemented by the project owner; Fengcheng Pipeline Gas Co., Ltd. and supervised by the CDM project developer, Enecore carbon Co., Ltd. It will ensure the measurable, long-term GHG emission reduction of the project during crediting period can be monitored, recorded and reported. It is a crucial procedure to identify the final CERs of the proposed project.

1. Monitoring organization



The monitoring organization team will be established before the crediting period. As the organization chart shows that the CDM Director will be nominated and take the overall responsibility for the

monitoring system of the proposed project. Clear roles and responsibilities will be assigned to all staff who get involved in the CDM monitoring plan.

As part of the QA process the CDM Director will help to ensure the monitoring staff are trained by consulting company, ensuring these trained staff perform the correct monitoring duties as required. Additional trained CDM staff should be able to take the responsibility of the monitoring system in case of the monitoring staff are absent.

A formal set of monitoring procedures will be established prior to the start of the project. These procedures will detail the organization, control and steps required for certain key monitoring system features, responsibility of every staff, etc.

2. Monitoring

2.1 Equipment and installation

All the necessary monitoring equipments will be installed on the project site to meet the requirements of the methodology. Adequate training will be provided to CDM staff operating, reading or maintaining the equipment. Installation procedures, calibration and maintenance frequency will be set according to the recommendations from the equipment manufacturers.

The locations of the meters or monitoring ports will be chosen in accordance to meeting the monitoring requirements of the methodology whilst under the guidance of the equipment manufacturer. The following diagram shows the locations where these metering instruments should be installed and which test should be taken for the project.

Figure B.3 Monitoring plan of the proposed project activity

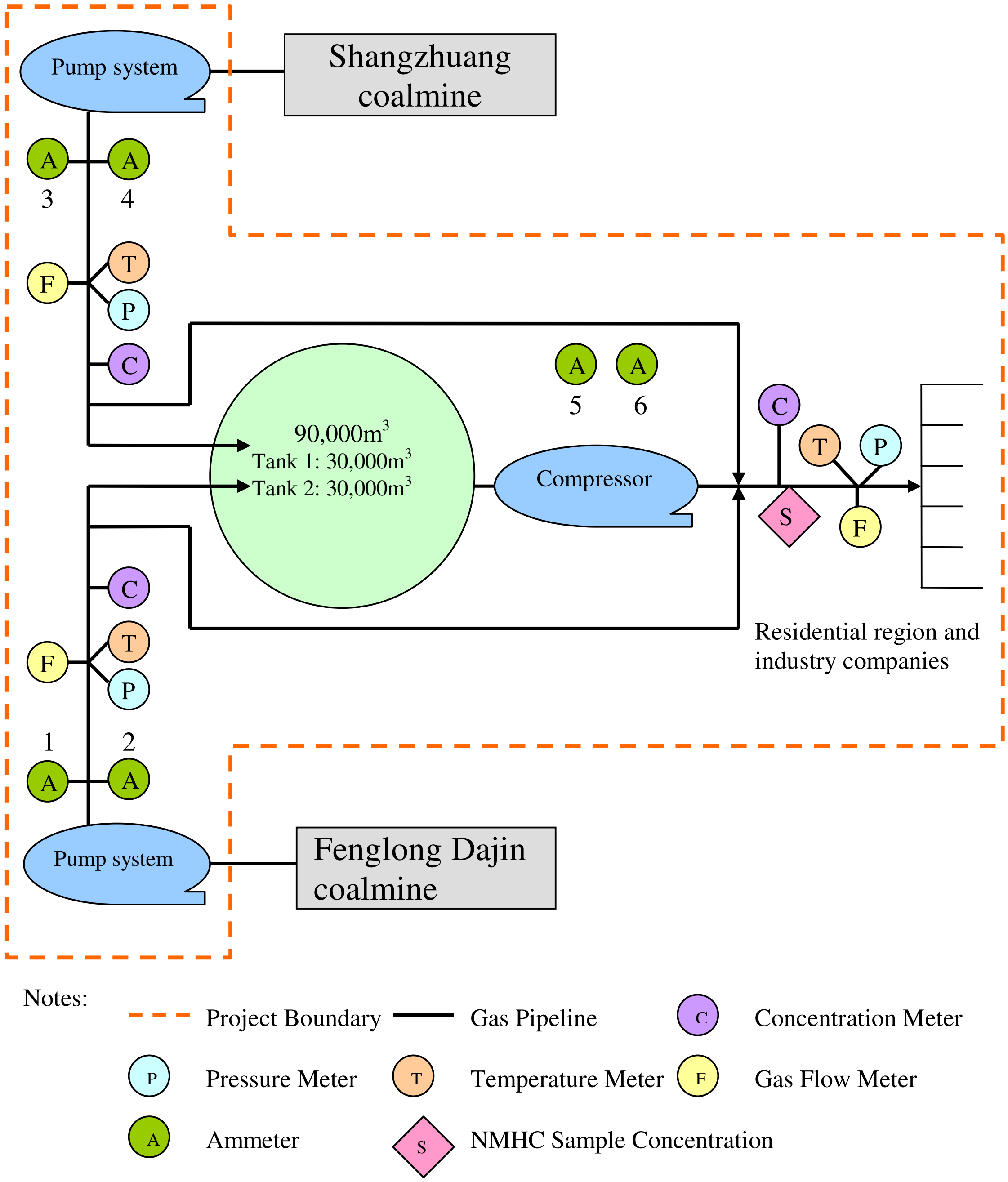


Table B.12 Information of the Monitoring Instruments

Symbol	Instrument	Function	Equipment model	Accuracy	Number
C	CH_4 concentration meter	Measure the concentration of the drained methane	KG9001B	0.5	3
F	Gas flow meter	Measure CMM flow rate transmitted to utilization	XMJ5060P	0.5	3

		equipment			
T	Temperature Meter	Measure temperature of the CMM transmitted to the gas pipeline	XMB7011	0.5	3
P	Pressure Meter	Measure Pressure of CMM	XMB7055	0.5	3
A	Ammeter	Measure how much electricity consumed by the proposed project	DP862	0.5	3 main 3 backup

No. 1 and No.2 ammeters will be installed on Fenglong Dajin coalmine to measure electricity consumed by pump system.

No. 3 and No. 4 ammeters will be installed on Shangzhuang coalmine to measure electricity consumed by pump system.

No. 5 and No.6 ammeters will be installed on the project site to measure electricity consumed by the equipments on site and daily operation.

No.1, No.3, No.5 ammeters are main ammeters for data record.

No.2, No.4, No.6 ammeters are backup ammeters for reference in case malfunction of main ammeters.

Power measuring equipment installation shall be collocated according to "Technique Management Regulation of Power Measure Equipment" (DL/T448-2000, issued by State Economic and Trade Commission on Nov.03, 2000 and implemented on Jan.1, 2001). Before the power measuring equipment is put to use, the project owner shall check their accuracy according to "Technique Management Regulation of Power Measure Equipment" (DL/T448-2000).

2.2 Policy monitoring

The level of enforcement of the Emission Standards of Coalbed Methane/Coal Mine Gas will be monitored once a year starting from 1 January 2010, in order to assess whether or not it is systematically enforced in China and within Jiangxi province.

Official central and provincial governmental reports, technical review and papers from CMM research institutes, industry associations, universities and other relevant public entities will be used to get relevant data and statistics, including but not limited to:

- volumes of high concentration CMM extracted and used in China by province, with particular emphasis on Jiangxi province;
- number of coalmines using high concentration CMM in Jiangxi province and utilisation rates;
- number of coalmines punished for non compliance with the Emission Standards in Jiangxi province and China.

If public data and statistics are not available, a back-up sample group of CMM projects will be selected within the South China Region (R3)[13] including Hubei, Zhejinag, Hunan, Guangxi and Jiangxi provinces. The selection will be done randomly among the existing projects with methane concentration in the

[13] Feasibility Study of CBM production in China, China Energy and Environment Programme, Ref. EuropeAid/120723/D/SV/CN

extracted CMM equal or greater than 30% within the selected zone. CMM projects developed or being developed as CDM will not be considered in the selection. A number of projects equal to the square root of the total number of applicable projects in the selected zone will be selected. Data and statistics of extracted and used CMM at each selected project, including info on methane concentration, will be collected.

Any amendment and/or revision of the Emission Standards will be also monitored.

3. Data collection

The steps of monitoring CMM gas delivered to project site and finally transmitted to residential region are as follows:

(1) Both the project owner and coal mine company should read and record data from gas flow meter on 1^{st}, 11^{th},21^{st} of every month;

(2) The data should be calculated base on the gas flow meter installed in the outlet of coal mine company, Coal mine company should inform project owner about the data of gas flow everyday in order to ensure the monitoring accuracy.

(3) The project owner should read ammeter installed in the project site and record electricity consumed by the project;

(4) Project owner should conduct periodical sampling of NMHC concentration test to make sure whether the concentration is under 1% and record the data for validation/verification.

(5) The project owner should offer reading record of measuring instruments and invoice copy piece to verifying people of DOE.

To the purpose of the monitoring of the level of enforcement of the mission Standards of Coalbed Methane/Coal Mine Gas, the Project Owner with the assistance of the CDM consultant, will:

- collect, analysis and convert official data and statistics in tabular electronic format;
- develop a detailed list of references;
- where feasible, conduct interviews with operators of the sample group of projects;
- consolidate all findings in a report for consideration of the veryfing DOE and the EB.

4. Calibration of meters and metering

The flow meters and ammeter should be calibrated before being installed, all of installed instruments should be tested by measuring and inspecting institution with certification entrusted by both the project owner and coal mine company, both sides should bear 50% of calibration fee respectively, negotiation will be held if meters run out of the accuracy range.

5. Quality Assurance

The project owner should sign an agreement with coal mine company that stipulates quality control process of measurement and adjustment to ensure measurement precision. Periodical metering instruments inspection and on-site checking shall be implemented according to national standards and regulations of gas supply industry.

If the imprecision of a measuring instrument falls outside the range of allowed error in some cases, or the function of instruments is abnormal, the CMM volume transmitted to gas pipeline should be confirmed according to the following measures:

(1) Firstly, read data from flow meters installed in the other side for reference, calculate CMM volume by the meter, unless any side thinks that the flow meter is also not precise in reading;

(2) If the flow meter has no acceptable precision or standard operation, the project owner and coal mine company should jointly design a reasonable conservative method to estimate readings, and explain that it's reasonable and conservative at verification of DOE.

(3) If project owner and coal mine company cannot reach an agreement on the conservative method to estimate readings, arbitration should be conducted according to conventional procedure to confirm the consistency of estimating method.

6. Data management

The CDM group appointed by the project owner should keep monitoring data in electronic archives at every month end; electronic documents should be copied by CD and printed to be kept in the form of paper document. The project owner should keep electricity purchase invoice. Paper documents, such as maps, forms, EIA reports etc, should be used with monitoring plan to verify the authenticity of data. In order to help verifiers obtain documents and information related to the emission reduction of the project, the project owner should offer index of the project document and monitoring report. All the data and information in the form of paper document will be kept in archives by CDM group, with at least one copy backup for each datum. All of the data should be kept within 2 years after the crediting period.

7. Monitoring report

The managerial organization will compile the annual monitoring report including monitoring result, emission reduction calculation and maintenance records. The report will provide to DOE for validation and verification.

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 study and monitoring methodology was completed on Jan.30th, 2008.

The entity determining the baseline study and monitoring methodology is:

Enecore Carbon Co.,Ltd
Jianwai SOHO, Tower 16, Room 1601
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China
Tel: +86-10-59000701
Fax: +86-10-59000706

Persons in charge:

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Miao Yu, CDM Project Developer
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Email: a.luo@enecore.com

Enecore Carbon Co.,Ltd is not project participant.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
The construction starting date of the project activity: 04/03/2006 (as evidenced by Construction start report)

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

>>
30 years

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

C.2.1. Renewable crediting period

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

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. **Starting date:**

>>
01/09/2009 or the date of project registration by the UNFCCC whichever is later

C.2.2.2. **Length:**

>>
10 Years

SECTION D. Environmental impacts

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

>>

An Environmental Impact Assessment has been completed in accordance with the regulations of the host country to identify potential negative impacts of the project on the environment, local communities and economy, and develop mitigation measures. The Jiangxi Environment Protection Bureau has ratified the environmental assessment report in Sept 19th, 2006 and agreed to implement the proposed project. The proposed project has been considered with respect to potential impacts on air quality, water quality, noise, solid waste, ecological effect, etc. The findings of this evaluation are summarized below.

Construction Phase

- Noise

The noises during the construction phase mainly come from various construction activities. Constructing workers should be protected when working, equipped with sound-blocking earplugs and crash helmets. But the noise influence last for only short time with low intense. Low-noise facilities should be employed as possible; sound-blocking chambers should be established where there is a fixed source of biggish noise, and sound-absorbing equipments should be used for source of relatively minor noise.

- Waste water

The waste water generated during the construction period mostly comes from construction process and daily life. Sedimentation is adopted to dispose of waste water from production process by recycle rather than discharging directly.

The waste water brought by constructing workers' daily life mainly comes from dejecta and water for washing. The waste water from daily life will be processed in cesspool, and it can't be discharged until disposed of.

- Garbage

During the construction period, daily garbage and construction garbage will come out, which can't be disposed on the project site. All the garbage will be collected and sent to garbage plants for treatment, by this way to reduce the pollution to the environment.

All the impact to the environment during the construction period is temporary, it will recover after the construction finished.

Operation Phase

- Air quality

A small amount of coalmine methane will be inevitably emit to the atmosphere, which generates during the compressing process, waster seal well process and maintenance of storage equipments. Emissions will be in compliance with host country. However, these emissions are viewed as significantly less harmful than the continued uncontrolled release of coalmine methane.

- Water quality

The waste water mainly comes from cleaning of equipments in storage station and residential wastewater of workers. Pollution indicators of residential wastewater are mainly COD, BOD, SS, etc. No pollution can be brought since it will be discharged to the public toilet for fertilizer. SS is mainly contained in pipeline cleaning wastewater which will be treated by a series of chemical measures in coagulation basin so that no adverse effects can be resulted on surface water. The pH of outlet waste water range from 6-9, meets GB8978-1996 first level standard.
Therefore, the proposed project will not result in any pollution on underground and surface water during the operation period.

- Noise

Most of the noise results from the equipments of storage station. Low-noise facilities should be employed as possible; sound-blocking chambers should be established where there is a fixed source of biggish noise, and sound-absorbing equipments should be used for source of relatively minor noise. It meets GB12348-90 II level standard.

- Solid waste

During the operational period of the proposed project, solid waste mainly comes from daily garbage and waste residues from pipelines. Though amount is very small, living garbage is assume to be 21.6 tons/a and waste residue is 31.5kg/a, the solid waste should be cleaned and treated properly in order not to bring any negative effect to the environment. Living garbage should be collected in time and sent to landfill.

- Ecological effect

The pipeline and storage station will adopt auto cut off valve, cathode protection, anticorrosion treatment and auto detect instrument to make accidental spurt reduce to minimum, which will accordingly mitigate the influence scale by the flare and reduce the emission of hydrocarbon. By this way the soil and vegetation will be protected effectively, ecological environment in the project area will not be affected significantly.

The outcome of this EIA is favorable, as the project is found to have no significant negative impacts while many potential positive impacts are identified. Nevertheless, during project construction and operation, all mitigation measures that are recommended by the EIA shall be implemented.

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

>>

According to Environment Impact Assessment and the approval from environmental bureau, no significant negative environmental impacts are expected to result in from the project activity. On the contrary, the project will lead to sustainable development and greatly reduce GHG emissions.

SECTION E. Stakeholders' comments

>>

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

>>

In order to realize the comments of local communities, the CDM Stakeholders Consulting Meeting of Jiangxi Fengcheng CMM distribution project was held in the office of Fengcheng Pipeline Gas Co., Ltd on 24th, March 2008. 24 delegates participated in the meeting, including representatives from local government and Environmental Protection Bureau; representatives from coal mine; representatives from the local residents; staffs of Fengcheng Pipeline Gas Co., Ltd and representatives from Enecore Carbon Co., Ltd. There the project was explained to the stakeholders by representatives from Enecore Carbon Co., Ltd and project owner, then the opinions and comments of the stake holders were collected afterwards. Enecore Carbon Co., Ltd. and project owner were available to answer any doubts about the project during the consultation meeting.

Meanwhile, public opinion survey was carried out on and 10 days prior to the meeting, 119 questionnaires were distributed and collected. The comments of local stakeholders based on the result of questionnaires are summarized in follow and will be readily accessible to DOE.

The questionnaire includes the following contents:

1. Brief introduction of the proposed project (site location, installed capacity, total investment, etc.)

2. Basic information and education level of the investigated

3. Questions on:

1) How much do you know about the CMM pipeline gas project?
   (Familiar; Know about it; Never know)
2) Will the project improve your living condition?
   (Yes; No; Even worse)
3) Will the project increase job opportunities?
   (Yes; No; Hard to say)
4) Do you think the project will benefit the economic development of the society?
   (Yes; No; Hard to say)
5) Which factor can you benefit from the gas supply project?
   (Cheap; Convenient; Stable; less pollution; Others)
6) What are the main impacts of the proposed CMM gas supply project on the local environment?
   (Water; Noise; Land occupation; Ecology; No significant impacts)
7) Which environmental protection methods should be taken to mitigate the negative impacts?
   (Reduce noise; Reduce garbage pollution; Reduce hydrocarbon emission; vegetation recovery)
8) Are you satisfied with the compensation of land use? (this question only for the people who relate to compensation)
   (Very satisfied; satisfied; not at all)
9) What is your attitude towards the project?

(Agree; Disagree; Don't care)

10) What other comments and suggestions do you have?

4 Signature and date

E.2. Summary of the comments received:

>>

After the public questionnaires were published for 10 days, no negative comments were received on the project. Knowing that the implementation of the project would not only utilize CMM for gas supply but also achieve the GHG mitigation by avoiding emitting to the atmosphere, all stakeholders agreed on the implementation of the project based on the result from public comments.

The survey had a 100% effective response rate (119 questionnaires returned out of 119 and 119 effective questionnaires). The following is a summary of the key findings:

Summary of the comment from stakeholders on the project

How much do you know about the CMM pipeline gas project?		
Familiar	Know about it	Never know
63.0%	37.0%	0%
Positive impacts on people's life to be brought about by the project:		
• Gas supply become stable	65.5%	
• More convenience to use gas	58.8%	
• Reduce gas cost	73.1%	
• Increase in the job opportunity	97.5%	
• Life quality improved	98.3%	
• Air pollution reduced	64.7%	
• Other	0.8%	
Negative impacts on people's life to be brought about by the project:		
• Noise	56.3%	
• Land occupation	0.8%	
• Local ecological environment degraded	28.6%	
• Waste water increased	25.2%	
What method should be taken to reduce the negative impacts mentioned above		
• Reduce noise	58.8%	
• Garbage treatment	14.3%	
• Reduce hydrocarbons emission	14.3%	
• Recover ecological environment	48.7%	
Opinions to the compensation (this question only for the people who relate to compensation)		
Very satisfied	Satisfied	Not at all
87.5%	12.5%	0
Support or object to the project development		
Support	Object	
100%	0	
Other assessment and suggestion to the project		
The project can greatly improve the life quality of local residents and air environment		

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

>>

CMM utilization is a clean development industry. The local communities show a positive attitude towards the project. The project owner will ensure sufficient investment to be used for fulfilling the requirements established in the EIA and all environmental standards and try every effort to minimize the negative impacts though it is not significant.

1. Before the waste water is discharged into Gan river, it will be conducted a series of treatment process in waste water treatment station to meet “waste water discharge standard” (GB8978-1996).
2. Recover green vegetation and grow green plants nearby after construction completion.
3. The equipment rooms with strong noise machines are equipped soundproof wall, noise-reduction treatment is taken to reduce negative impact to minimum.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Fengcheng Pipeline Gas Co., Ltd
Street/P.O.Box:	699 Jianyi Road, Fengcheng City, Jiangxi Province, PRC
Building:	
City:	Fengcheng
State/Region:	Jiangxi Province
Postfix/ZIP:	331100
Country:	China
Telephone:	0086 795 7071870
FAX:	0086 795 7071808
E-Mail:	
URL:	
Represented by:	Yang Jianlin
Title:	Deputy General Manager
Salutation:	Sir
Last Name:	Yang
Middle Name:	
First Name:	Jianlin
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

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URL:	www.cez.cz
Represented by:	
Title:	
Salutation:	Sir
Last Name:	Balac
Middle Name:	
First Name:	Jan
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>
No official funding from any Annex 1 country is involved in this proposed project.

Annex 3

BASELINE INFORMATION

Table A3-1 Physical parameters of CMM

Gas content of CMM	
CH_4	33.0%
N_2	57.5%
O_2	7.0%
CO_2	2.0%
CO	0.0016%
Unsaturated hydrocarbons	0.2%
Properties of CMM	
Low calorific value	14.6MJ/m^3
Explosive concentration (CH_4 concentration)	5%~15%

(Provided by Jiangxi light industry design institute)

Table A3-2 Estimated CMM destruction volume

Year	2008.10-2008.12	2009	2010	2011-2017	2018.1-2018.9
MM_{GAS} (10^4m^3)	405	1782	2511	3240/y	2430

Table A3-3 Operating Margin Emission Factor of CCPG in 2003

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	NCV	CO_2 Emission (tCO_2e)
									(tCO_2e/TJ)	(MJ/t,MJ/10^3m^3)	J=G*H*I*44/12 /100 (for mass unit)
		A	B	C	D	E	F	G=A+B+ C+D+E+F	H	I	J=G*H*I*44/12 /10 (for volume unit)
Raw Coal	10^4 t	1427.4 1	5504.9 4	2072.4 4	1646.4 7	769.47	2430.93	**13851.66**	25.8	20908	273971539.89
Cleaned Coal	10^4 t							**0**	25.8	26344	0.00
Other Washed Coal	10^4 t	2.03	39.63			106.12		**147.78**	25.8	8363	1169146.40
Coke	10^4 t				1.22			**1.22**	25.8	28435	32817.40
Coke Oven Gas	10^8 m^3			0.93				**0.93**	12.1	16726	69013.15
Other Gas	10^8 m^3							**0**	12.1	5227	0.00
Crude Oil	10^4 t		0.5	0.24			1.2	**1.94**	20	41816	59490.23
Gasoline	10^4 t							**0**	18.9	43070	0.00
Diesel Oil	10^4 t	0.52	2.54	0.69	1.21	0.77		**5.73**	20.2	42652	181015.94
Fuel Oil	10^4 t	0.42	0.25	2.17	0.54	0.28	1.2	**4.86**	21.1	41816	157229.00
LPG	10^4 t							**0**	17.2	50179	0.00
Refinery Dry Gas	10^4 t	1.76	6.53		0.66			**8.95**	18.2	46055	275069.63
Natural Gas	10^8 m^3					0.04	2.2	**2.24**	15.3	38931	489222.52
Other petroleum produce	10^4 t							**0**	20	38369	0.00
Other coking produce	10^4 t							**0**	25.8	28435	0.00
Other energy	10^4 t bc		11.04			16.2		**27.24**	0	0	0.00
										Subtotal	276404544.15

Data Source: China Energy Statistics Yearbook 2004

Table A3-4 Fuel-fired Electricity Generation of CCPG for Year 2003

Province	Electricity Generation (10^8 kWh)	Electricity Generation (MWh)	Internal Power Consumption Rate (%)	Supplied Electricity (MWh)
Jiangxi	271.65	27165000	6.43	25,418,291
Henan	955.18	95518000	7.68	88,182,218
Hubei	395.32	39532000	3.81	38,025,831
Hunan	295.01	29501000	4.58	28,149,854
Chongqing	163.41	16341000	8.97	14,875,212
Sichuan	327.82	32782000	4.41	31,336,314
Total				225,987,719

Data Source: China Electric Power Yearbook 2004

Table A3-5 Operating Margin Emission Factor of CCPG in 2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	NCV	CO_2 Emission (tCO_2e)
									(tCO_2e /TJ)	(MJ/t,MJ/10^3m^3)	K=G*H*I*44/12/100 (for mass unit)
		A	B	C	D	E	F	G=A+B+C +D+E+F	H	I	K=G*H*I*44/12/10 (for volume unit)
Raw Coal	10^4 t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	17144.1	25.8	20908	339092605.29
Cleaned Coal	10^4 t		2.34					2.34	25.8	26344	58316.13
Other Washed Coal	10^4 t	48.93	104.22			89.72		242.87	25.8	8363	1921441.23
Coke	10^4 t		109.61					109.61	25.8	28435	2948455.29
Coke Oven Gas	10^8 m^3			1.68		0.34		2.02	12.1	16726	149899.53
Other Gas	10^8 m^3					2.61		2.61	12.1	5227	60527.09
Crude Oil	10^4 t		0.86	0.22				1.08	20	41816	33118.27
Gasoline	10^4 t		0.06			0.01		0.07	18.9	43070	2089.33
Diesel Oil	10^4 t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	42652	266627.32
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	41816	464893.14
LPG	10^4 t							0	17.2	50179	0.00
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	18.2	46055	177950.07
Natural Gas	10^8 m^3						2.27	2.27	15.3	38931	495774.61
Other petroleum produce	10^4 t							0	20	38369	0.00
Other coking produce	10^4 t							0	25.8	28435	0.00
Other energy	10^4 t bc		16.92		15.2	20.95		53.07	0	0	0.00
										Subtotal	345671697.30

Data Source: China Energy Statistics Yearbook 2005

Table A3-6 Fuel-fired Electricity Generation of CCPG for Year 2004

Province	Electricity Generation (10^8 kWh)	Electricity Generation (MWh)	Internal Power Consumption Rate (%)	Supplied Electricity (MWh)
Jiangxi	301.27	30127000	7.04	28,006,059
Henan	1093.52	109352000	8.19	100,396,071
Hubei	430.34	43034000	6.58	40,202,363
Hunan	371.86	37186000	7.47	34,408,206
Chongqing	165.2	16520000	11.06	14,692,888
Sichuan	346.27	34627000	9.41	31,368,599
Total				249,074,186

Data Source: China Electric Power Yearbook 2005

Table A3-7 Operating Margin Emission Factor of CCPG in 2005

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	NCV	CO_2 Emission (tCO_2e)
									(tCO_2e/TJ)	(MJ/t,MJ/10^3m^3)	K=G*H*I*44/12/100 (for mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	K=G*H*I*44/12/10 (for volume unit)
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	**17827.75**	25.8	20908	352614496.76
Cleaned Coal	10^4 t	0.02						**0.02**	25.8	26344	498.43
Other Washed Coal	10^4 t		138.12			89.99		**228.11**	25.8	8363	1804669.00
Coke	10^4 t		25.95		105			**130.95**	25.8	28435	3522490.83
Coke Oven Gas	10^8 m^3			1.15		0.36		**1.51**	12.1	16726	112053.61
Other Gas	10^8 m^3		10.2			3.12		**13.32**	12.1	5227	308896.88
Crude Oil	10^4 t		0.82	0.36				**1.18**	20	41816	36184.78
Gasoline	10^4 t		0.02			0.02		**0.04**	18.9	43070	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		**9.49**	20.2	42652	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	**8.87**	21.1	41816	286959.09
LPG	10^4 t							**0**	17.2	50179	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			**6.66**	18.2	46055	204688.68
Natural Gas	10^8 m^3						3	**3**	15.3	38931	655208.73
Other petroleum produce	10^4 t							**0**	20	38369	0.00
Other coking produce	10^4 t				1.5			**1.5**	25.8	28435	40349.27
Other energy	10^4 t bc		2.88		1.74	32.8		**37.42**	0	0	0.00
										Subtotal	359887487.74

Data Source: China Energy Statistics Yearbook 2006

Table A3-8 Fuel-fired Electricity Generation of CCPG for Year 2005

Province	Electricity Generation (10^8 kWh)	Electricity Generation (MWh)	Internal Power Consumption Rate (%)	Supplied Electricity (MWh)
Jiangxi	300	30000000	6.48	28,056,000
Henan	1315.9	131590000	7.32	121,957,612
Hubei	477	47700000	2.51	46,502,730
Hunan	399	39900000	5	37,905,000
Chongqing	175.84	17584000	8.05	16,168,488
Sichuan	372.02	37202000	4.27	35,613,475
Total				286,203,305

Data Source: China Electric Power Yearbook 2006

Table A3-9 Operating Margin Emission Factor of CCPG (Weighted Average)

Item	Unit	2003	2004	2005	Weighted Average
Total CO_2 emission	tCO_2e	276,404,544	345,671,697	359,887,488	
Electricity delivered to the grid	GWh	225,987,719	249,074,186	286,203,305	
Operation margin(OM)	tCO_2e/MWh	1.223095	1.387826	1.257454	1.2899

Table A3-10 Share of emission from coal, oil and gas fuel in electricity generation in CCPG

		Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	NCV	Emission Factor	CO_2 Emission
Fuel	Unit	A	B	C	D	E	F	G=A+…+F	H	I	K=G*H*I*44/12/100
Raw Coal	10^4 t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	20908kJ/kg	25.8	352614496.76
Cleaned Coal	10^4 t	0.02	0					0.02	26344kJ/kg	25.8	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	8363kJ/kg	25.8	1804669.00
Coke	10^4 t		25.95		105			130.95	28435kJ/kg	25.8	3562840
Subtotal											**357982504**
Crude Oil	10^4 t		0.82	0.36				1.18	41816kJ/kg	20	36184.78
Gasoline	10^4 t		0.02			0.02		0.04	43070kJ/kg	18.9	1193.90
Diesel Oil	10^4 t	1.3	3.03	2.39	1.39	1.38		9.49	42652kJ/kg	20.2	299797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	41816kJ/kg	21.1	286959.09
Subtotal											**624135.55**
Natural Gas	10^7 m^3						30	30	38931kJ/m^3	15.3	655208.73
Coke Oven Gas	10^7 m^3			11.5		3.6		15.1	16726kJ/m^3	12.1	112053.61
Other Gas	10^7 m^3		102			31.2		133.2	5227kJ/m^3	12.1	308896.88
LPG	10^4 t							0	50179kJ/kg	17.2	0.00
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	46055kJ/kg	18.2	204689
Subtotal											**1280848**
Total											**359887488**

Data Source: China Energy Statistics Yearbook 2006

$$\lambda_{Coal,y} = 99.47\%, \lambda_{Oil,y} = 0.17\%, \lambda_{Gas,y} = 0.36\%$$

Table A3-11 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply	Emission Factor of Fuel (tCO_2e/TJ)	Emission Factor (tCO_2e/MWh)
		A	B	C=3.6/A/1000*B*44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	0.5843

$$EF_{Thermal,y} = 99.47\% \times 0.9508 + 0.17\% \times 0.5843 + 0.36\% \times 0.4237 = 0.94828 tCO_2 / MWh$$

Table A3-12 Installed Capacity of CCPG in 2005

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Fuel-fired	MW	5,906	26,267.8	9,526.3	7,211.6	3,759.5	7,496	60,167.2
Hydro	MW	3,019	2,539.9	8,088.9	7,905.1	1,892.7	14,959.6	38,405.2
Nuclear	MW	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	24	0	24
Total	MW	8,925	28,807.7	17,615.2	15,116.7	5,676.2	22,455.6	98,596.4

Data Source: China Electric Power Yearbook 2006

Table A3-13 Installed Capacity of CCPG in 2003

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Fuel-fired	MW	5,407.8	17,635.5	8,173.3	6,446.7	3,126.2	6,104	46,893.5
Hydro	MW	2,307.4	2,438	7,337.2	6,603.1	1,329.8	12,341.5	32,357
Nuclear	MW	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	0	0
Total	MW	7,715.2	20,073.5	15,510.5	13,049.8	4,456	18,445.5	79,250.5

Data Source: China Electric Power Yearbook 2004

Table A3-14 Installed Capacity of CCPG in 2002

Installed capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
Fuel-fired	MW	5,128.8	15,904.5	8,147.8	4,975.6	3,004.5	6,142	43,303.2
Hydro	MW	2,197.4	2,438	7,213.9	6,135.3	1,195.5	11,854.6	31,034.7
Nuclear	MW	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	0	0
Total	MW	7,326.2	18,342.5	15,361.7	11,110.9	4,200	17,996.6	74,337.9

Data Source: China Electric Power Yearbook 2003

Table A3-15 Newly Added Installed Capacity from Year 2002-2005

	2002	2003	2005	C-A	Percentage of newly added installed capacity
	A	B	C		
Fuel-fired (MW)	43303.2	46893.5	60167.2	16864	69.52%
Hydro (MW)	31034.7	32357	38405.2	7370.5	30.38%
Nuclear(MW)	0	0	0	0	0.00%
Wind & Others(MW)	0	0	24	24	0.10%
Total（MW）	74337.9	79250.5	98596.4	24258.5	100.00%
Percentage of installed capacity to 2006	75.40%	80.38%	100%	/	/

$$EF_{grid,BM,y} = 0.94828 \times 69.52\% = 0.6592 tCO_2 / MWh$$

Table A3-16 Baseline emission factor of CCPG (tCO_2/MWh)

Operating margin emission factor	A	1.2899	
Build margin emission factor	B	0.6592	
Combined emission factor	C=0.5×A+0.5×B	0.97455	

Annex 4

MONITORING INFORMATION

There is no other related monitoring information.