



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

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

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Tiefa Coal Industry Group CMM Utilization Project

Version 3. 1.

Date: 17/05/2008

A.2. Description of the project activity:

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Tiefa Coal Industry (Group) Co., Ltd. (Tiefa Coal Industry Group) produces coal at its six coal mines in the Tiefa mining area and two coal mines in the Kangping mining area.

The said six coalmines at Tiefa mining area have been emitting a large amount of methane gas, and have been extracting methane gas from underground boreholes for maintaining safety in its coal mining operations. However, given the average concentration of extracted methane from underground boreholes being 38.2% (in 2003), it had been difficult to stably supply methane with a concentration of 41%, which is the required level for industrial or utility use. Therefore, due to the difficulty in marketing of the said low concentration methane in the market, only a limited amount of extracted methane had been utilized as city gas for cooking purpose, *etc.* at the coalmine workers' residences and the rest has been released into the atmosphere without use.

<The UNDP Project>

In 1992, the UNDP began a five-year technical assistance project on CBM in China. Both the UNDP and the Chinese Government have contributed approximately US\$10 million to the project. The project has four sub-projects, which are located at Tiefa (Liaoning Province), Kailuan (Hebei Province), Van (Shaaxi Province), and Songzao (Sichuan Province).

Tiefa Sub-project was implemented by Tiefa CMA and REI Co. The purpose of the sub-project was to introduce goaf wells and long horizontal borehole drilling technologies to the Chinese coal mines. Three gob wells were drilled from the surface to 40-50m above the working seam at depths of 500-600m. Additionally, three long in-mine horizontal boreholes were directionally drilled into the goaf area using a downhole motor, with the longest borehole extending to 305m. Total gas production was 1.67 million m³ from the in-mine boreholes and 3.08 million m³ from the surface goaf wells respectively. Meanwhile, the methane drainage efficiency was increased by 57.2% compared to conventional methods (cross-measures borehole).¹

UNDP's above introduced technologies were not established sufficiently enough for Tiefa to operate in a safely adequate way on a commercial basis, and only on a demonstration basis. Tiefa have tried to improve such technologies as follows:

(i) Goaf well structure:

In order to prevent the rock caving at the bottom of the drilling wells, Tiefa modified the design and achieved sealing the ground water.

¹ More details can be available at the following source: <http://www.epa.gov/coalbed/pdf/int001.pdf>



(ii) Casting pipe for collection of gas

Casting pipes for collection of gas were installed at 10-15m above the target coal seams in accordance with the UNDP's introduced technology.

In order to achieve the effective gas extraction, Tiefa improved the said technologies and currently such pipes are installed at a closer 3-5m above the targeted coal seams.

(iii) Cleaning the wells:

In order to wash away the sediment in the wells, Tiefa added a system for well cleaning.

<The Green Aid Plan >

Green Aid Plan (GAP) is a project based grant where the Japanese Government (Ministry of Economy, Trade and Industry) provide support to transfer Japanese suitable technologies related to environment and/or energy to developing countries in order to enable simultaneous pursuit of environmental preservation and economic development. As one of the GAP projects, the New Environmental and Development and Investment Technology (NEDO) and the Chinese Government executed a demonstrational project of utilization of CMM at Tiefa since December 1st, 2001. In accordance with such GAP project, one spherical gas holder, one dehumidifying equipment, one calorific value adjuster, one monitoring system, some gas pipelines, one gas holder and two gas compressors were introduced and installed.²

With such help in installing equipments, Tiefa started CMM gas supply to Tielin City as city gas use from 2002 and **this part of gas supply shall be regarded as BaU** in this PDD (all equipments installed at the time of GAP project are illustrated in the Figure 1 below in this Section. Construction costs for such installed equipments in the calculation of IRRs in Sections B.4 and B.5, hence, have been excluded). According to the actual supply records, the amount of supply during the period 2002 to August 2005 (prior to the Project) was unstable due to several reasons, such as, operational troubles with the gas tank, delay in negotiation of gas sales price, etc. Hence, the historical maximum annual supply amount of gas during such period as to the supply amount in BaU has been adopted as a conservative approach. Regarding details, please refer to 2) of Section B.6.3.

On the other hand, Tiefa Coal Industry Group can not increase such gas supply amount without installing additional equipments, such as gas tanks and compressors, and without developing the goaf wells in order to keep the gas supply stable. Only with the CER sales revenue could make such additional investments plausible and increasing such gas supply amount feasible.

As the project activity, Tiefa Coal Industry Group developed a technology to extract Post-Mining CMM from surface goaf wells by improving the technology introduced by UNDP as per above mentioned in order to extract a higher methane rated concentration gas, combined with a technology to blend the low concentration methane (CMM) and high concentration methane (post-mining methane (PMM)) in order to achieve a stabilized supply of gas with adequate methane concentration.

² More details can be available at :

http://www.brain-c-jcoal.info/publication-files/oldjcoal/coal-safety/C_S-020.pdf



Thanks to the installation of the said technologies, Tiefa Coal Industry Group has planned to start the project (the Project) under the CDM to supply such CMM to two gas sales companies, namely, *Shenyang Aode Fuel Gas Co.*, (located in Faku County of Shenyang City) and *Tieling Panva Gas Co., Ltd.* (located in Tieling City).

Both of the two gas sales companies, in turn, supply such CMM to its respective customers as follows:

Shenyang Aode Fuel Gas Co., supplies CMM to the ceramic factories in Faku Ceramic City as industrial fuel for kiln use and to households in Diaobingshan City as city gas. (cf. Faku Ceramic City was planed to be developed regardless of the existence of this Project. Each ceramic factory in the said city has, regardless of the existence of the Project, decided to implement the business in this area considering several merits and incentives, including without limitation, the easiness in procurement of good quality raw material for ceramic production and low charges for the land utilized.)

Tieling Panva Gas Co. Ltd. supply CMM to households in Tieling City as city gas and to Febe Factory as industrial fuel for heating borax in a furnace to produce boric acid.

If the Project did not exist, *Shenyang Aode Fuel Gas Co.*, would have purchased or produced town gas and in turn supply to its customers, while *Tieling Panva Gas Co. Ltd.* would have purchased LPG and supply it to its customers. Hence, this Project contributes to the reduction of GHG by combusting methane in the CMM and substituting these fossil fuel based energy sources.

Following Figure 1 shows the outline and boundary of the Project.

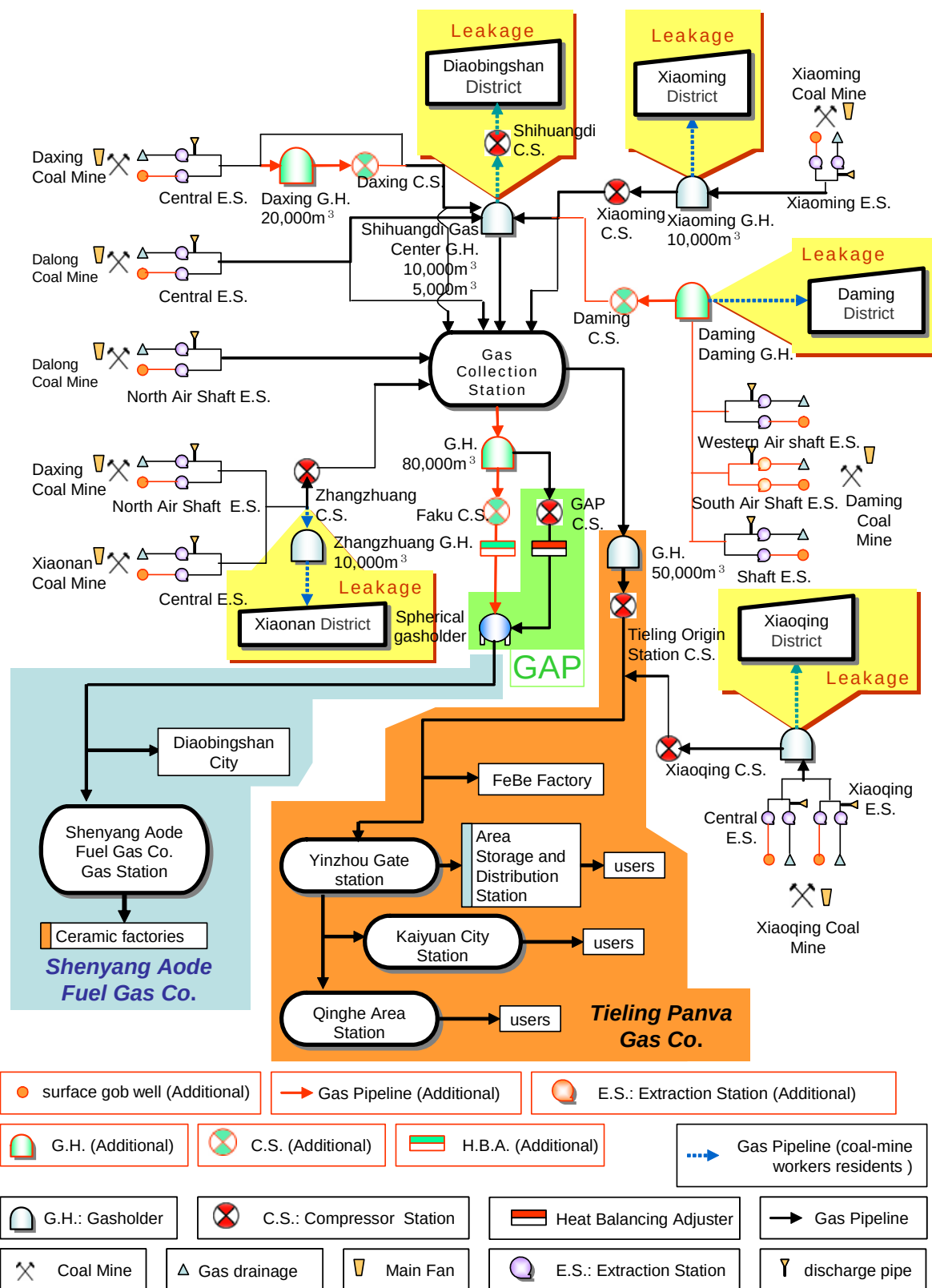


Figure 1: Project Boundary



Extraction and utilization of CMM brings a lot of benefits including the assurance of coal mine safety, a solution for a regional environmental issue by decreasing emission of air polluting substances, and the promotion of local economy, including without limitation, increasing the opportunity of employment. In addition, the use of this unused domestic energy contributes for the sustainable development in China also from the perspective of energy security.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Tiefa Coal Industry (Group) Co. Ltd.	No
Japan	MITSUI & CO. LTD	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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Liaoning province

A.4.1.3. City/Town/Community etc:

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Tieling City, Diaobingshan City, and Faku County of Shenyang 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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Tieling City is situated in the north part of the Provincial capital, Shenyang City, at north latitude 42°15' and east longitude 123°15'. It consists of Yinzhou Area, Qinghe Area, Diaobingshan City, Kaiyuan City and three counties. The City borders upon Jilin Province at its north end. Diaobingshan City is situated at the north of Tieling City, bordering upon Shenyang City, Faku County, at north latitude 42°27' and east longitude 123°33'. Tiefa Mining Area is in Diaobingshan City in Tieling City. The coalmines at Tiefa Mining Area of Tiefa Coal Industry Group are located at 37 km east from Tieling downtown, and at 90 km north from Shenyang City.

Tieling Panva Gas Co. Ltd supplies city gas to Yinzhou Area, Qinghe Area, Diaobingshan City, and Kaiyuan City in Tieling City and to Febe Factory located along the pipeline constructed to transfer CMM arising from the Project, from Tieling Origin Station to Yinzhou Gate Station.

Faku Ceramic City is an industrial park for ceramic factories situated at Faku County in Shenyang City,



located 90 km north from Shenyang City downtown at north latitude 42°30' and east longitude 123°25'.

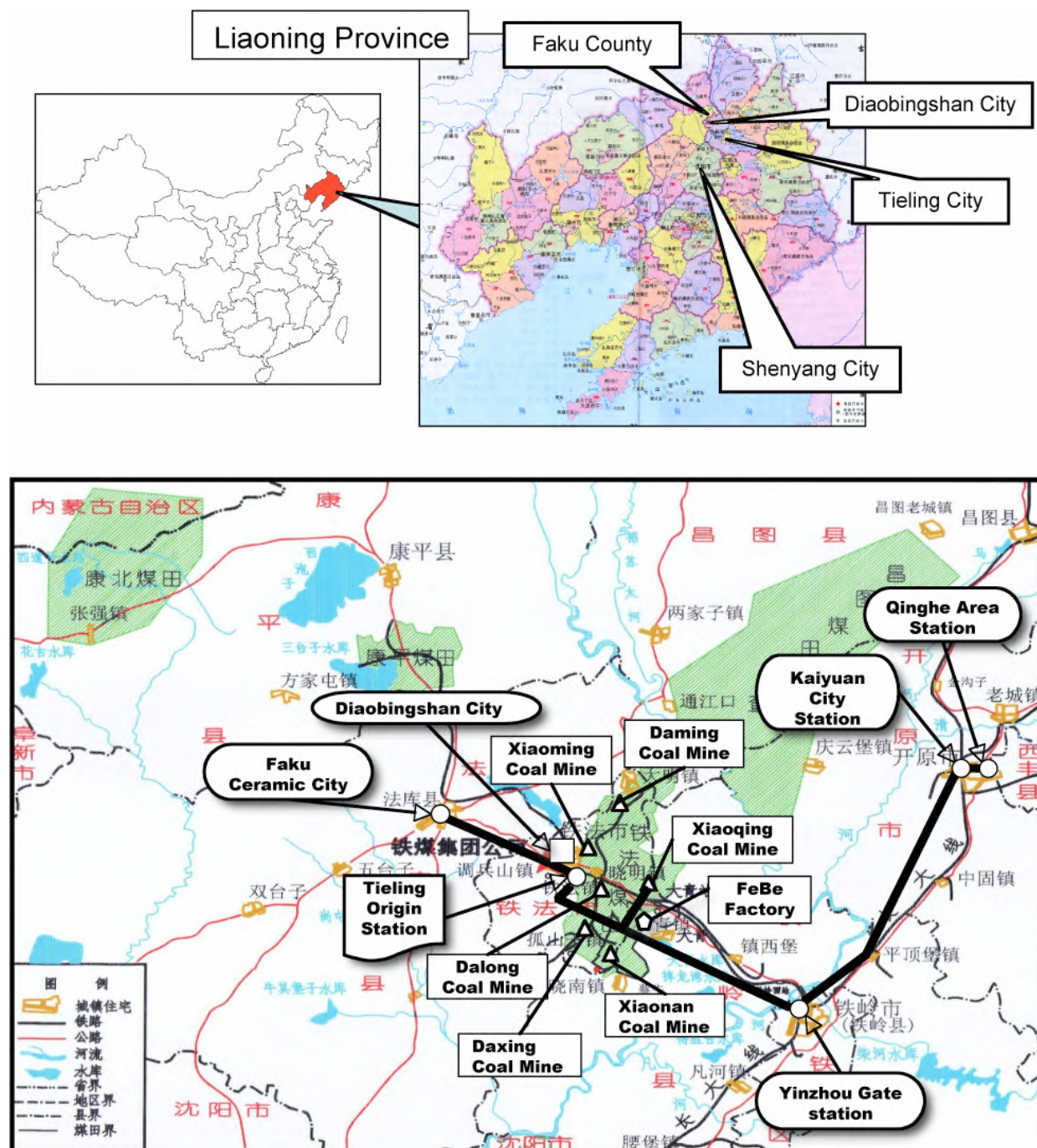


Figure 2: Map of the Project Areas

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

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Scope 8: Mining / Mineral Production

Scope 10: Fugitive Emission from Fuels

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

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The proposed Project activity aims to adjust the methane concentration of CMM to 41% (3,500 kcal/kg) for thermal use.

The six coal mines operating at Tiefsa Mining Area have higher gas emissions, with one of them designated as a coal and gas outburst mine under the Coal Mine Safety Regulation in China, and the remaining five designated as gassy mines. At the coal mines, the mining practices was such that ventilation fans in exhaust vertical shafts suctioned the air inside of the mines while introducing fresh air from suction vertical shafts. This mining practice has brought methane gas to the mining face, making it difficult to be compliant with the 1.0% concentration specified in the Coal Mine Safety Regulation. Therefore, in 1974, coal mines at Tiefsa Mining Area started the extraction of CMM utilizing underground boreholes (as Figure 3 below). The permeability coefficient of the Tiefsa mining area, ranging from 1.10×10^{-5} to $3.49 \times 10^{-2} \text{ m}^2/\text{MPa}^2 \cdot \text{day}$, however, made it very difficult to drain methane from virgin coal seams with such low permeability. As this method has not been efficiently extracting methane gas, Tiefsa Coal Industry Group has developed a technology to extract PMM from surface goaf wells and conventionally underground PMM.

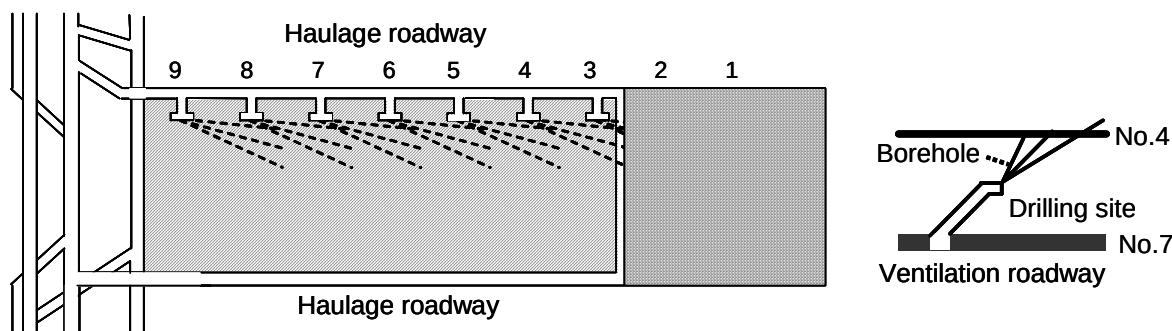


Figure 3 Plan View of borehole placement for methane recovery from gob area

This technology introduces a method of which cement is injected between the earth surface and the second coal seam, resulting to the solidification of the casings which prevents air leakage. A picture showing the construction of surface goaf well is given in Figure 4.a and b. As shown in Figure 5 boreholes are constructed on the side of the air drifts of the mining surface to efficiently capture methane gas flowing to the surface.

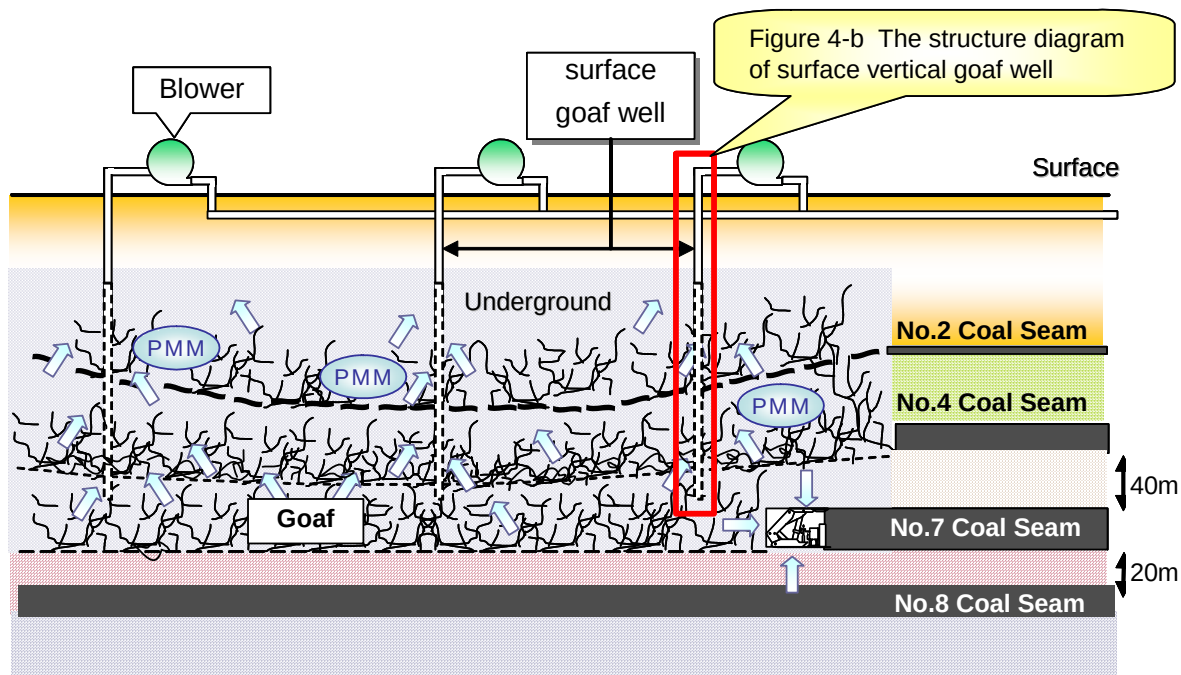


Figure 4.a Technological process of Surface vertical goaf wells

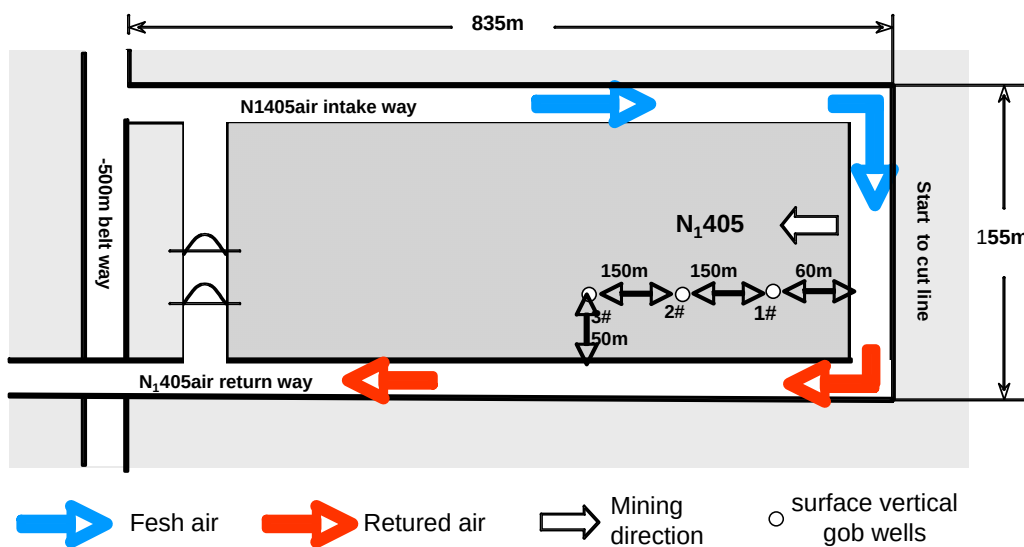


Figure 5. Layout plane of surface vertical gob wells in N1405 mining face

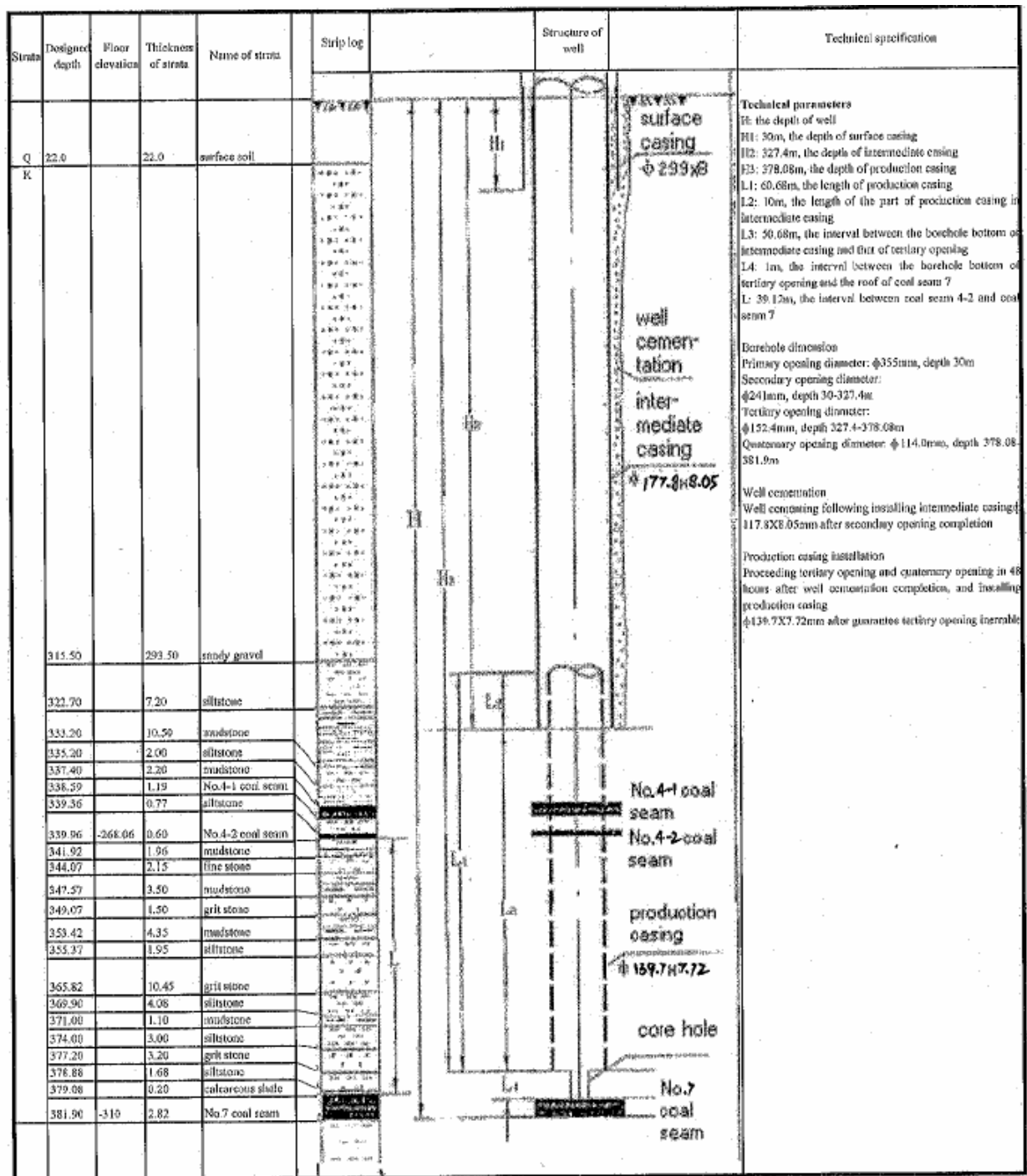


Figure 4.b The Structure Diagram of surface vertical Goaf Well



With the completion of the said technology, the concentration of the extracted methane gas was 32.6% for CMM from the underground boreholes, and 89.7% for PMM from the surface vertical goaf wells.

Combined with the technology for blending PMM and CMM, the stable supply of methane gas with the concentration of 41% required for city gas, was achieved. These technologies of extracting post mining methane and blending the PMM together with CMM were developed by Tiefa Coal Industry Group by itself in this Project, and technology transfer from foreign country has not been planned.

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

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The estimated GHG emission reductions are shown below:

Years	Annual estimation of emission reductions (tCO ₂ e/yr)
2008 Sep-Dec	233,075
2009	708,700
2010	718,313
2011	727,890
2012	737,412
2013	747,293
2014	747,293
2015 (Jan-Aug)	498,208
Total emission reductions (tCO ₂ e)	5,118,186
Total number of crediting years	7
Annual average over the crediting years of estimated reductions (tCO ₂ e/yr)	731,169

A.4.5. Public funding of the project activity:

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No public funding from Parties included in Annex I is involved.

**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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This Project employs the approved consolidated methodology ACM0008 / version 3 “Consolidated baseline methodology for coal bed methane and coal mine methane capture and use for power (electrical and motive) and heat and/or destruction by flaring” and “Consolidated monitoring methodology for virgin coal bed methane and coal mine methane capture and use for power (electrical and motive) and heat and/or destruction by flaring

This methodology also refers to the “Consolidated methodology for grid-connected electricity generation from renewable sources” (ACM0002 / Version 6), and the latest version (version 5) of “Tool for the demonstration and assessment of additionality”

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

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This methodology is applicable to this Project activity due to the following facts:

1. The Project activity involves underground boreholes in the mine to capture CMM, and also utilizes goaf gas capture techniques to capture Post-Mining CMM from surface goaf wells.
2. In this Project activity, CMM is extracted from a working coal mine by gas drainage, to be utilized.
3. The methane is captured and destroyed through utilization to produce thermal energy.
4. The remaining share of the methane, to be diluted for safety reason, is still vented.
5. The mining operations are conducted at on-going underground mines and not at open cast mines.
6. The Project activity does not deal with abandoned / decommissioned coalmines.
7. This Project does not capture/use virgin CBM.
8. All of the captured methane will be used for feeding into gas pipeline as a fuel for industrial factories and for city gas while the remaining share of the methane will be vented after dilution for safety reasons.
9. No activity using CO₂ or any other fluid/gas to enhance CBM drainage before mining has taken place.

Based on the above facts, the proposed Project activity satisfies all applicability conditions specified in ACM0008 / version 3.

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

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Based on ACM0008, the Project boundary for this Project activity (Project scenario) is:

- All equipments installed and used as part of the Project activity for the extraction, compression, and storage of CMM at the project site, and transport to off-site users.
- Heat generation facilities installed and used as part of the Project activity.

The following table illustrates each emission sources for both Project and baseline scenarios.



	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions of methane as a result of venting	CH ₄	Included	CH₄ in the gas extracted from coal mine will be vented to the atmosphere.
	Emissions from destruction of methane in the baseline	CO ₂	Included (Similar to the Project case) e	The CMM to be utilized as city gas supplied to the Tiefsa coal mine workers' residences is a business as usual activity and amount of emission in destruction of methane by such use by residence shall be same in the project activity. Hence, in the calculation of CERs, this amount shall be excluded.
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
	Grid electricity generation (electricity provided to the grid)	CO ₂	Excluded	In the Baseline Scenario, no power generation takes place, hence, excluded.
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
	Captive power and/or heat, and vehicle fuel use	CO ₂	Included	In the Baseline scenario, LPG and town gas shall be utilized as a fuel for heat generation. Hence, amount of emission in destruction of the said fuel shall be included.
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.

	Source	Gas	Included?	Justification / Explanation
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	Excluded	There is no additional on-site fuel consumption due to the project activity.



		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
	Additional electricity consumption due to the project activity	CO ₂	Included	Emissions from generating power by the connected grid for the additional power consumption due to the project activity shall be included.
	Emission from methane destruction	CO ₂	Included	From the combustion of methane in heat generation.
	Emissions from NMHC destruction	CO ₂	Included	From the process of combusting NMHC at the end user of CMM, if NMHC accounts for more than 1% by volume of extracted coal mine gas.
	Fugitive Emissions of unburned methane	CH ₄	Included	Small amounts of methane will remain unburned during heat generation.
	Fugitive methane emissions from on-site equipments	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. However taken into account other potential leakage effects.
	Accidental methane release	CH ₄	Excluded	Excluded for simplification. This emission source is assumed to be very small.

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

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Below, the steps for baseline scenario identification stipulated in the methodology will be followed for the proposed Project activity.

Step 1. Identify technically feasible options for capturing and/or using CMM
(note: no CBM is involved for the proposed Project activity)

This step lists up the possible baseline scenario options, which are technically feasible, for three stages (CMM



extraction, CMM treatment, and meeting energy demand) specified as Step 1a to 1c

Step 1a. Options for CMM Extraction

- A. Ventilation air methane (VAM): ventilation equipment is implemented to exhaust the gas in the underground mining corridors via air shafts;
- B. Pre-Mining CMM: extraction: extraction by underground boreholes is utilized;
- C. Post-Mining CMM extraction: extraction of goaf gas by surface vertical wells, or;
- D. Possible combinations of options A, B and C, with VAM accounting for 56%, Pre-Mining CMM from underground boreholes and Post-Mining CMM from surface goaf wells for an aggregated 44% of the total extracted methane³.

Step 1b. Options for extracted CMM treatment

- (i) Releasing CMM through gas drainage without use⁴;
- (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 heat generation);
- (viii) Combination of options (i) for 93.7% (average during 2007-2013) and (vii) for 6.3% (average during 2007-2013); or
- (ix) Combination of options (i) for 21% (average during 2007-2013) and (vii) for 79% (average during 2007-2013)

Step 1c. Options for energy production (i.e., for meeting the energy demand)

- 1. Utilization of town gas;
- 2. Utilization of LPG; or
- 3. Combination of town gas (for the case of energy demand in Shenyang Aode Fuel Gas Co. and its customers) and LPG (for the case of energy demand in Tieling Panva Gas Co., Ltd. and its customers);

Regarding the “Energy production to meet the demand” in Tieling Panva Gas Co., Ltd., it is very difficult to

³ The actual record of extraction of methane from coal mines from 2002 to 2004 (prior to the project activity) shows VAM accounting for 56%, CMM from underground boreholes and Post-Mining CMM from surface goaf wells for an aggregated 44% of the total extracted methane. In accordance with the estimation of extraction amount of methane provided in Figure 6, above ratio will not deviate drastically from the above historical record.

⁴ This option (i) corresponds to the option i (venting) specified in the methodology. However, the term “venting” may be misunderstood as releasing the CMM through the ventilation system (concentration is less than 1%). This option (i) is meant to release the captured CMM without being used. Further, in the coal mines in this Project activity, part of the methane, through gas drainage, is emitted after being captured. This practice can be continued as the baseline scenario [This option is added by the project participant]



objectively identify the ratio of combination of coke oven gas and LPG, considering the unstable operation of Tieling Coke Factory which was already closed. Hence, the Project decides to choose the option of utilization of only LPG as a baseline scenario of energy production to meet the demand in Tieling Panva Gas Co., Ltd. and its customers as a conservative approach. (Emission Factor of LPG is lower than that of coke oven gas. Hence, choice of LPG as an alternative fuel shall be considered as a conservative approach in view of the generated amount of CERs)

Regarding the “Energy production to meet the demand” in Shenyang Aode Fuel Gas Co., each options of utilization of town gas and utilization of LPG might be possible, however, the total costs for each options are very different (total costs for utilization of town gas in 2007 is estimated to be around 33 million RMB and in 2008-2013, 54 million RMB for each year. On the other hand, total costs for utilization of LPG in 2007 is estimated to be around 84million RMB and in 2008-2013, 173 million RMB for each year), hence, in view of its economics, it is natural that Shenyang Aode Fuel Gas Co., decides to utilize town gas to meet the demand of its customers.

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

Options for CMM Extraction

Article 136 of the National Coalmine Safety Regulation in China stipulates the maximum concentration of methane in galleries as less than 1.0%. In order to satisfy these conditions, CMM extraction is implemented. Furthermore, the National People’s Congress, Standing Committee of the NPC, State Council and State Administration of Work Safety have issued a series of regulations, including without limitation, the *National Coal Mine Safety Regulation (Version2005)*⁵, which can be found on the website (<http://www.chinasafety.gov.cn>). According to these regulations and conditions, each coal mines are obliged to extract a certain amount of CMM prior to their coal mining activities, to ensure safety in the coal mines. The density of the methane must be managed below a certain level, however, there exists no mandatory requirements on the utilization of the extracted CMM. On the other hand, in the case of utilization of CMM, 30% of concentration of methane in CMM is mandatory required as a minimum concentration in order to maintain safety. And in this Project, Tielin Panva gas Co. has requested Tiefa Coal Industry Group, in the gas sales contract, to maintain the concentration of methane in the CMM supplied within the range of 43% plus/minus 2% , and similarly Shenyang Aode Fuel Co. has also requested Tiefa Coal Industry Group, in the gas sales contract, to maintain the concentration of methane in the CMM supplied within the range of 41% plus minus 2%. (Both of such requests are made from the requirement of the calorific value for the fuel for Kiln, household use, etc.)

Daming No.1 Coal Mine, Xiaoming Coal Mine, Dalong Coal Mine, Daxing Coal Mine, Xiaonan Coal Mine, and Xiaoqing Coal Mine are mandated to extract the gas extraction. Thus, it becomes necessary for the mines to implement not only ventilation, but also pre-mining and post-mining CMM from surface goaf wells extractions so as to maintain the methane below a certain level.

With the above facts, implementing options A, B or C provided in step 1.a. individually will not allow Tiefa to meet the safety requirements. Therefore, Options A, B, and C are eliminated.

Options for CMM Treatment

(v) Use for additional captive power generation

In China, it is generally encouraged to utilize coal waste and CMM for power generation based on the national comprehensive resource use policy. However, captive thermal power generation is also required to be

⁵ Item 104, 107 and 145 of *National Coal Mine Safety Regulation (Version 2005)*



connected to grid networks so that generated electricity is to be anyway transmitted firstly to grid networks.

And according to the Provisional Management Rules of the Construction of Small Scale Thermal Power Plant in 1997, it is prohibited to construct thermal power plant with capacity less than 25MW per unit, unless it is a natural resource comprehensive utilization plant burning industrial wastes. If construction of CMM power plant shall be identified as this exception, the construction of it is governed by this rule and in accordance with this rule, Tiefa have to get approval from the governmental authority.

And according to the Management Rules of Identification of Natural Resource Comprehensive Utilization Power Plant in 2000, such power plant shall be identified by the provincial Commission of Development and Reform in line with certain standards. If construction of CMM power plant shall be identified as this exception, the construction of it is governed by this rule and in accordance with this rule, Tiefa have to get approval from the governmental authority.

Hence, in order to construct and operate CMM power plants, Tiefa Coal Industry Group shall get the approval from the governmental authority in either case of captive power generation and additional grid supply power generation.

Tiefa Coal Industry Group operates Tiefa coal-field and Kangping coal-field. Tiefa Coal Industry Group has already constructed and operated a coal waste power plant at Tiefa coal field as a captive power generation to cover the electricity demand in Tiefa coal-field. In line with the above mentioned, Tiefa Coal Industry Group had to obtain approval for such captive power generation from the governmental authority and the grid set the condition in such approval that, in exchange, Tiefa Coal Industry Group must purchase electricity from the grid to cover the electricity demand in Kangping coal-field. Hence, specifically, Tiefa Coal Industry Group is not allowed to construct a captive power station to cover the demand of the Kanping coal-field.

In accordance with the current estimation, the existing coal waste power plant will cover the electricity demand at the Tiefa coal-field during, at least, for the crediting period of the Project, while, Tiefa Coal Industry Group must purchase electricity from the grid regarding the electricity demand in Kangping coal-field. This situation and the said conditions are not likely to be changed in future. Therefore, it shall not be approved by the governmental authority that Tiefa Coal Industry Group constructs a new power plant utilizing CMM as a fuel for its captive use to operate its coal mines.

Therefore, this option (v) Use for additional captive power generation is eliminated due to the regulatory requirement.

Step 3. Formulate baseline scenario alternatives

Based on the above discussion, the remaining baseline scenario alternatives are formulated below:

CMM Extraction:

- D. Possible combinations of options A, B and C, with VAM accounting for 56%, pre-mining CMM from underground boreholes and post-mining CMM from surface goaf wells for an aggregated 44% of the total extracted methane

CMM Treatment

- (i) Releasing CMM through gas drainage without use;
- (ii) Using/destroying ventilation air methane rather than venting it;
- (iii) Flaring of CMM;
- (iv) Use for additional grid power generation;



- (vi) Use for additional heat generation;
- (vii) Feed into gas pipeline (to be used as fuel for vehicles or heat generation);
- (viii) Combination of options (i) for 93.7% (average during 2007-2013) and (vii) for 6.3% (average during 2007-2013); or
- (ix) Combination of options (i) for 21% (average during 2007-2013) and (vii) for 79% (average during 2007-2013)

Energy production to meet the demand

1. Utilization of town gas;
2. Utilization of LPG; or
3. Combination of town gas (for the case of energy demand in Shenyang Aode Fuel Gas Co. and its customers) and LPG (for the case of energy demand in Tieling Panva Gas Co., Ltd. and its customers); or

In principle, combinations of each of the baseline options listed above are possible. This would deliver a very large number of possible combined scenarios. The technically viable scenarios that also comply with relevant laws and regulations are:

A. Business as usual. (Scenarios D+(viii) +3)

Gas—which would be used by the project activity— is extracted from pre-mining CMM from underground boreholes and post-mining CMM from surface goaf wells and a ratio of 6.3% (average during 2007-2013) will be utilized in the same manner as the current situation while the remaining 93.7% of them (average during 2007-2013) will be released to the atmosphere without any use.

The options for supply sources of city gas and/or industrial fuels are those used before implementation of the Project and/or existence of feasible sources to supply, as follows:

- Tieling Panva Gas Co., Ltd. and its customers (City gas for Tieling City and industrial fuel for Febe Factory): **LPG**,
- Shenyang Aode Fuel Gas Co. and its customers (Faku Ceramic City as industrial fuel in kiln and Diaobingshan City): as city gas, and for Diaobingshan City: **town gas**.

Most part of CMM would be vented into atmosphere and small portion of CMM would be fed into pipeline.

B. VAM Utilization (Scenarios D+(ii)+3)

No changes to the thermal supply in the coalmines, only using VAM (methane concentration at <0.75%) to produce power.

C. Flare (Scenarios D+(iii)+3)

The CMM drained from the extraction systems would be destroyed by flaring. No changes will be made to power and heat supply

D. Gas supply (Scenarios D+(ix)...in this case, all energy demand is met by supplied gas)

Gas—which would be used by the Project activity— is extracted from pre-mining CMM from underground boreholes and post-mining CMM from surface goaf wells and a ratio of 79% (average during 2007-2013) will be fed into the gas pipeline to be used for city gas or other industrial use while the remaining 21% (average



during 2007-2013) will be released into atmosphere without use. [equivalent to the project activity without CER].

E. Grid Power Generation. (Scenarios D+(iv)+3.)

The extracted CMM with methane concentration more than 30% could be combusted in reciprocating engines or gas turbines to generate electricity for the local grid.

F. Heat Generation. (Scenarios D+(vi)+3)

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

Step 4. Eliminate baseline scenario alternatives that face prohibitive barriers

CMM Treatment

Several barriers are found for some options for the “CMM Treatment” stage:

(ii) Using/destroying ventilation air methane rather than venting it;

Other than pilot plant phased projects, the utilization of VAM have not been proven as a commercially stable operation and implemented in a commercial scale. Technology utilizing VAM with the methane concentration of less than 1% is not implemented as it has not yet been commercialized in China. Utilization of VAM is just on pilot stage. The technology is immature.

Therefore, combined scenario **B. VAM Utilization** cannot be the baseline scenario due to the technological barrier.

(iii) Flaring of CMM;

Because this option does not utilize the energy potential of CMM, it does not address the energy shortage issues that exist in China, particularly with the use of clean burning gas. Flaring also requires additional costs without any revenue created. So clearly, it faces tremendous barriers.

Therefore, combined scenario **C. Flare** cannot be the baseline scenario.

(iv) Use for additional grid power generation;

As mentioned in Step 2 above, Tiefa Coal Industry Group has constructed and operated a coal waste power plant at Tiefa coal field as captive power generation covering the electricity demand in Tiefa coal-field in accordance with an agreement executed between Tiefa Coal Industry Group and the grid company. Article 2.4 in such agreement clearly mentions that the grid company will not make any payment for the electricity generated by the said coal waste power plant and supplied to the grid, if any.

Considering the said term and condition, Tiefa Coal Industry Group prepared internal regulation that the operator of the said power plant shall carefully adjust the output to cover only the captive demand of Tiefa Coal Industry Group and not to generate additional electricity which shall be supplied to the grid company without any sales revenue.

Prior to making decision of this Project, Tiefa Coal Industry Group contacted the grid company to clarify the situation in case of CMM power generation plant. The grid company clearly mentioned that the situation was the same. Taking into account the situation at that timing, Tiefa Coal Industry couldn't expect to enter into a power sales agreement with the grid company regarding sales and purchase of the electricity to be generated



by CMM power plant and supplied to the relevant grid.

Therefore, combined scenario **E. Grid Power Generation** cannot be the baseline scenario due to the investment barrier.

(vi) *Use for additional heat generation;*

Tiefa Coal Industry Group has already supplied heat to the company offices and coalmine workers' residences from coal waste cogeneration power plant in the amount enough to cover the demand of them. There is and will be no additional significant heat demand in the coverage of the relevant heat supply system.

Therefore, combined scenario **F. Heat Generation** cannot be the baseline scenario due to investment barrier.

As a result of steps above, the possible baseline scenarios can be narrowed down to combined scenarios **A. Business as usual** and **D. Gas supply**.

For options A and D above, application is considered separately for the four users, in theory. Namely, for each user, there are two options whether CMM is used or not. However, because some parts of pipeline can be utilized for several users simultaneously, the Tiefa Coal Industry Group's (decision-maker's) *optimal* solution for investment decision-making is to supply as much gas as possible (taking the physical constraints into account). It is obvious that the project formation (consisting of four users) is the optimal solution, if supplying CMM is economically feasible.

Therefore, it becomes sufficient enough to consider Options A and D for the four users *as a package*. (For safety sake, there is no coal mine located near to each users of the Project, which is capable to supply enough CMM to meet the energy demand for the said users, other than Tiefa Coal Industry Group. Hence, there is no possibility that the end users will use CMM in case of Option A).

In addition, it is natural to assume that the energy demand of each user in the baseline scenario is the same as that in the Project scenario which will be monitored *ex post*.

Step 5. Identify most economically attractive baseline scenario alternative

Sub-step 5a. – Option I. Apply simple cost analysis

Above Option D, as the Baseline scenario alternative, apparently generates financial or economic benefits. Hence, in accordance with ACM0008, we proceed to Step 5.b.

Sub-step 5b. – Option II. Apply investment comparison analysis

Investment comparison analysis is applied to assess the economic efficiency of the project activity *without* CER revenue. It is noted that for this case, the decision maker for investment is Tiefa Coal Industry Group (not each user) and the gas is sold to the gas suppliers and not to the end users directly.

For key assumptions for the analysis, see the below financial analysis. The underlying detailed spreadsheet calculation and associated parameters used for investment decision-making, such as operation costs, capital investment costs, and the hurdle rate for investment decision-making by Tiefa Coal Industry Group are provided in Table 9 Annex3. For the avoidance of doubt, as mentioned in Section A.2, all the following calculation does not include the construction cost for the equipments installed at the UNDP's project and GAP project in Tiefa. And any and all costs and expenses for construction, operation and maintenance owed (or to be owed) by Shenyang Aode Fuel Gas Co. and/or Tieling Panva Gas Co. are excluded in this calculation.



Gas Sales Unit Price (Yuan/m ³) ⁶ (not including VAT)	Faku: 0.28 (–2007), 0.37 (2008–) Tieling: 0.37 (2006–)
Capital Expenditures (Million Yuan)	364.
Annual Operation Cost (Million Yuan)	22.84
Project Lifetime (Years)	20
Income Tax rate	33%
City Maintenance and construction tax rate	7%
Education additive charge rate	4.5%
Hurdle FIRR	8%
FIRR (without CER revenues)	5.53%
FIRR (with CER revenues)	11.47%

Note: FIRR is calculated based on parameters stated in the feasibility study report.

Furthermore, the following table shows the results and estimation of sales quantity of CMM from 2005-2013 (all quantities are adjusted to a 41% methane concentration basis.).

Unit : 10³m³ (CH₄ 41%)

	CMM Sales Quantity				
	Total	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City
2002	11,863	11,863	0	0	0
2003	7,324	7,324	0	0	0
2004	4,829	4,829	0	0	0
2005	14,046	10,814	315	2,911	6
2006	67,999	30,912	2,517	34,272	298
2007	93,329	32,912	2,517	56,734	1,166
2008	157,429	34,912	2,517	118,400	1,600
2009	159,429	36,912	2,517	117,815	2,185

⁶ The gas sales price is the price based on the contractual agreement between the Tiefa Coal Industry Group and each gas sales company.



2010	161,429	38,912	2,517	117,380	2,620
2011	163,429	40,912	2,517	116,634	3,366
2012	165,429	42,912	2,517	116,044	3,956
2013	167,429	44,912	2,517	115,622	4,378
2014	167,429	44,912	2,517	115,622	4,378
2015	167,429	44,912	2,517	115,622	4,378
Total (2008-15)	1,309,432	329,296	20,136	933,139	26,861

The appropriate financial indicator for the benchmark analysis is IRR (Internal Rate of Return), which is a typical measure adopted by project sponsors or investment companies and is a common factor in the feasibility reports for this kind of projects in China. Project sponsors or investment companies will not invest in projects, of which IRR is equal to or lower than this hurdle rate.

In China, most key industries practically set such hurdle rate at eight percent (8%)⁷, which is the benchmark IRR of total investment. As a result of the analysis above, FIRR without CER revenue is much lower than such hurdle rate. This means that Option B is not economically feasible to implement.

On the other hand, Option A is the Business as Usual scenario, hence, it is clear that Option A can be realized. As a result of this step 5.b, Option D can not be realized due to economical low feasibility and Option A can be realized, therefore, Option A is concluded as the baseline scenario.

For each user, consideration on the “accounting” of the replaced energy is given in Figures 7 and 8.

Sub-step 5c. Sensitivity analysis

The main input parameters would have to vary as follows in order for the project to cross the IRR hurdle rate of eight percent (8%):

- Investment costs: 23.7% decrease
- Operating costs: 15.6% decrease
- Gas sales unit price: 8.4% increase

Investment costs:

In this project, the biggest investment will be made for the development of surface vertical goafwells. This cost mainly consists of procuring steel pipes used as wells. When Tiefa decided to implement this project, it is reasonably predicted that demand of steel pipes continue to outstrip supply of them, hence, it is reasonable that Tiefa Coal Industry (Group) Co., Ltd. judged that it is unlikely that such a large decrease (23.7%) in investment costs would happen.

Operating costs:

⁷ Economic Assessment Methods and Parameters for Construction Projects (Edition Three), 2006, China Planning Press.



In this project, the largest component of operating costs is labor costs. Considering the economic growth in China, it is highly unlikely that labor cost will be largely decrease.

Gas sales price:

Gas Sales Price for the sales to Shenyang Aode Fuel Gas Co. is determined in accordance with the formula in the long term sales contract where the unit price of CMM will be automatically discounted if the consumption amount will increase, hence, there exists no case that the total gas sales revenue will increase equal to or more than 8.4%, since even if the total sales quantity will increase, unit price will be discounted. And in case of sales to Tieling Panva Gas Co., Ltd., there is a contract effective until the end of 2007 and after that unit Gas Sales Price will be decided by negotiation by taking into account unit Gas Sales Price to Shenyang Aode Fuel Gas Co., hence, in this case, either, there might be small possibility that the unit Gas Sales Price increases equal to or more than 8.4%.

Therefore, it is concluded that the conclusion in the previous sub-step is robust.

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): >>

In 2004, Tiefen Coal Industry Group asked China Coal Information Institute (“CCII”) to prepare estimation of revenue (including sales revenue of CERs to be generated from this Project), operational costs and fixed asset investment in order for them to analyze pros. and cons. of this Project prior to making the definitive decision at its Meeting of Board of its Representatives. even in the situation that there was no need to prepare a feasibility study covering the entire Project activity, because (i) gas extraction and supply by Tiefen Coal Industry Group have already been covered within their original scope of work related to coal mine operation, hence, there was no need to prepare mandatory feasibility study and acquire official approval therefore, and (ii) each feasibility study for Gas supply to Fake and Tieling covered only the part related to each gas sales company.

CCII submitted the said estimation accompanied with detailed explanation on 10th July, 2004 to Tiefen Coal Industry Group. In accordance with the said estimation, Tiefen Coal Industry Group prepared its spreadsheet calculation (attached in Table 9 in Annex 3) and on that basis, made decision at its Meeting of Board of its Representatives to implement this Project (copy of original minutes of this meeting is submitted to Validator and English translation of minutes of this meeting is attached in Annex 3. It is clearly mentioned in such minutes that without sales revenue of CERs, Tiefen Coal Industry Group can not finance enough money for CMM development project).

After such decision, Tiefen Coal Industry Group asked CCII to find a suitable project developer of this Project and a buyer of CERs from this Project. Almost at the same time, Mitsui & Co., Ltd. executed a service agreement with CCII on 23rd September, 2004 to ask CCII to recommend potential sites of Coal Mine Methane CDM projects in China. After receipt of CCII’s report in accordance with the said service agreement, on 12th November, 2004, Mitsui & Co., Ltd. visited Tiefen Coal Industry Group together with CCII to start discussions on how to proceed with the cooperation in development of CDM project at their coal mines.

As a result of further discussion between Tiefen Coal Industry Group and Mitsui & Co., Ltd., both parties entered into a Memorandum of Understanding on 7th March, 2005 to confirm both parties’ intention to proceed with this Project as a CDM project and agreed on allocation of the scope of work between both parties for implementation of this Project.



In accordance with the said Memorandum of Understanding, Mitsui & Co., Ltd. prepared and submitted to Tiefa Coal Industry Group, a PCN for this project, analysis of applicability of five New Methodologies, which were discussed at the CDM Executive Board and the Methodologies Panel at that time and other related materials for further discussion. Thereafter, taking into account the discussion of the relevant methodologies, including the discussion for combining them, Tiefa Coal Industry Group and Mitsui & Co., Ltd., have continuously co-worked in preparation of the PDD for this Project. In parallel, both Parties developed further discussions on commercial issues between them and executed a Cooperation Agreement on 19th December, 2005 to confirm basic terms and conditions applicable to the commercial transaction between Tiefa Coal Industry Group and Mitsui & Co., Ltd.

At the same time, Tiefa started discussion with some contractors for procurement of necessary equipments, and executed their first procurement contract on 8th October, 2005 for procurement of compressors which consist part of this Project.

Considering the above, 8th October, 2005 shall be the project start date for this Project and prior consideration of the CDM, including the fact that continuing and real actions were taken to secure CDM status for this Project, can be said to be clear.

Following the methodology, the steps of the additionality tool are traced below keeping consistency of the baseline scenario identification:

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

This is identical to the baseline scenario identification procedure specified in Steps 1 and 2 in Section B.4.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

For this Project activity, revenues from the sale of city gas can be expected in addition to CER revenues. For the demonstration of additionality, Paragraph 5 of approved consolidated baseline methodology ACM0008 states that “the baseline scenario alternative selected in the previous section shall be used when applying steps 2 (or 3) to 5 of the tool for the demonstration and assessment of additionality”. In Step 5 “Identify most economically attractive baseline scenario alternative (optional)” in Section B4 of this PDD, the baseline scenario for this project activity has been identified based on FIRR figures. For this Sub-step 2a, benchmark analysis (Option III) is applied as follows.

Sub-step 2b – Option III. Apply benchmark analysis

The appropriate financial indicator for the benchmark analysis is IRR (Internal Rate of Return), which is a typical measure adopted by project sponsors or investment companies and is a common factor in the feasibility reports for this kind of projects in China. Project sponsors or investment companies will not invest in projects, of which IRR is equal to or lower than this hurdle rate.

In China, most key industries practically set such hurdle rate at eight percent (8%) as we showed in Sub-step 5b. in Section B.4. Hence, in the analysis under this Option III, eight percent (8%) shall be used as the benchmark for IRR.

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

FIRR is used as the financial indicator for this analysis



For key assumptions for the analysis, see the below financial analysis. The underlying detailed spreadsheet calculation and associated parameters used for investment decision-making, such as operation costs, capital investment costs, and the hurdle rate for investment decision-making by Tiefa Coal Industry Group are provided in Table 9 in Annex 3.

For the avoidance of doubt, as mentioned in Section A.2, the following calculation does not include the construction cost for the equipments installed at the UNDP's project and GAP project in Tiefa. And any and all costs and expenses for construction, operation and maintenance owed (or to be owed) by Shenyang Aode Fuel Gas Co. and/or Tieling Panva Gas Co. are excluded in this calculation.

Gas Sales Unit Price (Yuan/m ³) ⁸ (not including VAT)	Faku: 0.28 (–2007), 0.37 (2008–) Tieling: 0.37 (2006–)
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Income Tax rate	33%
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FIRR (without CER revenues)	5.53%
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Note: FIRR is calculated based on parameters stated in the feasibility study report.

The following table shows the results and estimation of sales quantity of CMM from 2005-2013 (all quantities are adjusted to a 41% methane concentration basis.).

Unit : 10³m³ (CH₄ 41%)

	CMM Sales Quantity				
	Total	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City
2002	11,863	11,863	0	0	0
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2004	4,829	4,829	0	0	0
2005	14,046	10,814	315	2,911	6

⁸ The gas sales price is the price based on the contractual agreement between the Tiefa Coal Industry Group and each user.



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2007	93,329	32,912	2,517	56,734	1,166
2008	157,429	34,912	2,517	118,400	1,600
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2013	167,429	44,912	2,517	115,622	4,378
2014	167,429	44,912	2,517	115,622	4,378
2015	167,429	44,912	2,517	115,622	4,378
Total (2008-15)	1,309,432	329,296	20,136	933,139	26,861

As specified above, FIRR for Tiefa Coal Industry Group without CER revenues is 5.53%, which is much lower than the benchmark FIRR necessary for investment decision making. Therefore, the investment analysis concluded that the Project activity without CER revenues is not an economically attractive course of action.

Sub-step 2d– Sensitivity analysis

The main input parameters would have to vary as follows in order for the project to cross the IRR hurdle rate of eight percent (8%):

- Investment costs: 23.7% decrease
- Operating costs: 15.6% decrease
- Gas sales unit price: 8.4% increase

Investment costs:

In this project, the biggest investment will be made for the development of surface vertical goafwells. This cost mainly consists of procuring steel pipes used as wells. When Tiefa decided to implement this project, it is reasonably predicted that demand of steel pipes continue to outstrip supply of them, hence, it is reasonable that Tiefa Coal Industry (Group) Co., Ltd. judged that it is unlikely that such a large decrease (23.7%) in investment costs would happen.

Operating costs:

In this project, the largest component of operating costs is labor costs. Considering the economic growth in China, it is highly unlikely that labor cost will be largely decrease.

Gas sales price:

Gas Sales Price for the sales to Shenyang Aode Fuel Gas Co. is determined in accordance with the formula in the long term sales contract where the unit price of CMM will be automatically discounted if the consumption amount will increase, hence, there exists no case that the total gas sales revenue will increase equal to or more than 8.4%, since even if the total sales quantity will increase, unit price will be discounted. And in case of sales



to Tieling Panva Gas Co., Ltd., there is a contract effective until the end of 2007 and after that unit Gas Sales Price will be decided by negotiation by taking into account unit Gas Sales Price to Shenyang Aode Fuel Gas Co., hence, in this case, either, there might be small possibility that the unit Gas Sales Price increases equal to or more than 8.4%.

Therefore, it is concluded that the conclusion in the previous sub-step is robust.

Step 3. Barrier analysis

[Omitted]

Step 4. Common practice analysis

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

China is the largest emitter of CMM in the world, releasing over 12 billion cubic meters in 2000. This represents nearly 37% of the world's CMM emissions. In 2002 only 196 coal mines in China had undertaken methane drainage. The average drainage rate in the country is less than 10%. Moreover, less than 50% of China's drained CMM was utilized, which means that only less than 5% of the total CMM emitted by China is being used at coal mines.

This means that the technology of CMM extraction and utilization is not widespread in China. Moreover, site-specific situations and opportunities usually determine the plausibility of a CMM project. The magnitude of CMM emissions released from coalmines can vary greatly from mine to mine making CMM project transparency difficult from mine to mine. For instance, some coal mine drainage systems in China produce 60% methane gas requiring no additional engineering control measures. Others consistently produce large enough quantities of CMM (>35% methane). These situations and opportunities are not currently present at the Tiefa coal mines since the quantities of high concentrated CMM (>35% methane) is not enough to proceed with the Project. Tiefa is in a need to use the advanced gas drainage technology, namely surface vertical goaf well as one of the first commercial scale projects in China. Tiefa mine-specific conditions distinguish it from other Chinese coalmines that may currently utilize CMM.

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

Currently, there is no similar project in China to feed CMM into gas pipeline as fuel for industrial use, as well as city gas. So a conclusion can be made that the proposed project activity is not a common practice in China.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

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 ₂ e)
PE_{ME}	Project emissions from energy use to capture and use methane (tCO ₂ e)

PE _{MD}	Project emissions from methane destroyed (tCO ₂ e)
PE _{UM}	Project emissions from un-combusted methane (tCO ₂ e)

Under this Project activity, CMM is utilized as city gas for Tieling City and Diaobingshan City, and as an energy source for the ceramic factories at the Faku ceramic city as well as for a fuel source to produce boric acid at Febe factory.

Out of the CMM utilized as city gas, the CMM utilized for coal-mine workers' residences in Tiefa coal-field is an activity under the business as usual scenario. While this situation has been dealt with under the leakage section of which result is shown in Section B.6.1., the result shows that there exist no overlaps between the baseline thermal CMM utilization and the use for the Project activity.

Combustion emissions from additional energy required for CMM capture and use

PE_{ME} describes the electricity consumed to operate the blower facility when extracting CMM from underground boreholes, and to operate the compressor when supplying the CMM to users under a certain pressure.

Therefore, PE_{ME} is calculated based on the following formula.

CE_{FELEC} has been calculated utilizing the ACM0002 with the applicable power grid set as the Northeast China Power Grid.

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

where

$CONS_{ELEC,PJ,t}$	Additional electricity consumption for capture and use of methane, if any [MWh]
CE_{FELEC}	CO ₂ emission factor of electricity used by coal mine calculated by the method specified by ACM0002 [tCO ₂ e/MWh]

$$CE_{FELEC} (=0.5 \times EF_{OM,ELEC} + 0.5 \times EF_{BM,ELEC})$$

EF _{OM,ELEC}	1.2404 t-CO ₂ /MWh
EF _{BM,ELEC}	0.8631 t-CO ₂ /MWh
CE _{FELEC}	1.0518 t-CO ₂ /MWh

Source : Office of National Coordination Committee on Climate Change,
emission factors of the Northeast China Power Grid (NCPG)

EF_{OM,y}

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

EF_{OM,y} of NCPG is calculated by using the aggregated amount of electricity supply amount in Liaoning Province, Jilin Province and Heilongjiang Province during 2003 to 2005 and the aggregated amount of CO₂ emission during the said period.

Table 1 Weighted average emissions per electricity unit



	2003	2004	2005	Total
$\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}$ (tCO ₂ e)	174,151,899	199,754,431	207,282,748	581,189,077
$\sum_j GEN_{j,y}$ (MWh)	145,975,752	158,425,475	164,164,426	468,565,654
$EFOM,y$ (tCO ₂ e/MWh)	1.1930	1.2609	1.2627	1.2404

Amount of CO₂ emission is calculated by using the amount of each fuel consumed at the electricity power stations of the said three provinces during the said period and using Net Calorific Values, Carbon Emission Factor and OXD_i provided in the following table.

Table 2 Net Calorific Values, Carbon Emission Factor, OXD_i of each fuel

Energy		Net Calorific Values		Carbon Emission Factor	OXD _i
Coal	Raw Coal	20,908	kJ/kg	25.8	1
	Clean Coal	26,344	kJ/kg	25.8	1
	Other Washed Coal (Middling)	8,363	kJ/kg	25.8	1
	Coke	28,435	kJ/kg	25.8	1
Oil	Crude Oil	41,816	kJ/kg	20.0	1
	Gasoline	43,070	kJ/kg	18.9	1
	Kerosene	43,070	kJ/kg	19.6	1
	Diesel	42,652	kJ/kg	20.2	1
	Fuel Oil	41,816	kJ/kg	21.1	1
	Other Petroleum Products	38,369	kJ/kg	20.0	1
Gas	Natural Gas	38,931	kJ/m ³	15.3	1
	Coke Oven Gas	16,726	kJ/m ³	12.1	1
	Other Coal Gas (By Gas Furnace)	5,227	kJ/m ³	12.1	1
	Liquefied Petroleum Gas	50,179	kJ/kg	17.2	1
	Refinery Gas	46,055	kJ/kg	18.2	1



Source: Net Calorific Values is in accordance with the “China Energy Statistical Yearbook, 2006 p287 “. Carbon Emission Factor and OXD,I is in accordance with the “2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume2 Energy, CHAPTER 1 P1.21-P1.24 ,Table 1-3, Table 1-4.”

 $EF_{BM,y}$

The Build Margin emission factor for the proposed Project is calculated ex ante. The sample group of the proposed Project is obtained by adding up power plant capacity built most recently in the NCPG during the past few years. Between 1998 and 2005, 21.34% of new capacity additions have been seen and thus data between 1998 and 2005 are used to calculate the EF_{BM} .

For the variables to calculate the Build Margin emission factor, the following data have been utilized:

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

$$EF_{BM,y} = 91.31\% \times 0.9454 = \mathbf{0.8631} \quad (\text{tCO}_2/\text{MWh})$$

Ratio of Thermal Power Plant in electric source of the NCPG is showed in the following Table 3

Table 3 – Electrical Source of the NCPG

	Installed Capacity MW			Additional Installed Capacity	Ratio in Additional Installed Capacity
	1998	1999	2005		
	A	B	C		
Thermal Power	26,104.9	27,136.9	33,934	7,829.1	91.31%
Hydro Power	5,482.3	5,522.7	5,971.4	489.1	5.70%
Nuclear Power	0	0	0	0	0.00%
Wind Power	17	22.9	273.3	256.3	2.99%
Total	31,604.2	32,682.5	40,178.7	8,574.5	100.00%
Ratio compared to the capacity in 2005	78.66%	81.34%	100%		

Source: China Electricity Power Year Book 1999, 2000 and 2006

$EF_{Thermal}$ is calculated as follows. (λ_{coal} , λ_{oil} and λ_{gas} is showed in Table 4).

$$\begin{aligned}
 EF_{Thermal} &= \lambda_{coal} \times EF_{coal,Adv} + \lambda_{oil} \times EF_{oil,Adv} + \lambda_{gas} \times EF_{gas,Adv} \\
 &= 98.88\% \times 0.9508 + 0.27\% \times 0.5843 + 0.85\% \times 0.4237 \\
 &= 0.9453
 \end{aligned}$$

Table 4 CO₂ Emission Factor of each fuel in the NCPG in 2005



Energy		Consumption Amount	CO2 Emission Amount		λ_i
Coal	Raw Coal	101,347.5 10^3 t	200,454,896	tCO2e	
	Clean Coal	0 10^3 t	0	tCO2e	
	Other Washed Coal (Middling)	5,681.6 10^3 t	4,494,940	tCO2e	
	Coke	0 10^3 t	0	tCO2e	
			204,949,836	tCO2e	98.88 %
Oil	Crude Oil	11.6 10^3 t	35,571	tCO2e	
	Gasoline	0 10^3 t	0	tCO2e	
	Diesel	32.3 10^3 t	102,039	tCO2e	
	Fuel Oil	133.3 10^3 t	431,247	tCO2e	
	Other Petroleum Products	0 10^3 t	0	tCO2e	
			568,858	tCO2e	0.27 %
Gas	Natural Gas	308 10^6 m ³	672,681	tCO2e	
	Coke Oven Gas	528 10^6 m ³	391,817	tCO2e	
	Other Coal Gas (By Gas Furnace)	2,099 10^6 m ³	486,768	tCO2e	
	Liquefied Petroleum Gas	1.2 10^3 t	3,798	tCO2e	
	Refinery Gas	68 10^3 t	208,991	tCO2e	
			1,764,054	tCO2e	0.85 %
Total			207,282,748	tCO2e	100%

Source : China Energy Statistical Yearbook 2006

EF_{i,Adv} is provided in following Table 5.Table 5 EF_{i,Adv}

	Symbol	Transmission End Efficiency	Carbon Emission Factor (tC/TJ)	OXID _i	Emission Factor EF _{i,Adv}
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal thermal power plants	EF _{Coal,Adv}	35.82%	25.8	1	0.9508
Oil	EF _{Oil,Adv}	47.67%	21.1	1	0.5843



thermal power plants					
Gas thermal power plants	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237

According to the statistics on new thermal power projects stated in the “11th Five-Year Developing Guidelines” in China announced by the State Electricity Regulatory Commission, single-unit power plants with capacity 600MW and above accounts for 21%, single-unit power plants with capacity 300MW accounts for 60% of the new thermal power projects established during 2000-2005, and the remainders are power plants below the capacity of 300MW. The total units of the new large and medium-sized thermal power projects in the entire country in 2004 counts for 34GW, of which the 600MW units total 11 sets that account for nearly 20% of new power generation capacity of the large and medium-sized thermal power projects for that year. In a sense, the coal-fired power commercial technology with optimal efficiency is identified to be the domestic 600MW sub-critical units, which are led from these calculation results. The weighted arithmetic mean of coal consumption of the new 11 sets with 600MW units in 2004 is taken as the approximate estimated value of that of commercial optimal efficiency technology. The coal consumption ratio of domestic sub-critical power generation plant with 600MW units is estimated at 336.66gce/kWh, and the corresponding power supply efficiency is estimated at 35.82%. The gas turbine power plant (including oil and gas fired) commercial technology with optimal efficiency is identified to be the 200MW level combined cycle (the technical level is equivalent to the type of 9E unit of GE). According to relevant statistics of gas turbine power plants in 2004, the practically highest power supply efficiency of gas turbine is taken as approximate estimated value of that of commercial technology with optimal efficiency, the coal consumption (corrected by calorific value) of gas turbine power plant is estimated at 268.13 gce/kWh, and the corresponding power supply efficiency is estimated at 47.67%.

Combustion emissions from use of captured methane

Under the methodology, PEMD is to be calculated with the following equation including emissions arising from combustion of non methane hydrocarbons (NMHC), if the percentage contained in the coal mine gas is or exceeds 1% in mass. For this Project, as provided in Section B.7.1 and Table 8 in Annex 3, hence below (4) is calculated as utilizing $r = 0$. The content of NMHC will be tested and monitored on an annual basis to ensure the absence of NMHC.

CEF_{CH_4} is 2.75 tCO_{2e}/tCH₄.

$$PE_{MD} = MD_{GAS} \times CEF_{CH_4} \quad (3)$$

where

PE_{MD}	Project emissions from CMM/CBM destroyed (tCO _{2e})
MD_{GAS}	Methane destroyed after being supplied to gas grid or for vehicle use (tCH ₄)
CEF_{CH_4}	Carbon emission factor for combusted methane (2.75 tCO _{2e} /tCH ₄)

Among all of the CMM transported to the CMM gas grid, a portion of it will remain un-combusted and emitted to the atmosphere. Therefore, MD_{ELEC} will be calculated utilizing the IPCC Guidelines as setting 98.5% as the efficiency of methane destruction/oxidation in power plant. The portion of CMM emitted to the atmosphere will be covered under the section “***Un-combusted methane from flaring and end uses***”.

The unit for MD_{GAS} and MM_{GAS} is stipulated in tCH₄. Monitoring will be conducted by measuring the flow



amount, CH₄ concentration rate, pressure and temperature of CMM and converted into mass.

$$MD_{GAS} = MM_{GAS} \times Eff_{GAS} \quad (4)$$

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/oxidation 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%)

Un-combusted methane from flaring and end uses

The equation of un-combusted methane from the CMM gas grid is as follows. In this Project's case, use of methane (i) stands for gas grid.

$$PE_{UM} = GWP_{CH_4} \times \sum_i MM_i \times (1 - Eff_i) \quad (5)$$

where:

PE _{UM}	Project emissions from un-combusted methane (tCO ₂ e)
GWP _{CH₄}	Global warming potential of methane (21 t CO ₂ e/tCH ₄)
i	methane used for 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 (%) set at 98.5%

Baseline Emissions

Baseline emissions are given by the following equation:

$$BE_y = BE_{MD,y} + BE_{MR,y} \quad (6)$$

BE _y	Baseline emissions in year y (tCO ₂ e)
BE _{MD,y}	Baseline emissions from destruction of methane in the baseline scenario in year y (tCO ₂ e)
BE _{MR,y}	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)

Methane destruction in the baseline

Depending on the nature of the activities in the baseline scenario, CBM/CMM can be removed at three different stages – (1) as coal bed methane from a CBM to goaf wells prior to mining, or from post-mining CMM from surface goaf wells;

(2) during the mining process using surface or underground pre-mining CMM underground borehole drainage techniques, or;
(3) after the mining process by drainage from sealed goafs but before the mine is closed.

The Project activity contains the following two stages:

(1) as coalmine methane from post-mining CMM from surface goaf wells; and,



- (2) during the mining process using underground pre-mining CMM from underground borehole drainage techniques

If such CMM is to be combusted and destructed under the baseline scenario, such emissions must be counted based on the following equation.

Note herewith a typo exists in the methodology whereas $BE_{MR,y}$ should read $BE_{MD,y}$.

$$BE_{MR,y} = CEF_{CH_4} \times \sum_i (CMM_{BL,i,y} + PMM_{BL,i,y}) \quad (7)$$

where:

$BE_{MD,y}$	Baseline emissions from destruction of methane in the baseline scenario in year y (tCO ₂ e)
i	methane used for supply to gas grid to various combustion end uses
$CMM_{BL,i,y}$	Pre-mining CMM from underground boreholes that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (expressed in tCH ₄)
$PMM_{BL,i,y}$	Post-Mining CMM from surface goaf wells that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH ₄)

Out of the CMM utilized as city gas, the CMM used for coal-mine workers' residences in Tiefsa coal-field is an activity under the business as usual scenario. The supply of CMM for coal-mine workers' residences in Tiefsa coal-field is to facilitate the livings of the mining workers, and is supplied with priority in comparison to the CMM to be utilized as city gas under the Project activity. Therefore, city gas for utilization as coal-mine workers' residences in Tiefsa coal-field will take place in both the baseline scenario and the Project scenario as a *Business as Usual* activity, thus, is not affected by the Project activity, and does not influence the emission reductions.

Hence $BE_{MD,t} = 4,864 \times 0.985 \times 0.67 \times 2.75 = 8,827$ [tCO₂/yr] CMM would be utilized in Tieling City only. The associated amount is conservatively assumed as the historical amount in 2002 (= 4,864 km³) as shown in Annex3).

Methane released into the atmosphere

Depending on the nature of the project activity, CMM can be removed at three different stages –

- (1) as coal bed methane from a CBM wells prior to mining, and from post-mining CMM from surface goaf wells (2) during the mining process using surface or underground pre-mining CMM from underground borehole drainage techniques, or (3) after the mining process by drainage from sealed goafs but before the mine is closed.

The Project activity contains the following two stages:

- (1) as coalmine methane from post-mining CMM from surface goaf wells;
- (2) during the mining process using surface and underground pre-mining CMM from underground borehole drainage techniques

This methane would have been emitted to the atmosphere in the baseline scenario, unless some capture and use activities form part of the baseline:

The subject of this Project activity is post-mining CMM from surface goaf wells and pre-mining CMM from surface goaf well, and i stands only for Gas grid. And since the relative aggregated concentration ratio of NMHC is lower than 1% (detail information is provided in Table 8 of Annex 3), hence, r can be set at 0.



Monitoring checks to see how this varies with time will be carried out in line with the methodology.

Since no CMM is combusted and destructed under the baseline scenario, both $CMM_{BL,i,y}$ and $PMM_{BL,i,y}$ are 0. As a result, $BE_{MR,y}$ stands for the amount of methane gas utilized for CMM gas grid under the project scenario.

$$BE_{MR,y} = GWP_{CH_4} \times \left[\sum_i (CMM_{PJ,i,y} - CMM_{BL,i,y}) + \sum_i (PMM_{PJ,i,y} - PMM_{BL,i,y}) \right] \quad (8)$$

Where,

$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
i	Methane used for supply to gas grid to various combustion end uses
$CMM_{PJ,i,y}$	Pre-mining CMM from surface goaf wells captured, sent to and destroyed by use i in the project activity in year y (expressed in tCH ₄)
$CMM_{BL,i,y}$	Pre-mining CMM from surface goaf wells that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (expressed in tCH ₄)
$PMM_{PJ,i,y}$	Post-Mining CMM from surface goaf wells captured, sent to and destroyed by use i in the project activity in year y (tCH ₄)
$PMM_{BL,i,y}$	Post-Mining CMM from surface goaf wells that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH ₄)
GWP_{CH_4}	Global warming potential of methane (21 tCO ₂ e/tCH ₄)

Table 6: Overall Picture of CMM ventilation/extraction and Use/release to atmosphere

	Ventilation Air Methane	Methane Recovery		CMM Supply Amount					Emitted in the Atmosphere
		underground boreholes	surface goaf wells	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City	coal-mine workers residents	
2002	94,760	63,466	0	4,864	0	0	0	2,510	56,092
2003	82,898	73,639	0	3,003	0	0	0	3,310	67,327
2004	102,320	73,742	6,300	1,980	0	0	0	2,960	75,102
2005	96,627	66,814	6,500	4,434	129	1,194	2	3,340	64,215
2006	106,643	45,602	15,850	12,674	1,032	14,052	122	3,730	29,843
2007	93,095	56,400	18,600	13,494	1,032	23,261	478	4,910	31,825
2008	93,095	55,000	30,000	14,314	1,032	48,544	656	5,270	15,184
2009	88,095	54,000	31,000	15,134	1,032	48,304	896	5,630	14,004
2010	78,095	60,000	30,000	15,954	1,032	48,126	1,074	5,790	18,024
2011	78,095	59,000	31,000	16,774	1,032	47,820	1,380	6,220	16,774
2012	68,095	70,000	30,000	17,594	1,032	47,578	1,622	6,580	25,594
2013	68,095	70,000	30,000	18,414	1,032	47,405	1,795	6,825	24,529
2014	68,095	70,000	30,000	18,414	1,032	47,405	1,795	6,825	24,529
2015	68,095	70,000	30,000	18,414	1,032	47,405	1,795	6,825	24,529

**Leakage**

The formula for leakage is given as follows

$$LE_y = LE_{d,y} + LE_{o,y} \quad (32)$$

where:

LE_y	Leakage emissions in year y (tCO ₂ e)
$LE_{d,y}$	Leakage emissions due to displacement of other baseline thermal energy uses of Methane in year y (tCO ₂ e)
$LE_{o,y}$	Leakage emissions due to other uncertainties in year y (tCO ₂ e)

Extraction of CMM is conducted for the coal mine's safety purpose, hence the extracted amount under the Project activity and the baseline activity are equal. Furthermore, since the utilization of CMM is for city gas under this Project activity, there exists no leakage emissions due to other uncertainties, hence, $LE_{o,y}$ is 0.

(b) Displacement of baseline thermal energy uses:

Calculation of mean annual demand (TH_y) for each year of the crediting period

If $ME_k - (MM_{ELEC,k} + MM_{HEAT,k}) > TH_k$ can be proved, then, the baseline thermal energy demand, i.e., the $LE_{d,y}$ can be ignored.

$$ME_k - (MM_{ELEC,k} + MM_{HEAT,k}) > TH_k \quad (33)$$

With:

$$TH_k = (TH_{BL,y}/12) * d_k^{\max} \quad (34)$$

where

ME_k	Total methane extracted on month k (tCH ₄)
$MM_{ELEC,k}$	Methane measured sent to power plant on month k (tCH ₄)
$MM_{HEAT,k}$	Methane measured sent to new heat generation uses on month k in the Project Scenario that would not have been sent in the Baseline Scenario on day k (tCH ₄)
TH_k	Methane used to serve thermal energy demand in the baseline for month k (tCH ₄)
$TH_{BL,y}$	Projected annual baseline thermal demand for year y
d_k	scalar adjustment factor for month k to reflect seasonal variations such that $\sum d_k = 12$
$d_k^{\max}$	maximum scalar adjustment factor for month k over the past 5 years (i.e. $\sum d_k^{\max} > 12$)

Under the baseline scenario, CMM is not utilized for power generation. Therefore, $MM_{ELEC,k}$ is 0 for this Project activity. Hereafter we explain that $ME_k - (MM_{HEAT,k}) > TH_k$ following approach a) *Engineering / economic study of thermal energy demand*.

1) Who the users of CMM for thermal energy are, by quantity and type (e.g., residential, commercial,



industrial);

The extracted CMM are utilized as city gas at coalmine workers' residences in the Tiefa mining area. Therefore, MMHEAT_k stands for the city gas distributed for coal-mine workers' residences in Tiefa mining area.

2) What service agreements are in place with these end users;

There exists the following two types of gas sales system: (i) customer can use gas up to the amount equivalent to the Prepaid IC card which each customer purchases or charges prior to the consumption and (ii) gas sales price is charged after the consumption in accordance with the consumed amount recorded at the gas meters set up inside each house/apartment. In case of (ii), some customers have rejected gas company's reading the relevant meters and if such meters are set up inside the houses/apartments, the gas company can not read the meters and charge gas sales price to such customers. Accordingly, data provided in the following table are the actual results for the customers who use IC card system or accept the said reading of the meters.

3) Average CMM/thermal energy consumption rates for each type of end user;

Following table shows the amount of CMM consumed by coal-mine workers and residents during the period from Year 2001 to 2005. In accordance with the data, the largest consumption amount of gas at one household is 19.31 m³ recorded in February, 2002. Therefore, THBL_k is set as 19.31 m³ recorded in February, 2002, which is a conservative approach .

			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2001	Consumption	10 ³ m ³ (CH4 100%)	201	195	212	200	169	147	148	152	143	158	170	208	
	workers residents	household	13,044	10,987	12,687	14,899	16,005	19,365	18,452	19,560	19,647	19,641	19,354	17,241	
	Average	m ³ (CH4 100%) /household	15.41	17.75	16.71	13.42	10.56	7.59	8.02	7.77	7.28	8.04	8.78	12.06	133.40
	dk		1.39	1.60	1.50	1.21	0.95	0.68	0.72	0.70	0.65	0.72	0.79	1.09	12
2002	Consumption	10 ³ m ³ (CH4 100%)	228	213	253	234	222	189	192	189	191	220	234	258	
	workers residents	household	12,986	11,031	13,645	15,489	17,041	19,423	19,354	19,147	19,258	19,846	19,427	18,235	
	Average	m ³ (CH4 100%) /household	17.56	19.31	18.54	15.11	13.03	9.73	9.92	9.87	9.92	11.09	12.05	14.15	160.26
	dk		1.31	1.45	1.39	1.13	0.98	0.73	0.74	0.74	0.74	0.83	0.90	1.06	12
2003	Consumption	10 ³ m ³ (CH4 100%)	53	48	59	54	57	60	48	41	43	57	75	106	
	workers residents	household	13,501	11,201	13,002	15,662	17,003	19,870	19,721	19,081	19,655	19,863	19,250	18,580	
	Average	m ³ (CH4 100%) /household	3.93	4.29	4.54	3.45	3.35	3.02	2.43	2.15	2.19	2.87	3.90	5.71	41.81
	dk		1.13	1.23	1.30	0.99	0.96	0.87	0.70	0.62	0.63	0.82	1.12	1.46	12
2004	Consumption	10 ³ m ³ (CH4 100%)	106	73	69	69	67	69	65	66	63	64	51	65	
	workers residents	household	18,580	12,452	13,771	15,337	16,894	19,559	20,135	20,316	20,952	20,737	20,086	19,630	
	Average	m ³ (CH4 100%) /household	5.71	5.86	5.01	4.50	3.97	3.53	3.23	3.25	3.01	3.09	2.54	3.31	46.99
	dk		1.46	1.50	1.28	1.15	1.01	0.90	0.82	0.83	0.77	0.79	0.65	0.85	12
2005	Consumption	10 ³ m ³ (CH4 100%)	61	78	63	23	132	66	65	65	65	63	68	67	
	workers residents	household	13,248	11,456	13,205	15,298	15,292	15,577	15,784	16,451	16,292	15,924	17,090	16,934	
	Average	m ³ (CH4 100%) /household	4.60	6.81	4.77	1.50	8.63	4.24	4.12	3.95	3.99	3.96	3.98	3.96	54.51
	dk		1.01	1.50	1.05	0.33	1.90	0.93	0.91	0.87	0.88	0.87	0.88	0.87	12



	Consumption	household	Monthly Consumption / household				Σ THBL,k
	Plan	Plan	THbl,y	THbl,y/12	$d_k^{\max}$	THbl,k	
	10^3 km^3 (CH ₄ 100%)		m^3 (CH ₄ 100%)	m^3 (CH ₄ 100%)		m^3 (CH ₄ 100%)	
2008	5,270	44,000	119.77	9.98	1.90	18.96	10,013
2009	5,630	47,000	119.79	9.98	1.90	18.97	10,697
2010	5,790	49,000	118.16	9.85	1.90	18.71	11,001
2011	6,220	52,000	119.62	9.97	1.90	18.94	11,818
2012	6,580	55,000	119.64	9.97	1.90	18.94	12,502
2013	6,825	57,500	118.70	9.89	1.90	18.79	12,968
2014	6,825	57,500	118.70	9.89	1.90	18.79	12,968
2015	6,825	57,500	118.70	9.89	1.90	18.79	12,968

- 4) The number of end users serviced by the distribution system relative to the total pool of possible end users, given infrastructure constraints;

As the above table shows, as of the year end 2005 there exists 16,934 households which accepted the readings and paid their bills, while in the meantime there are households which have refused to pay their bills. The consumption amount shown in the above table includes the consumed amount for the households which have refused the readings and have not paid their bills.

- 5) How quickly the total pool of possible end users is expected to grow, if at all;

Supply of city gas to end users is estimated to be increased to a number of 57,500 households by the year 2013, as shown in the table below. This figure includes households which refuse readings and paying their bills.

- 6) Whether official plans exist to expand the CMM / CBM thermal energy system;

In the future, Daming District is scheduled to receive CMM from the Daming Coal Mine, however, since the CMM supplied from the Daming Coal Mine is currently not connected to the CMM network of Tiefsa Coal Industry Group, there is no effect to the supply. Furthermore, this figure is included in the end users column in the above table.

- 7) The cost/benefits of expanding the CMM / CBM delivery system to additional end users;

City gas supply to the Daming District is not to be conducted as a profit making business but to provide a social living basis to the coal miners. Costs such as for construction are included in the prime cost of coal mining.

- 8) The type and cost of alternative fuels for potential or existing CMM / CBM thermal energy customers, compared to the cost of delivering CMM / CBM;

Costs associated with providing CMM as city gas to the coal mine workers' residents is cheaper to that than



venting the CMM into the atmosphere not supplying it to the coal mine workers' residence as city gas while providing town gas by constructing a facility to extract town gas from raw coal. The first priority is the welfare of coal mine workers, and only the *remaining* CMM is to be sold to the suppliers (Tieling Panva Gas Co. Ltd., and Shenyang Aode Fuel Gas Co.) as city gas for the proposed Project. Therefore, the supply of CMM to coalmine workers' residences are considered as "common" for the baseline and Project scenarios, which would not have an influence as far as the effect of GHG emission reductions is concerned

9) Any other variables relevant to the particular thermal energy CMM / CBM distribution system associated with the project.

None.

As a result of verifying the situation as stated above, the city gas for coal-mine workers' residences in Tiefert mining is supplied as a business as usual activity, and will not be affected by the Project activity since extracted CMM amount is abundant and some amount of CMM will be emitted into the atmosphere without use, even in case the Project activity takes place.

Finally, following Table 9 shows the estimation of CMM demand and supply in the Project Scenario.

Table 9: CMM demand and supply in the Project Scenario

Unit : 10³m³ (CH₄ 100%)

	Methane Recovery			Methane Supplies					Emitted in the Atmosphere
		underground boreholes	surface goaf wells	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City	coal-mine workers residents	
								THBL _k	
2008 SEP.-DEC.	28,333	18,333	10,000	4,771	344	16,181	219	3,338	3,480
2009	85,000	54,000	31,000	15,134	1,032	48,304	896	10,697	8,937
2010	90,000	60,000	30,000	15,954	1,032	48,126	1,074	11,001	12,813
2011	90,000	59,000	31,000	16,774	1,032	47,820	1,380	11,818	11,176
2012	100,000	70,000	30,000	17,594	1,032	47,578	1,622	12,502	19,672
2013	100,000	70,000	30,000	18,414	1,032	47,405	1,795	12,968	18,387
2014	100,000	70,000	30,000	18,414	1,032	47,405	1,795	12,968	18,387
2015 JAN. - AUG.	66,667	46,667	20,000	12,276	688	31,603	1,197	8,645	12,258

Where,

Emitted in the Atmosphere: amount of CMM extracted and released into the Atmosphere without use.

BaU (coal-mine workers residents): During the period from 2007 to 2013, equal to the THBL_k (Methane used to serve estimated thermal energy demand in the baseline for month k of year y)

In accordance with above, even in case of THBL_k, there will be enough supply of CMM. Therefore, we come to a conclusion that leakage regarding displacement of baseline thermal energy uses could be ignored. Therefore, the below equation can be proved.

$$ME_k - (MMELEC_k + MMHEAT_k) > TH_k$$

$$\text{Hence, } LE_y = LE_{d,y} = 0.$$

**(b) CBM drainage from outside the de-stressed zone,**

This Project does not utilize any CBM, hence, this leakage can be ignored.

(c) Impact of CDM Project activity on coal production,

CMM extraction is present in the baseline scenario. Hence, in accordance with ACM0008, leakage regarding impact of CDM project activity on coal production could be ignored.

(d) Impact of CDM Project activity on coal prices and market dynamics

No reliable scientific information is currently available to assess the risk of impact of CDM project activity on coal prices and market dynamics.

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

Data / Parameter:	EF _{OM,y}
Data unit:	tCO ₂ e/MWh
Description:	Operating margin emission factor of Northeast China Power Grid
Source of data used:	“The Clarification of Determining Baseline Emission Factor for China Regional Grid” by NCCC
Value applied:	1.1983
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 ₂ e/MWh
Description:	Build margin emission factor of Northeast China Power Grid
Source of data used:	“The Clarification of Determining Baseline Emission Factor for China Regional Grid” by NCCC
Value applied:	0.8108
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 ₂ e/tCH ₄
Description:	Carbon emission factor for combusted methane



Source of data used:	ACM0008 Section 6.2 formula (3)
Value applied:	2.75
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0008 / version 03.
Any comment:	-

Data / Parameter:	Eff _i
Data unit:	%
Description:	Efficiency of methane destruction in use gas grid.
Source of data used:	ACM0008 / version 03
Value applied:	98.5%
Justification of the choice of data or description of measurement methods and procedures actually applied :	In accordance with Formula (8) in Section 6.2 of ACM0008, figure for Eff _{GAS} is set at 98.5%
Any comment:	-.

B.6.3 Ex-ante calculation of emission reductions:
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1) Estimation of Project activity emissions:Ex ante ESTIMATION

For the underlying assumptions such as pre-mining CMM from underground boreholes and post-mining CMM from surface goaf wells utilization plan by each end user, please see Annex 3.

2) Estimation of baseline emission:



Years	BE _y	BE _{MD,y}	BE _{MR,y}	(CMM _{PJ,y} + PMMP _{J,y}) - (CMM _{BL,y} + PMM _{BL,y})	CMM _{PJ,y} + PMMP _{J,y}	CMM _{BL,y} + PMM _{BL,y}	BE _{Use,y}
	tCO ₂	tCO ₂	tCO ₂	tCH ₄	tCH ₄	tCH ₄	tCO ₂
2008 SEP.-DEC.	283,188	2,942	280,246	13,345	14,415	1,070	0
2009	861,117	8,827	852,290	40,585	43,795	3,210	0
2010	872,655	8,827	863,828	41,135	44,345	3,210	0
2011	884,192	8,827	875,365	41,684	44,894	3,210	0
2012	895,729	8,827	886,902	42,233	45,443	3,210	0
2013	907,267	8,827	898,440	42,783	45,993	3,210	0
2014	907,267	8,827	898,440	42,783	45,993	3,210	0
2015 JAN.-AUG.	604,845	5,885	598,960	28,522	30,662	2,140	0
Total	6,216,260	61,789	6,154,471	270,883	293,353	22,470	0

FORMULA for ex post Calculation

The baseline emissions BE_t is given by

$$BE_t = BE_{MD,t} + BE_{MR,t} + BE_{Use,t} \quad (\text{B-9})$$

where

- $BE_{MD,t}$: Baseline emissions from destruction of methane [tCO₂e/duration of t],
 $BE_{MR,t}$: Baseline emissions from release of methane into the atmosphere [tCO₂e/duration of t],
 $BE_{Use,t}$: Baseline emissions from production of heat or supply to gas replaced by the project activity [tCO₂e/duration of t]

defined for a certain period of time s specified by t (such as day, month or year).

For $BE_{MD,t}$, CMM would be utilized additionally by the project in Tieling City only. The associated amount is conservatively assumed as the historical amount in 2002 ($= 4,864 \times 10^3 \text{ m}^3$) as shown in Table 6. Therefore,

$$BE_{MD,t} = 4,864 \times 0.985 \times 0.67 \times 2.75 = 8,827 \text{ [tCO}_2\text{/yr]} \quad (\text{B-10})$$

On the other hand $BE_{MR,t}$ is represented as the amount of post-mining CMM from surface goaf wells and pre-mining CMM from underground boreholes supplied to the users by the project:

$$BE_{MR,t} = [\sum_i (CMM_{PJ,i,t} + PMM_{PJ,i,t}) - \sum_i (CMM_{BL,i,t} + PMM_{BL,i,t})] \times GWP_{CH_4} \quad (\text{B-11})$$

where

- $CMM_{PJ,i,t}$: Pre-mining CMM from underground boreholes captured and sent to the user i by the project [tCH₄/duration of t],



- $PMM_{PJ,i,t}$: Post-mining CMM from surface goaf wells captured and sent to the user i by the project [tCH₄/duration of t],
- $CMM_{BL,it}$ Pre-mining CMM from underground boreholes that would have been captured, sent to and destroyed by use i in the baseline scenario [tCH₄/duration of t],
- $PMM_{BL,it}$ Post-mining CMM from surface goaf wells that would have been captured, sent to and destroyed by use i in the baseline scenario [tCH₄/duration of t],

because city gas use at coal-mine workers' residences in Tiefa mining are, which consumes CMM and PMM, would not be influenced by the implementation of the Project activity, and its amount would not be changed between the baseline and project scenarios. Therefore, $BE_{MR,t}$ for coal-mine worker's residences in Tiefa mining area can be set as zero.

For $BE_{Use,t}$,

$$BE_{Use,t} = ED_{CPMM,t} \quad (\text{B-12})$$

where

$ED_{CPMM,t}$: Emissions from displacement of end uses by using CMM [tCO₂e/duration of t],

because only extraction of pre-mining CMM from underground boreholes and Post-Mining CMM from surface goaf wells are implemented (no CBM).

$ED_{CPMM,t}$ is given by:

$$ED_{CPMM,t} = \frac{\sum_i [CMM_{PJ,I,t} + PMM_{PJ,I,t}]}{\sum_i [CMM_{PJ,I,t} + PMM_{PJ,I,t}]} \times PBE_{Use,t} = PBE_{Use,t} \quad (\text{B-13})$$

where

$PBE_{Use,t}$: Potential total baseline emissions from production of heat replaced by the Project, because only pre-mining CMM from underground boreholes and post-mining CMM from surface goaf wells are implemented to be used (no CBM).

The Project does not monitor the end-use consumption of CMM, instead, monitors the amount of CMM (methane) supplied to the end users. As the methodology specified, the boiler efficiency (at the end-user consumption point) can be set as 100% as a conservative estimation. Therefore, the PDD uses the amount of energy supplied to end-users, instead of the equivalent HEAT consumption in the baseline scenario:

$$PBE_{Use,t} = \sum_i [GAS_{i,t} \times EF_{i,GAS}] \quad (\text{B-14})$$

where

$EF_{i,GAS}$: Emissions factor of energy replaced by the project [tCO₂/GJ], provided in Section B. 6.1

$GAS_{i,t}$ [GJ]

with :

$$GAS_{i,t} = MM^{(i)}_{GAS,t} [tCH_4] \times (1,000/0.714286 \text{ kg CH}_4/\text{Nm}^3) \times 35.812500 \text{ MJ/Nm}^3 \quad (\text{B-15})$$

1Nm³ of methane (0°C, 1 atm) can be converted into 35.812500 MJ/Nm³, while 1m³ of methane (20 °C, 1 atm) can be converted to 33.367961 MJ/m³.

Therefore, it is concluded that

$$BE_{t} = 8,827 [\text{tCO}_2/\text{yr}] + [\sum_i (CMM_{PJ,i,t} + PMM_{PJ,i,t}) - \sum_i (CMM_{BL,i,t} + PMM_{BL,i,t})] \times GWP_{CH_4} + \sum_i [GAS_{i,t} \times EF_{i,GAS}] \quad (\text{B-16})$$

Ex ante ESTIMATION

Years	BE _y	BE _{MD,y}	BE _{MR,y}	(CMMPJ,y + PMMPJ,y) - (CMMBL,y + PMMBL,y)	CMMPJ,y + PMMPJ,y	CMMBL,y + PMMBL,y	BE _{Use,y}
	tCO ₂	tCO ₂	tCO ₂	tCH ₄	tCH ₄	tCH ₄	tCO ₂
2008 SEP.-DEC.	283,188	2,942	280,246	13,345	14,415	1,070	0
2009	861,117	8,827	852,290	40,585	43,795	3,210	0
2010	872,655	8,827	863,828	41,135	44,345	3,210	0
2011	884,192	8,827	875,365	41,684	44,894	3,210	0
2012	895,729	8,827	886,902	42,233	45,443	3,210	0
2013	907,267	8,827	898,440	42,783	45,993	3,210	0
2014	907,267	8,827	898,440	42,783	45,993	3,210	0
2015 JAN - AUG.	604,845	5,885	598,960	28,522	30,662	2,140	0
Total	6,216,260	61,789	6,154,471	270,883	293,353	22,470	0

For the underlying assumptions, please see Annex 3.

3) Estimation of emission reductions:FORMULA for Calculation

The emission reductions ER_t is given by

$$ER_t = BE_t - PE_t \quad (\text{B-17})$$

using the notations above (there is no leakage (detail analysis is provided in B.6.1.)).

Ex ante ESTIMATION



Years	ER	BE	BEMD _y	BEMR _y	BEUse _y	PE	PEME	PEMD	PEUM	LE
	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂	tCO ₂
2008 SEP.-DEC.	233,075	283,188	2,942	280,246	0	50,113	5,707	38,925	5,481	0
2009	708,700	861,117	8,827	852,290	0	152,417	17,562	118,265	16,590	0
2010	718,313	872,655	8,827	863,828	0	154,342	17,850	119,755	16,737	0
2011	727,890	884,192	8,827	875,365	0	156,302	18,152	121,245	16,905	0
2012	737,412	895,729	8,827	886,902	0	158,317	18,528	122,737	17,052	0
2013	747,293	907,267	8,827	898,440	0	159,974	18,528	124,226	17,220	0
2014	747,293	907,267	8,827	898,440	0	159,974	18,528	124,226	17,220	0
2015 JAN. - AUG.	498,208	604,845	5,885	598,960	0	106,637	12,352	82,819	11,466	0
Total	5,118,186	6,216,260	61,789	6,154,471	0	1,098,074	127,205	852,198	118,671	0

For the underlying assumptions, please see Annex 3.

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

>>

Ex ante ESTIMATION

Years	Estimation of project activity emission	Estimation of baseline emission	Estimation of leakage	Estimation of overall emission reductions
	tCO ₂	tCO ₂	tCO ₂	tCO ₂
2008 SEP.-DEC.	50,113	283,188	0	233,075
2009	152,417	861,117	0	708,700
2010	154,342	872,655	0	718,313
2011	156,302	884,192	0	727,890
2012	158,317	895,729	0	737,412
2013	159,974	907,267	0	747,293
2014	159,974	907,267	0	747,293
2015 JAN. - AUG.	106,637	604,845	0	498,208
Total	1,098,074	6,216,260	0	5,118,186

For the underlying assumptions, please see Annex 3.

B.7 Application of the monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**

Data / Parameter:	$CONS_{ELECT,PJ,t}$			
Data unit:	MWh			
Description:	Additional electricity consumption for capture and use of methane. Power consumptions by compressors and air compressors.			
Source of data to be used:	Monitoring data provided by Tiefsa Coal Industry Group			
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2007	8,029.506	2012	17,615.998
	2008	16,277.451	2013	17,615.998
	2009	16,697.693	2014	17,615.998
	2010	16,971.522	2015	17,615.998
	2011	17,258.942	Total	145,699.106
Description of measurement methods	Electricity use by additional compressors and air compressors are continuously measured, and the accumulated consumption is manually recorded once a day in a			



and procedures to be applied:	monitoring table.
QA/QC procedures to be applied:	Wattmeter will be periodically checked and maintained Amount of electricity used by compressors necessary for CMM supply to Tieling City in baseline scenario is set at zero on a conservative basis. Accordingly, amount of additional electricity used in the Project will be recorded in larger amount than actual.
Any comment:	Compressor pressurizing and conveying CMM from surface goaf wells and underground boreholes to Faku Ceramic City, Diaobingshan City, Tieling City and Febe Factory.

Data / Parameter:	PC _{CH4}					
Data unit:	%					
Description:	Concentration (in volume) of methane in extracted gas Concentration (in volume) of methane contained in gas supplied to Faku Ceramic City, Diaobingshan City, Tieling City and Febe Factory					
Source of data to be used:	Monitoring data provided by Tiefa Coal Industry Group					
Value of data applied for the purpose of calculating expected emission reductions in section B.5	<table><tr><td>CH₄</td><td>46.07</td><td>mol%</td></tr></table>			CH ₄	46.07	mol%
CH ₄	46.07	mol%				
Description of measurement methods and procedures to be applied:	Continuously monitored at spherical gasholder, FeBe Factory and Yinzhou Gate station in Tieling Panva Gas Co. Ltd.. Data are to be stored in computers. In addition, they are measured at every hour and manually recorded in a monitoring table.Samples are taken and analyzed at spherical gasholder and Tieling Origin Station in Tiefa Coal Industry Group once a year. Accuracy of this meter is within a 1% variance. See Figures 11, 12 and 13 for details as well as the conversion formula in Annex 4.					
QA/QC procedures to be applied:	The Project will adopt concentration meters which pass the performance test executed or to be executed by Shenyang City Energy Standard Testing Institute. Such concentration meter will be periodically checked and maintained. Analysis of gas sample will be executed by using gas chromatography. As a back-up of such sampling, analysis by using optical interference detector will be executed at Extraction Station.					
Any comment:	-					

Data / Parameter:	PC _{NMHC}								
Data unit:	%								
Description:	NMHC concentration (in volume) in extracted gas. NMHC concentration (in volume) contained in the gas supplied to Faku Ceramic City, Diaobingshan City, Tieling City and Febe Factory								
Source of data to be used:	Monitoring data provided by Tiefa Coal Industry Group								
Value of data applied for the purpose of calculating expected emission reductions in	<table><tr><td>H₂</td><td>0.00</td><td>mol%</td></tr><tr><td>O₂</td><td>8.52</td><td>mo%</td></tr></table>			H ₂	0.00	mol%	O ₂	8.52	mo%
H ₂	0.00	mol%							
O ₂	8.52	mo%							



section B.5	N ₂	43.74	mo%
	CO	0.09	mo%
	CO ₂	1.28	mo%
	CH ₄	46.07	mo%
	C ₂ H ₄	0.00	mo%
	C ₂ H ₆	0.29	mo%
	C ₃ H ₈	0.01	mo%
(Same as provided in Table 8 in Annex 3)			
Description of measurement methods and procedures to be applied:	Samples will be taken at spherical gasholder and Tieling Origin Station in Tiefsa Coal Industry Group and will be analyzed once a year at suitable company, institution or other entity and will be reported in annual monitoring report for verification purpose.		
QA/QC procedures to be applied:	Analysis of gas sample will be executed by using gas chromatography.		
Any comment:	-		

Data / Parameter:	MM_{GAS}			
Data unit:	tCH ₄			
Description:	Methane measured supplied to gas grid Amount of Methane supplied to and consumed by Faku Ceramic City, Diaobingshan City, Tieling City and Febe Factory			
Source of data to be used:	Monitoring data provided by Tiefsa Coal Industry Group			
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2007	25,637.5	2012	45,443.3
	2008	43,245.7	2013	45,992.7
	2009	43,795.1	2014	45,992.7
	2010	44,344.5	2015	45,992.7
	2011	44,893.9	Total	365,338.1
Description of measurement methods and procedures to be applied:	(1) Faku Ceramic City: Flow amount, concentration, pressure, and temperature are continuously measured by spherical gasholders at Tiefsa Coal Industry Group. Flow amount is continuously measured at Shenyang Aode Fuel Gas Co. Gas Station. (2) Diaobingshan City: Flow amount, concentration, pressure, and temperature are continuously measured by spherical gasholders at Tiefsa Coal Industry Group., Flow amount is continuously measured at Diaobingshan City Gas Network. (3) Tieling City: Flow amount, concentration, pressure, and temperature are continuously monitored at Yinzhou Gate Station and the data are electronically archived. (4) Febe Factory: Flow amount, concentration, pressure, and temperature are continuously measured at Febe Factory .			



	Accuracy of each equipment is within a 1.5% variance See Figures 11, 12 and 13 for details as well as the conversion formula in Annex 4
QA/QC procedures to be applied:	The Project will adopt meters which pass the performance test executed or to be executed by Shenyang City Energy Standard Testing Institute. Such concentration meter will be periodically checked and maintained. Back-up of the monitoring will be executed as mentioned above.
Any comment:	The mass of 1 Nm ³ of CH ₄ is 0.714286kg under 0 degrees centigrade, 1atm and 0.67kg under 20 degrees, 1atm .

B.7.2 Description of the monitoring plan:

>>

Tiefa coal mining group appoints the monitoring manager of the Project activity, and establishes the monitoring team headed by the monitoring manager, in order to enforce monitoring, data recording and storage according to the monitoring plan indicated in the PDD.

Monitoring will be implemented as follows:

1. DATA MONITORING BY END USER AND GAS SUPPLIER

The amount of CMM supplied to each end-user is monitored by Tieling Panva Gas Co. Ltd. and Shenyang Aode Fuel Gas Co in order to charge the fees to the end users. Such data will be recorded continuously in an electrical form.

The data are aggregated for end-users with the same baseline fuel users.

Regarding the gas sales to households, there is a risk that the relevant households reject such gas company's checking the meter.

2. DATA MONITORING BY TIEFA COAL MINE COMPANY

Tiefa Coal Industry Group has its own monitoring system to monitor the amount of CMM supplied to Tieling Panva Gas Co. Ltd. and Shenyang Aode Fuel Gas Co. .

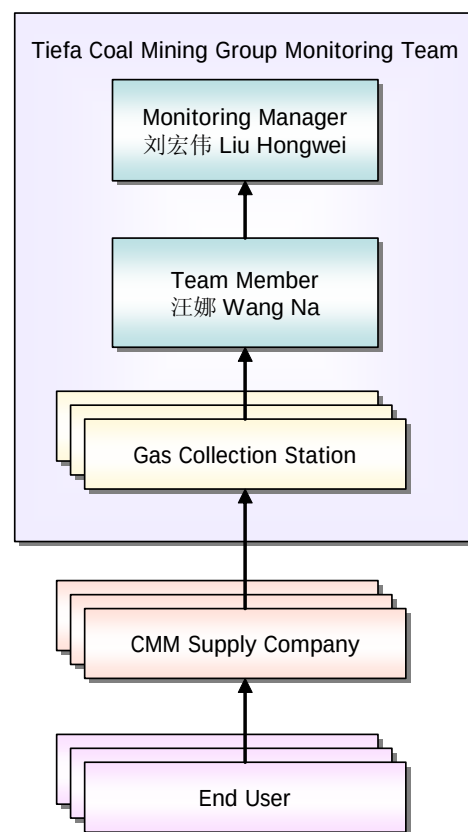
3. DATA COLLECTION / COMPILATION / ASSESSMENT BY TIEFA COAL MINE COMPANY

Tiefa Coal Industry Group collects associated data from the said two gas companies and compiles them onto a spreadsheet for recording. Thenafter it checks whether the data are consistent with their aggregated data for CMM sales to the city gas company. Data are depicted in the graphical chart at each compilation in order to find out irregular events. All data are backed-up each time in a separate data storage system.

4. DATA ADJUSTMENT

If Tiefa Coal Industry Group's monitoring team identifies some inconsistencies or lack of data, the team tries to identify the reasons and adjust the data as appropriate, including methods such as, by comparison

<Monitoring Organization>





with the back up data of the relevant data, provided that such adjustment must be verified at the time of verification. Precise procedures for adjustment and their rationale will be documented for verification.

5. CALCULATION OF EMISSION REDUCTIONS

After resolving all inconsistencies and/or lack of data, Tiefa Coal Industry Group's monitoring team calculates the emission reductions. Monitoring manager is responsible for the result.

6. MAINTENANCE

According to the requirement of monitoring instruments, the instruments will be examined based on a certain interval specified by the manufacturer's instruction.

7. DATA ARCHIVE

The data should be kept in the archives until the end of the crediting period plus 2 years.

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

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The baseline and monitoring study was completed on 13/10/2006

The baseline is determined by:

Name/oriination	Project participant: Yes/No
Dr. Naoki Matsuo and Mr. Kazuo Sasaki Climate Experts Ltd. RATIO 1002, Tukiiji 1-10-11, Chuo-ku, Tokyo 104-0045, JAPAN n_matsuo@climate-experts.info , sasaki@cdm-coordinator.com	No
China Coal Information Institute, 35 Shaoyaoju, Chaoyang District, Beijing 100029, China	No
Mitsui & Co., Ltd. 2-1, 1-Chome, Otemachi, Chiyoda-ku, Tokyo, 100-8631	Yes

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:

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The Project decided to implement this project on 8th October, 2005.

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

>>

20 years:

The operational lifetime of the Project is estimated as 20 years, as is common for equipments utilized in this Project.

**C.2 Choice of the crediting period and related information:****C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

>>

01/09/2008

C.2.1.2. Length of the first crediting period:

>>

7 years

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

n.a.

C.2.2.2. Length:

>>

n.a.

**SECTION D. Environmental impacts**

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

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1. Construction and operation of surface goaf wells**(1) Land Acquisition:**

In order to conduct construction and operation of surface goaf wells, it is necessary to execute land condemnation. Regarding the land which Tiefa already acquired for the Project, Tiefa have already made compensation in accordance with the laws and regulations, a copy of which will be demonstrated to the validator, and regarding the land which Tiefa will further acquire for the Project, Tiefa will make compensation in accordance with such laws and regulations, to the land user and the bureau of State Land and Resources, respectively.

(2) Noise:

Most of the wells are located far from the residential areas, so that noise issues will not occur for most of the wells. Regarding the wells situated near the residential areas, the Environmental Protection Agency will execute a noise test, and, if any, the compensation will be made in accordance with the laws and regulations.

(3) Impact on ground, such as surface recoupment and ground sinkage:

<Designing phase>

Working face excavation of mining is carried out based on a production transferal plan. When the excavation of the working face is complete and the working face is formed, the designing of goaf drilling will be carried out. The design will be on the basis of the geological specification of the working face, and the effective design of drilling depth, the number of wells to be drilled, and the drilling sites will be mainly based on the factors such as the direction of the working face, inclination of the coal seam, depth of burial, and direction of mining, so as to drain out the maximal amount of the coalmine methane with the highest possible concentration. After the initial design, on-the-spot investigation is carried out based on the location of the designed drilling sites. If there are some unfavorable conditions which restrict the production such as high voltage cables, obstacles and residential buildings near the drilling sites, the initial design will be adjusted.

<The installation of well cementation and screen-mesh tubes>

After the secondary drilling, well cementation units will be installed for annular space between the second drilling face and the protective casing so as to prevent leakage. The screen-mesh tubes are mainly installed in the section of its third phase drilling holes, with the exposed portion including the tubes in the coal seams facing the roof of the major mining seams. There is a 10-meter overlapping with the second protective casing so as to prevent the fallout of the screen-mesh tube during the collapse of the goaf. The screen-mesh tubes will be processed into strip-shaped holes by lathe to prevent them from distortion. The space between the screen-mesh tubes is connected by threaded connection, and is dropped off down to the bottom of the third phase drilling hole by using drill rods.

<Ecosystem recovery>

All the facilities and mining articles will be taken away after the preparation phase is complete, thenafter the



ecosystem recovery phase will commence by extracting and transporting all the waste mud and cement to the waste-yard, after which the mud pit will be filled with soil for ploughing to take place the following year.

(4) Leakage of methane from abandoned surface goaf wells:

When the productions from working faces are complete, all of the equipments will be evacuated, thenafter sealed completely, with very little methane left in the drill wells. At this time, the control valve of the drill well of the goaf will be turned off, and the drainage of the methane will be ceased. So, there is no risk of leakage of CMM from the abandoned wells.

1. Constructing two gas holders and the associated facilities of Daxing and Daming

Two gas holders and the associated facilities will be constructed separately in Daxing and Daming. The construction work might cause noise that impacts the environment to some extent. Therefore, Tiefsa Coal Industry Group will take measures, for example, using the facilities with lower noise, and designing the inner wall and platform of the holders under construction sound insulation requirements, resulting to the noise approaching the level as if no construction work had taken place. There are no other environmental impacts except for the noise.

3. CMM Utilization in Tieling and Faku City

The proposed Project includes Tieling subproject and Faku subproject. The Tieling subproject includes two components Tieling city residential gas and Febe plant fuel gas; the Faku subproject includes two components Faku Ceramic City fuel gas and Diaobingshan city residential gas. The “Environmental Assessment Report on Tiefsa Coal Mining Coal Mine Methane Comprehensive Utilization Demonstration Engineering in Tieling, Liaoning Province” of the Tieling subproject and the “Environmental Assessment Report on Shenyang Faku Coal Mine Methane Engineering Construction Project” of the Faku subproject were approved by Liaoning Province Environmental Protection Agency in November, 1998 and in January, 2006 respectively.

The analysis of the environmental impacts of the proposed project is as follows:

1. Tieling subproject

The construction of Tieling subproject may affect environment in the aspects like noise, water, land, etc.

This project may impose effect on Tiefsa Departure Station in terms of noise at boundary, especially during night the effect of the noise at boundary is relatively large. In order to ease its negative influence of noise on surrounding environment, the following measures are to be adopted: 1. Select and apply low-noise typed compressor, dust removals, and boiler fans. 2. Add an extra ring typed resistive muffler at the entrance and exit of Roots blower in the compressor room., do appropriate damping treatment for the room, and design and construct the interior wall and ceiling according to the construction sound insulation requirements. 3. Set up a sound insulation room or sound insulation function in the dust removal system and adopt damping measures. 4. Build a sound insulation room for boiler fans, open an air entrance in the ceiling or in the wall, and install a muffler for use while air enters. In terms of the layout of equipments, fans should be placed near one side of boiler room to ensure that the air entrance is to the windward. This measure can achieve the dual effects of energy saving and noise reducing. The volume of insulated sound can reach over 20 Dbc. Adopting above sound-insulation and noise-reduction measures can effectively control the influence of noise equipment imposed on surrounding environment at the departure and terminal stations.

The discharged waste water by this project mainly includes: the gas-holder condensate water discharged by the departure station and three terminal stations, the water-seal overflow discharged by the terminal stations and the domestic waste water discharged by the departure and terminal stations and so on. In order to reduce its influence on the surrounding environment caused by the discharged water, the following controlling measures should be adopted: 1. only when the domestic waste water is treated through cesspool can it be discharged into general discharge gate. 2. gas-holder condensate water and water-seal overflow have similar property, similar concentration of pollutants, so they can be recycled and used as water-seal refilling liquid after the following treatment (see Figure 10). 3. Strengthen management on the gas-holder oil pump of the departure station to avoid the occurrence of oil leaking accidents and to prevent further pollution of underground water.

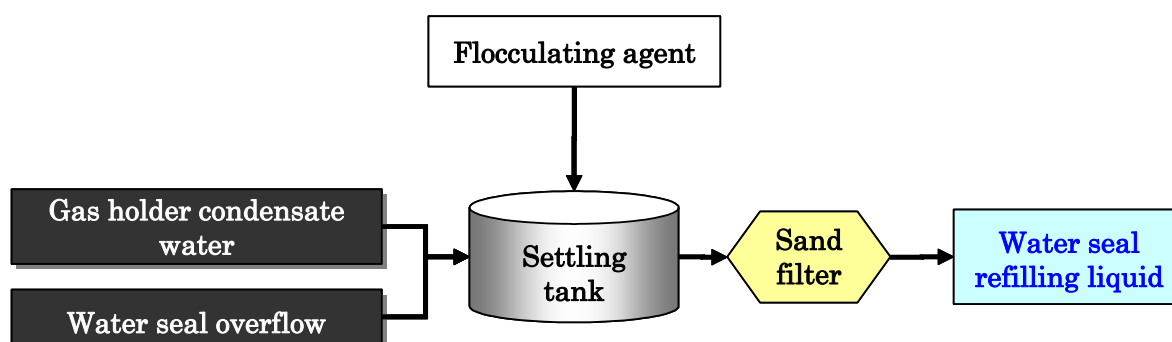


Figure 10 wastewater treatment

The negative effect of this project on eco-environment mainly includes: its influence on peasants and migrating people caused by the altering of land function as well as its effect on food, vegetables and the vegetations on the land. The following measures can be adopted to solve the problem: pay attention to protecting and restoring the vegetation destroyed by construction work. Plant trees, grasses on the digged ground within the year of construction. The construction period should be before spring sowing and after autumn harvest. At the precondition of not affecting the normal running of the pipeline, the land for permanent bury of pipelines should be allowed to grow again and a contract on protecting pipelines and its signs may be signed with peasants who grow crops on the land.

2. Faku subproject

The construction of Faku subproject may cause effect on environment in the aspects like atmosphere, water, noise, earth, etc.

The main air pollution caused by Faku subproject is oil smoke. This project establishes five ovens, with the emission concentration at 2.4 mg/m^3 . After being treated by the oil smoke purifying device which has over 75% purifying efficiency, and being emitted in the gas emission tube which is 1 m higher than surround buildings, the emission concentration will reach the maximum allowed volume of 2.0 mg/m^3 required in GB18483-2001, and it will not impose pollution on surround environment.

The main wastewater caused by this project is domestic wastewater. Its discharge volume is 817.6 t/a (2.2 t/d). After being treated in the oil insulation pool, the catering wastewater will be treated in the cesspool together with domestic wastewater, and then flow into Nansha River through the pipe network of the industrial park, and finally enter the Shangdun Reservoir. Meanwhile, leakage prevention measures should be done for the oil insulation pool and the cesspool. The main solid waste generated by the project is domestic waste. The volume is 23.185 t/a. The domestic waste will be sent to environment protection agencies for innoxious treatment and will not cause large effect on surrounding environment.



The noise effect of the project is mainly caused by the running of gate station compressor, boiler fans, draught fans and firefighting pumps, etc. The following measures may be adopted: place the production equipment like the compressor in a closed workshop, and apply sound elimination and damping measures like adding mufflers, damping pad, etc; reduce the noise at the tuyere by adding pipeline mufflers, reducing wind speed at the tuyere and so on; Through sound insulation by the plant house and the distance damping, the noise at boundary may reach the Type 1 requirement in GB3096-93, and may have relatively little influence on surrounding environment.

Its influence on eco-environment mainly includes the influence on peasants caused by altering of land use function as well as the influence on crop field and vegetations caused by the construction work along the pipeline. In order to restore and reduce damage on the original eco-environment as much as possible, after the completion of the project, the green area should be no less than 35% of the total area, which should be 23345 m². The average depth of the pipeline is 1.8 meter, all the left digging earth should be refilled; during the construction period, there should be no cutting of trees. If there is any tree being affected by construction, it should be transplant and should be assured survival after transplantation (if it cannot be survived after transplantation, another tree should be planted according to the method of growing a new tree if the original transplanted tree is dead), so as to maintain the original eco-system and environment. After the completion of the pipeline, the project land should be recovered to its original status.

After the completion of these two projects, coal mine methane will replace the coke-oven gas and town gas producer gas, which may reduce the emission of SO₂, smoke and dust, in the meantime, reduce the emission of methane, and may benefit the improving of air environment quality of this region.

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:

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This project improves air pollution by switching city gas from town gas and blast furnace gas to CMM.

There is no significant environmental impact caused by this project activity.



**SECTION E. Stakeholders' comments**

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

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In order to invite comments from stakeholders, Tiefa Coal Mining Group held the “CDM Stakeholders Consulting Meeting of CMM” at Hotel Tiefa Coal Mining Group between 9:00–11:00 on April 18, 2006.

1. Notice of the meeting

Holding of the CDM Stockholders Consulting Meeting of CMM was informed through the internal and external website of Tiefa Coal Mining Group and Tiefa Coal Mining Group TV on April 12, 2006. ‘The Notice on CDM Stockholders Consulting Meeting of CMM Project in Tiefa Coal Mining Group’ was also issued on ‘Tieling Daily’ on April 13, 2006. In addition, representatives from the local government, environmental department and groups of enterprises as well as local residents were also invited by phone.

2. Time, venue, participants of the meeting

On April 18, 2006, the CDM Stakeholders Consulting Meeting of CMM in Tiefa Coal Industry Group was held in Tiefa Coal Industry Group Hotel at 9:00am. More than 30 delegates participated in the meeting, including representatives from the governmental departments such as Tieling City, Faku County, Diaobingshan Municipal Construction Committee and Environmental Protection Bureau; representatives from enterprises such as Shenyang Aode Fuel Gas Co., Tieling Panva Gas Co., Ltd, Faku Economic and Technical Development Zone and Ceramics producers in Faku County; representatives from the local residents; and representatives from China Coal Information Institute, Tiefa Coal Industry Group and Mitsui & Co., Ltd..

E.2. Summary of the comments received:

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During the said CDM Stakeholders Consulting Meeting, no negative comments were received on the Project.

Some stakeholders asked following questions for clarification, Q1: Impact on gas supply to the ceramic factory, Q2: social and economic benefits of the Project, Q3: Environmental Impact and Q4: Impact on farmers’ land use. Tiefa Coal Industry (Group) Company seriously replied to the said questions as follows:

- A1: There is no material adverse effect on gas supply. On the other hand, sales revenues of CER will become a part of financial resource to develop and maintain equipments necessary for the supply of gas to the users, including without limitation, ceramic factory. In other words, CDM registration will increase the certainty of the said gas supply.
- A2: Profits of CDM projects are additional revenues for the enterprise. It’s some kind of compensation for the investment on the project an enterprise has made. CDM projects can play the role of increasing investment return of enterprises as well as enhancing confidence of enterprises in making investment. With improved attraction, necessary capital can be raised for projects developed by enterprises through a CDM. Tiefa Coal Industry Group can further improve its exploitation and utilization of CMM with international technologies and capital.

Extraction and utilization of CMM brings a lot of benefits including the assurance of coal mine safety, a solution for a regional environmental issue by decreasing emissions of air polluting substances, and the promotion of local economy, including without limitation, increasing the opportunity of employment. In addition, the use of this unused domestic energy contributes for the sustainable development in China also from the perspective of energy security.



A3: In order to execute this Project, two new gas holders and the associated facilities will be constructed separately in Daxing and Daming. The construction work might cause noise. Therefore, we will take measures, for example, using the facilities with lower noise, and designing the inner wall and platform of our plant under the construction sound insulation requirements, to make the noise incorporated under the previous level. Other than this “noise” aspect, there is no concern of environmental pollution due to this Project.

A4: For the issue of occupying the farmland, we can consider providing economic compensation according to the national policy. The construction period will avert the ploughing season and harvest time, the permanent occupied area are allowed to re-cultivate under the condition of no impact on the safe operation of pipelines.

The questioner and other attendance had no objections.

At the end of the consultation meeting, all of the stakeholders who joined the meeting came to a unanimous agreement to the Project implemented as a CDM project.

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

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There are no material judgmental comments which require the Project to take countermeasure.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Tiefa Coal Industry (Group) Co.,Ltd.
Street/P.O.Box:	People St.Diao Bing Shan City
Building:	
City:	Diao Bing Shan City
State/Region:	Liaoning Province
Postfix/ZIP:	112700
Country:	P.R. China
Telephone:	+86 0410 6835960
FAX:	+86 0410 6835406
E-Mail:	shixuewen88@126.com
URL:	http://www.tfcoal.com/xwz/index.asp
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Shi
Middle Name:	
First Name:	Xuewen
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Mitsui & Co., Ltd.
Street/P.O.Box:	2-1, Ohtemachi 1-chome, Chiyoda-ku
Building:	
City:	Tokyo
State/Region:	
Postfix/ZIP:	100-0004
Country:	Japan
Telephone:	+81-3-3285-2705
FAX:	+81-3-3285-9612
E-Mail:	tknep@dg.mitsui.com
URL:	http://www.mitsui.co.jp/tkabz/english/index.html
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Inamuro
Middle Name:	
First Name:	Masaya
Department:	Emission Reductions Projects Development Department
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public fund is used for this Project activity.

**Annex 3****BASELINE INFORMATION**

Table-1: Additional electricity consumption for capture and use of methane

	2008		2009		2010		2011		
	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	
Tieling Origin Station	4	2,282,354	4	2,430,271	4	2,578,187	4	2,726,104	
Xiaoqing C.S.	2	328,500	2	328,500	2	328,500	2	328,500	
Zhangzhuang C.S.	2	1,458,333	2	1,458,333	2	1,458,333	2	1,458,333	
Xiaoming C.S.	3	703,125	3	585,937	3	585,937	3	585,937	
Daxing C.S.	3	2,655,139	3	2,794,653	3	2,920,566	3	3,060,069	
Faku C.S.	4	8,400,000	4	8,400,000	4	8,400,000	4	8,400,000	
Daming C.S.	2	450,000	2	699,999	2	699,999	2	699,999	
Total	20	16,277,451	20	16,697,693	20	16,971,522	20	17,258,942	

	2012		2013		2014		2015		Total
	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	Nos of Operating Compressor	electricity consumption kWh/y	electricity consumption kWh/y
Tieling Origin Station	4	2,874,021	4	2,874,021	4	2,874,021	4	2,874,021	16,060,792
Xiaoqing C.S.	2	328,500	2	328,500	2	328,500	2	328,500	1,971,000
Zhangzhuang C.S.	2	1,458,333	2	1,458,333	2	1,458,333	2	1,458,333	8,749,998
Xiaoming C.S.	3	585,937	3	585,937	3	585,937	3	585,937	3,632,810
Daxing C.S.	3	3,125,208	3	3,125,208	3	3,125,208	3	3,125,208	17,885,485
Faku C.S.	4	8,400,000	4	8,400,000	4	8,400,000	4	8,400,000	50,400,000
Daming C.S.	2	843,999	2	843,999	2	843,999	2	843,999	4,381,995
Total	20	17,615,998	20	17,615,998	20	17,615,998	20	17,615,998	103,082,080



Table-2 Plan of Methane Recovery and Methane Supplies

Unit : 10^3m^3 (CH₄ 100%)

	Methane Recovery			Methane Supplies					
		underground boreholes	surface goaf wells	Total	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City	coal-mine workers residents
2008 SEP.-DEC.	9,444	6,111	3,333	8,929	1,590	115	5,394	73	1,757
2009	85,000	54,000	31,000	70,996	15,134	1,032	48,304	896	5,630
2010	90,000	60,000	30,000	71,976	15,954	1,032	48,126	1,074	5,790
2011	90,000	59,000	31,000	73,226	16,774	1,032	47,820	1,380	6,220
2012	100,000	70,000	30,000	74,406	17,594	1,032	47,578	1,622	6,580
2013	100,000	70,000	30,000	75,471	18,414	1,032	47,405	1,795	6,825
2014	100,000	70,000	30,000	75,471	18,414	1,032	47,405	1,795	6,825
2015 JAN. - AUG	66,667	46,667	20,000	49,745	12,276	688	31,603	1,197	3,981
Total	474,444	319,111	155,333	375,003	85,460	5,275	244,627	6,840	32,802

Table-3 Methane supplied to and destroyed by each end user in the Project scenario

Unit : 10^3m^3 (CH₄ 100%)

	Tieling City		FeBe Factory		Faku Ceramic City		Diaobingshan City		Total	
	MMGAS	MDGAS	MMGAS	MDGAS	MMGAS	MDGAS	MMGAS	MDGAS	MMGAS	MDGAS
2008 SEP.-DEC.	4,771	4,699	344	337	16,181	15,874	219	216	21,515	21,126
2009	15,134	14,907	1,032	1,012	48,304	47,386	896	882	65,366	64,187
2010	15,954	15,715	1,032	1,012	48,126	47,211	1,074	1,058	66,186	64,996
2011	16,774	16,522	1,032	1,012	47,820	46,911	1,380	1,359	67,006	65,804
2012	17,594	17,330	1,032	1,012	47,578	46,674	1,622	1,598	67,826	66,614
2013	18,414	18,138	1,032	1,012	47,405	46,504	1,795	1,768	68,646	67,422
2014	18,414	18,138	1,032	1,012	47,405	46,504	1,795	1,768	68,646	67,422
2015 JAN. - AUG	12,276	12,092	688	675	31,603	31,003	1,197	1,179	45,764	44,949
Total	119,331	117,541	7,224	7,084	334,422	328,067	9,978	9,828	470,954	462,520



Table-4 Project emissions from CMM destroyed

Unit :tCH₄

	Tieling City		FeBe Factory		Faku Ceramic City		Diaobingshan City		Total	
	MM _{GAS}	MD _{GAS}	MM _{GAS}	MD _{GAS}	MM _{GAS}	MD _{GAS}	MM _{GAS}	MD _{GAS}	MM _{GAS}	MD _{GAS}
2008 AUG.-DEC.	3,197	3,148	230	226	10,841	10,636	147	145	14,415	14,154
2009	10,140	9,988	691	678	32,364	31,749	600	591	43,795	43,005
2010	10,689	10,529	691	678	32,244	31,631	720	709	44,345	43,547
2011	11,239	11,070	691	678	32,039	31,430	925	911	44,894	44,089
2012	11,788	11,611	691	678	31,877	31,272	1,087	1,071	45,443	44,631
2013	12,337	12,152	691	678	31,761	31,158	1,203	1,185	45,993	45,173
2014	12,337	12,152	691	678	31,761	31,158	1,203	1,185	45,993	45,173
2015 JAN. - AUG.	8,225	8,102	461	452	21,174	20,772	802	790	30,662	30,116
Total	79,951	78,752	4,840	4,746	224,063	219,805	6,685	6,585	315,539	309,888

Unit :tCO₂

	PE _{MD}				
	Tieling City	FeBe Factory	Faku Ceramic City	Diaobingshan City	Total
2008 SEP.-DEC.	8,658	621	29,248	398	38,925
2009	27,466	1,865	87,309	1,625	118,265
2010	28,955	1,865	86,986	1,949	119,755
2011	30,442	1,865	86,434	2,504	121,245
2012	31,931	1,865	85,997	2,944	122,737
2013	33,419	1,865	85,684	3,258	124,226
2014	33,419	1,865	85,684	3,258	124,226
2015 JAN. - AUG.	22,280	1,244	57,123	2,172	82,819
Total	216,570	13,055	604,465	18,108	852,198

Table-5 Project emissions from un-combusted methane

	Tieling City		FeBe Factory		Faku Ceramic City		Diaobingshan City		Total	
	MMi x (1-Eff _i)	PE _{UM}	MMi x (1-Eff _i)	PE _{UM}	MMi x (1-Eff _i)	PE _{UM}	MMi x (1-Eff _i)	PE _{UM}	MMi x (1-Eff _i)	PE _{UM}
	tCH ₄	tCO ₂	tCH ₄	tCO ₂	tCH ₄	tCO ₂	tCH ₄	tCO ₂	tCH ₄	tCO ₂
2008 SEP.-DEC.	48	1,008	5	105	206	4,326	2	42	261	5,481
2009	152	3,192	13	273	615	12,915	9	189	790	16,590
2010	160	3,360	13	273	613	12,873	11	231	797	16,737
2011	169	3,549	13	273	609	12,789	14	294	805	16,905
2012	177	3,717	13	273	606	12,726	16	336	812	17,052
2013	185	3,885	13	273	604	12,684	18	378	820	17,220
2014	185	3,885	13	273	604	12,684	18	378	820	17,220
2015 JAN. - AUG.	123	2,583	9	189	402	8,442	12	252	546	11,466
Total	1,199	25,179	92	1,932	4,259	89,439	100	2,100	5,651	118,671



Table-6 Methane emissions released to the atmosphere in the baseline scenarios

Unit : 10³m³ (CH₄ 100%)

	Tieling City		FeBe Factory		Faku Ceramic City		Diaobingshan City		Total		Methane emissions released to the atmosphere in the baseline scenarios	Coal-mine residents Leakage
	Project Scenario	Baseline Scenario	Project Scenario	Baseline Scenario	Project Scenario	Baseline Scenario	Project Scenario	Baseline Scenario	Project Scenario	Baseline Scenario		
	CMMPI,y + PMMPI,y	CMMBL,y + PMMBL,y	CMMPI,y + PMMPI,y	CMMBL,y + PMMBL,y	CMMPI,y + PMMPI,y	CMMBL,y + PMMBL,y	CMMPI,y + PMMPI,y	CMMBL,y + PMMBL,y	CMMPI,y + PMMPI,y	CMMBL,y + PMMBL,y		
2008 SEP.-DEC.	4,771	1,597	344	0	16,181	0	219	0	21,515	1,597	19,918	0
2009	15,134	4,791	1,032	0	48,304	0	896	0	65,366	4,791	60,575	5,630
2010	15,954	4,791	1,032	0	48,126	0	1,074	0	66,186	4,791	61,395	5,790
2011	16,774	4,791	1,032	0	47,820	0	1,380	0	67,006	4,791	62,215	6,220
2012	17,594	4,791	1,032	0	47,578	0	1,622	0	67,826	4,791	63,035	6,580
2013	18,414	4,791	1,032	0	47,405	0	1,795	0	68,646	4,791	63,855	6,825
2014	18,414	4,791	1,032	0	47,405	0	1,795	0	68,646	4,791	63,855	6,825
2015 JAN. - AUG	12,276	3,194	688	0	31,603	0	1,197	0	45,764	3,194	42,570	6,825
Total	111,677	33,537	7,224	0	311,038	0	7,901	0	437,840	33,537	404,303	31,045

Table-7 Omitted

Table 8 Analysis of gas contents

Contents	Unit	Analysis Result
H ₂	mol %	0.00
O ₂	mol %	8.52
N ₂	mol %	43.74
CO	mol %	0.09
CO ₂	mol %	1.28
CH ₄	mol %	46.07
C ₂ H ₄	mol %	0.00
C ₂ H ₆	mol %	0.29
c ₃ H ₈	mol %	0.01
Total	mol %	100.00

Analyzed by Chiba Prefecture Environmental Technology Centre
(Evidence of this analysis will demonstrate to the validator)



Table 9 IRR Calculation Sheet

Project Description		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	29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Meeting Memo of Tiefa Coal Field CMM Utilization as CDM Project

Meeting time : August 12, 2004
Meeting place : Meeting Room at 6 Floor, Tiefa Group
Meeting content : CMM utilization as CDM project in Tiefa Coal Field

Attendee:

Mr. Zhang Yuanming Mr. Zhang Futang Mr. Liu Dongcai Mr. Li Guojun Mr. Wang Hui
Mr. Liu Guofeng Mr. Sun Shaojun Mr. Liu Hongwei

Meeting Memo:

Tiefa Group held a meeting for CMM utilization as CDM project in the 6 floor of Tiefa Group at 08:30 August 12, 2004. The meeting decided “Develop Tieling Gas Supply Project (including Bomaite Ferroalloy) and Fafu Gas Supply Project into CDM project” (CDM Project).

Detail requests were as follows:

1. To contact overseas buyer together with CCII, cooperate with each party friendly and implement mutual discussion result.
2. Overseas buyer's work:
 - 1) To investigate the feasibility of the CDM project;
 - 2) To budgetary estimate project owner's the cost of the CDM project;
 - 3) To estimate CERs market of the CDM project.
 - 4) To calculate revenue of the CDM project, and estimate the cost of CDM equipment investment and construction.
3. Tiefa's work:
 - 1) To provide all the necessary information of coal mine operation and CMM reclaiming.
 - 2) To negotiate with Chinese related governments for the CDM Project.
4. Without CDM revenue, Tiefa can not finance enough money for CMM development project; but Kyoto Protocol brought new meaning to the project, therefore, both parties shall develop this project well in the principal of reciprocal, mutual benefit and honest.

August 12, 2004

Tiefa Coal Industry (Group) Limited Liability Company



Annex 4

MONITORING INFORMATION

The monitoring points are shown in the following charts. For each monitoring items and monitoring management system, please see Section D.

The Figure 11 below depicts the overall picture of the project scheme and specifies associated emission sources to monitor (as CH₄ or CO₂). The Figures 12 and 13 specify the monitoring points in Tieling City/Febe Factory and Faku Ceramic City by using gas manometer/thermometer/concentration meter, flowmeter, and wattmeter.

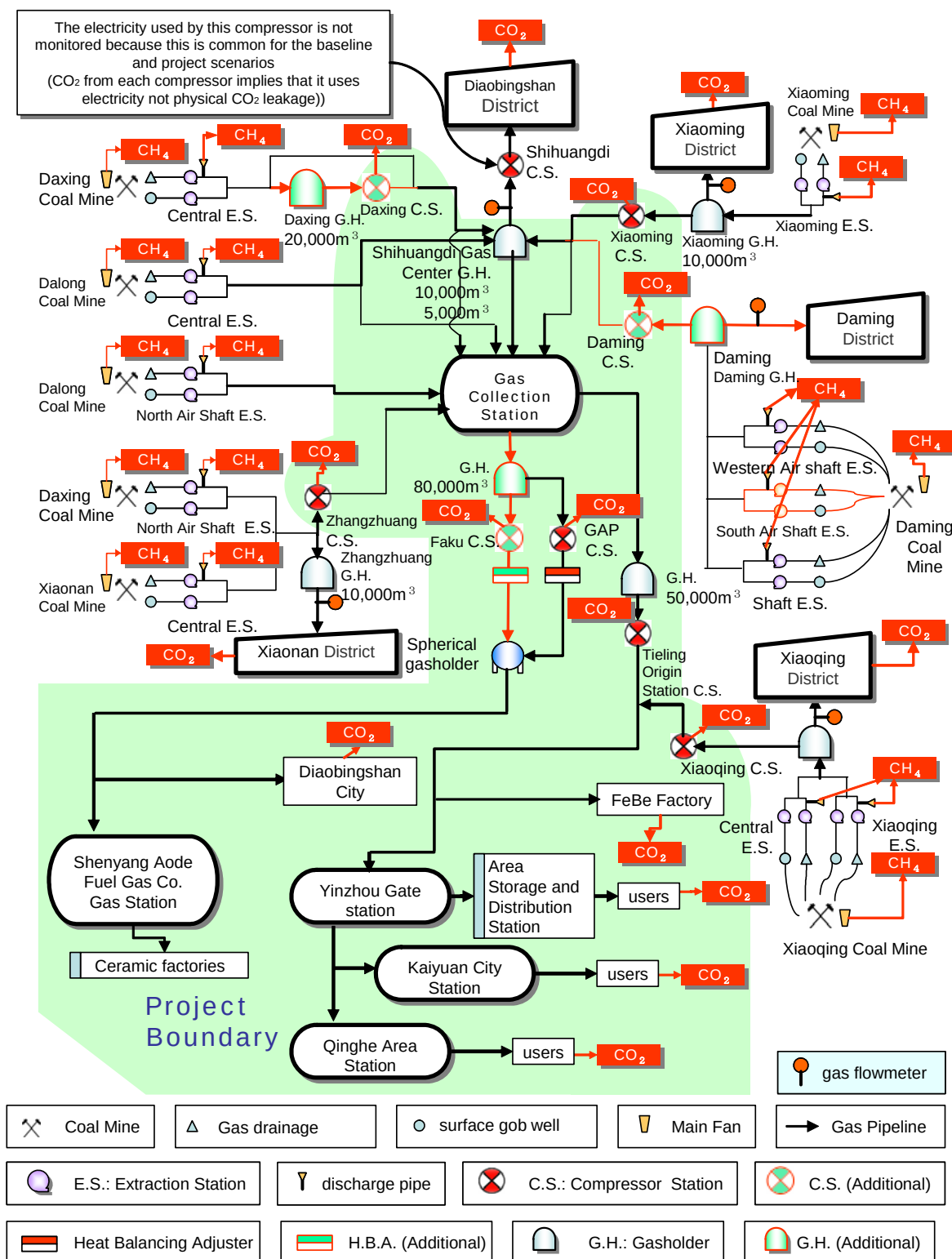


Figure 1: Emission Sources related to the project activity

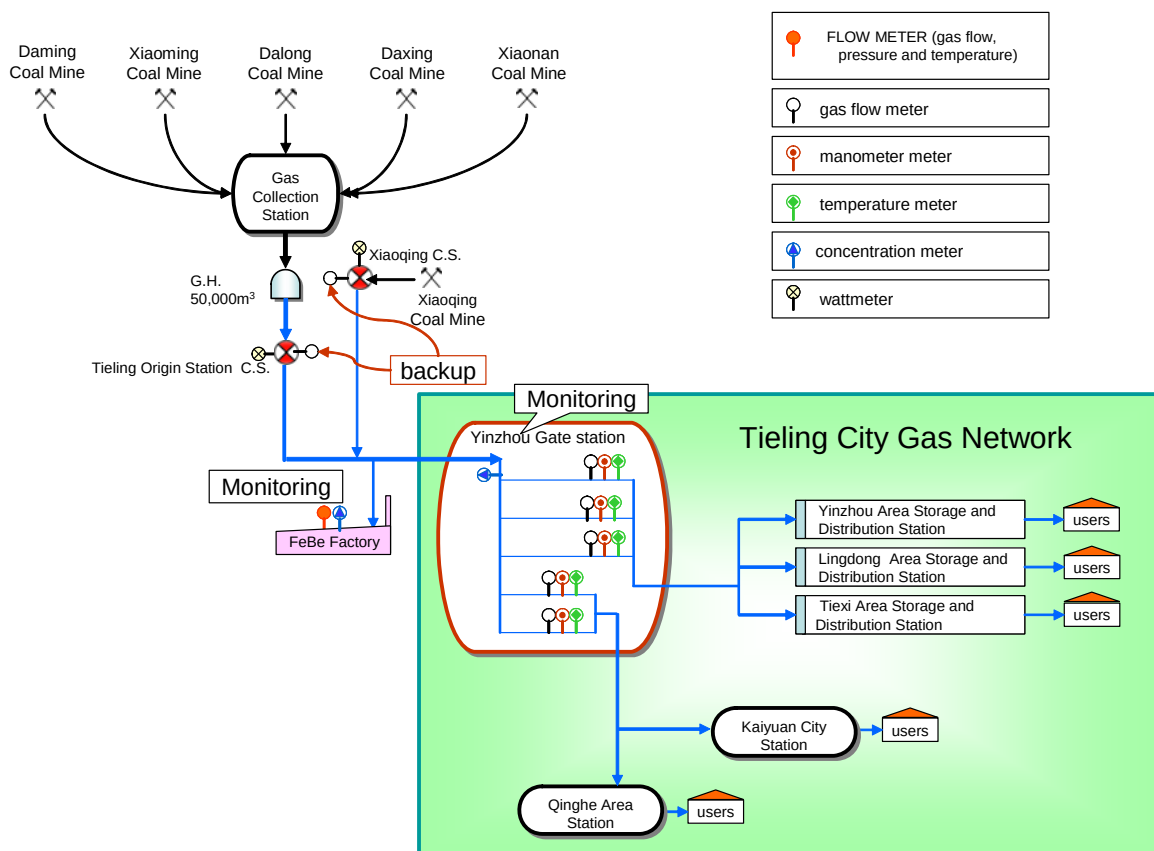


Figure 2: Monitoring points in Tieling City/Febe Factory

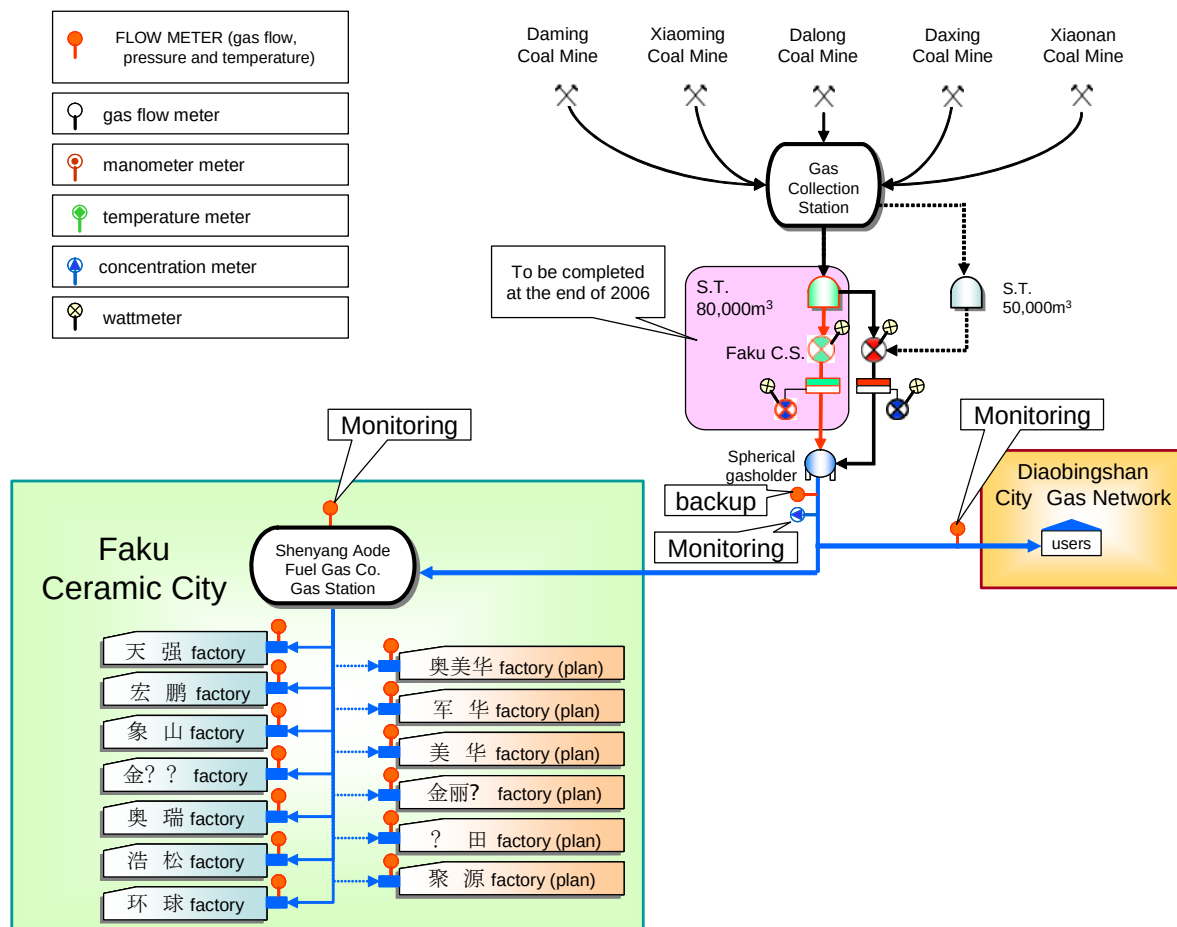


Figure 3: Monitoring points in Faku Ceramic City/Diaobingshan City