

Environmental and Social Management
Plan for Rural “Coal-to-Gas” Program
during the 13th Five-year Plan Period in
Beijing

Beijing Gas Group Co., Ltd

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1 Project Overview

1.1 Company History

Beijing Gas Group Co., Ltd (“BGG”) is one of the oldest gas suppliers in China, dated back to 1958. Over the past 58 years of growth, thanks to the rapid development of China’s natural gas sector and the deepening of natural gas marketization reform, BGG has been growing rapidly and become the largest single urban gas company in China, the first group company ever to be qualified as high-tech enterprise in the industry, enjoying a leadership in China’s natural gas sector. BGG is the first single urban gas company in China to hit the 10 billion mark in terms of purchase and sale of natural gas, as the annual gas consumption in Beijing ranks the two place in the world, only after Moscow.

BGG deals with natural gas business and energy supply and services. In particular, its natural gas business covers upstream unconventional natural gas development, construction and operation of long-distance natural gas transmission pipelines and reservoirs, construction and operation of downstream urban natural gas pipeline networks as well as natural gas user services; its energy supply and services cover LPG, coal-based chemistry, design, engineering, heat supply and gas-related services.

The areas of natural gas application in Beijing mainly involve residence, business, Industry, heating and cooling and power generation. As of 2015, there were 5.89 million resident natural gas users and about 50000 commercial users citywide, with 600 million m² heated using natural gas, accounting for 40.5% of total natural gas consumption. With the four heating and power centers built in place and put into operation in succession, the gas loan on

power plants grows rapidly, accounting for 41% of the total gas consumption. As of the end of 2014, 6595 T/h boilers were gasified and the gas supply during heating season increased by about 400 million m³. According to Beijing 2013-2017 Clean Air Action Plan, by 2017, the total coal consumption will be reduced by 13 million tons from 2012 and kept under 10 million tons. The ratio of high-quality energy consumption will be increased to over 90% and the percentage of coal in the energy mix will be decreased to below 10%, thus further enhancing the supply of such clean energy as power and natural gas and the energy balance.

1.2 Implementation plan in support of rural gasification

The coal reduction and substitution-based clean air action in rural Beijing is an important initiative undertaken by Beijing municipal government in response to the CPC Central Committee and the State Council’s call for air pollution control in the capital city. Over the past two years of implementation, this effort drew much attention of Beijing municipal government as well as such central government departments as National Development and Reform Commission (NDRC) and Ministry of Environmental Protection.

In early 2015, according to the requirement of Beijing Municipal Government for “early arrangement and deployment”, the city’s new socialist countryside office immediately held a working meeting to launch the 2015 coal reduction and substitution-based clean air action citywide, planning for various activities in 2015, which have been carried out successfully thanking to the joint effort of all departments and governments at all levels, power, gas and coal companies in the city.

On January 4, 2016, standing committee member of CPC Central Committee Political Bureau and Vice Premier of the State Council Zhang

Gaoli conducted a field survey in Beijing and held a workshop on air pollution control, where he raised five requirements for air pollution control efforts in Beijing and stressed the need to increase the control over pollution caused by bulk coal and replace bulk coal with gas as well as promote the coal-to-gas, coal-to-electricity and other new energy application efforts.

As of the end of 2015, there were about 1.1 million households using bulk coal for heating in Beijing Municipality. About 164000 households were in downtown area, of which 80000 households were urban residents and 84000 households were scattered throughout 143 villages in rural areas; about 936000 households were in 2892 villages in suburban Beijing, including 546000 households in 1477 villages in plain areas and 390000 households in 1415 villages in mountainous areas. A total of about 3.2 million tons of coal were consumed annually. According to the objective of the plan, by 2020, bulk coal control will be completed for 756000 households in 1972 villages citywide. By the end of 2017, the six downtown districts will become substantially coal free, Tongzhou District by the end of 2018; and all villages in the plain areas will become coal free by the end of 2020.

As the most important gas supplier in Beijing, BGG is duty bound to respond to the governmental call for the clean energy renovation and to carry out the rural clean energy renovation task.

By 2015, BGG’s natural gas transmission and distribution pipelines will exceed 14000 km in length, equipped with 17000 regulator stations (boxes) at all levels. During the 12th five-year plan period, such external gas sourcing projects as Shaanxi-Beijing Line #3, Tangshan LNG and Datang Coal Gasification Project will be built in place in succession, thus forming a long-distance transmission and supply system comprising three gas sources and six channels, with annual total gas supply of 41 billion m³. Six gas gate stations

including Xishatun and Yancun will be built in place, with daily receiving capacity of over 120 million m³, thus forming a urban gas distribution system comprising five rings, five levels and even radiations”. The gas pipeline network extends faster to new towns and rural areas to cover the entire suburban Beijing other than Yanqing County, with a multisource and multidirectional natural gas supply system already in place. The reliable natural gas supply system provides a powerful support for the gasification effort in rural areas. A review of how gas is supplied in outer suburban Beijing, 10 outer suburban districts and counties other than new town accommodate a total of 124 towns, of which 37 are supplied by existing pipelined gas, 7 by existing CNG/LNG, 28 by planned pipelined gas and 52 by planned CNG/LNG.

With such natural gas pipelines as Shaanxi-Beijing Line #4 and Sino-Russian East Line built in place and put into operation, the upstream gas supply to Beijing during the 13th five-year plan period becomes more sufficient and the security of natural gas supply is further enhanced, in addition to a more established multisource and multi-pipe supply structure. In particular, homemade gas resources include Changqing Gas Field, Tarim Gas Field and Datang Coal-turned Natural Gas Project. Imported gas resources include Central Asian natural gas, Tangshan LNG and Sino-Russian Eastern Line Natural Gas. Based on the analysis of available resource, it is predicted that the total gas supply capacity will be $957 \times 10^8 \text{m}^3$ in 2015 and $1304 \times 10^8 \text{m}^3$ in 2020.

1.3 Beijing Gas has implemented the rural gasification program

In 2013, according to the requirements contained in Beijing 2013-2017 Clean Air Action Plan Priorities Breakdown (Jingzhengbanfa (2013)No. 49) for “the outreach of urban pipeline network to rural areas”, a pilot program of

substitution of pipelined natural gas for coal was conducted in Xindian Village of Machikou Town of Changping District and Caituo Village of Yukou Town of Pinggu District, covering nearly 700 households with respect to heating and cooking.

On the basis of the efforts made in 2013, the coal-to-gas pilot program was extended to Maquanying of Chaoyang District, Wailangying Village of Tongzhou District and Caiyu Town of Daxing District where conditions permit for gas pipelining in 2014, covering 2554 households in 7 villages.

In 2015, according to the 2015 Measures for Beijing 2013-2017 Clean Air Action Plan Priorities Breakdown and the Opinion on Refining the Coal-to-Electricity and Coal-to-Gas Policies in Rural Beijing, 1846 rural households in 9 villages were gasified.

In 2016, on the basis of the pilot effort, the rural gasification program speeded up, as a total of 26428 households in 87 villages were gasified.

BGG completed the gasification of 31528 households in 105 villages in 2013-2016, during which BGG accumulated a wealth of practical engineering experience, identified issues and problems encountered in construction process and has established a proven and effective line of communication with low impact on environment and society, thus laying a solid foundation for better completion of rural gasification program in the future.

1.4 Project overview

This project is part of Beijing 2017-2020 Rural “Coal-to-Gas” Program. According to the project implementation plan, BGG will gasify 510 villages in 2017-2020, involving 216751 user households and covering in-village pipelines, mainly including buried pipelines at the exit of regulator boxes, in-village overhead pipelines and inlets as well as gas meter boxes. The main

workload covers about 4490 km of in-village low-pressure pipelines, 14560 aboveground inlets and valve boxes and 216751 gas meter boxes and aboveground incoming integrated gas meter boxes. The total investment proposed for this project is RMB 3318.48 million. Some of the pipelines and facilities outside the village do not fall within the scope of this project, and the total investment is estimated to be 1.8 billion.

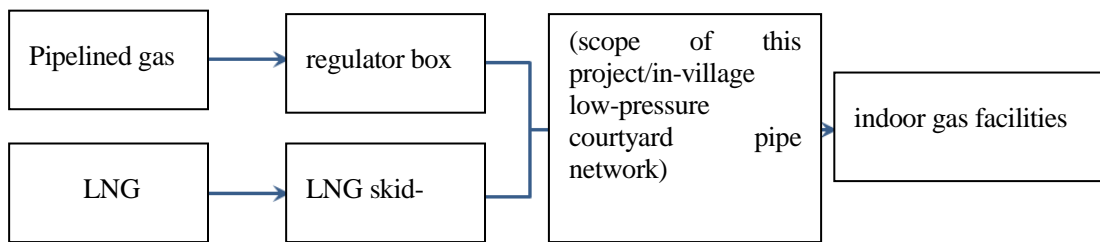


Figure 1. Schematics of scope of implementation of this project

The Project will procure contractors and ask them to implement the Project according to the engineering design and quality standards and requirements. Since civil works will be carried out in 510 villages, contractors may be able to employ local labor to participate in construction activities, according to previous experiences. During construction, the contractor will be responsible for ESMP implementation, including construction organization, site management, personnel training, technical guidance, quality control, and construction safety, etc.

2 . Chinese Laws and Regulations

2.1 Construction Engineering Safety Regulations

According to the Construction Engineering Safety Regulation, the construction contractors shall comply with applicable environmental protection laws and regulations and take measures on construction sites to prevent or minimize the adverse effect of noise, vibration, dust, exhaust gas, effluent, solid waste and construction lighting on people and environment.

2.2 Ambient Air Quality Standard GB3095-2012 Secondary Standard

Table 1. Concentration limits of basic items of ambient air pollutants

No	Pollutant	Average time	Concentration limit		Unit
			Level 1	Level 2	
1	SO ₂	Annual average	20	60	μg/m ³
		24-hour average	50	150	
		1-hour average	150	500	
2	NO ₂	Annual average	40	40	
		24-hour average	80	80	
		1-hour average	200	200	
3	CO	24-hour average	4	4	Mg/m ³
		1-hour average	10	10	
4	O ₃	Daily maximum 8-hour average	100	160	μg/m ³

		1-hour average	160	200	
5	Particle (particle size less than or equal to 10 μ m)	Annual average	40	70	
		24-hour average	50	150	
6	Particle (particle size less than or equal to 2.5 μ m)	Annual average	15	35	
		24-hour average	35	75	

Table 2. Concentration limits of other items of ambient air pollutants

No	Pollutant	Average time	Concentration limit		Unit
			Level 1	Level 2	
1	Total suspended particle (TSP)	Annual average	80	200	μ g/m ³
		24-hour average	120	300	
2	NO _x	Annual average	50	50	
		24-hour average	100	100	
		1-hour average	250	250	
3	Lead (Pb)	Annual average	0.5	0.5	
		Quarterly average	1	1	
4	Benz (a) pyrene	Annual average	0.001	0.001	
		24-hour average	0.0025	0.0025	

2.3 Environmental Quality Standard for Noise GB3096—2008

Determination of rural acoustic environmental function

Generally, rural areas are not zoned in terms of acoustic environmental function, and according to the requirements of environmental management, the department of people’s government at the county level or above in charge of environmental protection may determine the acoustic environmental quality requirements applicable to rural areas according to the following requirements:

a) Rehabilitation facilities in rural areas shall comply with type 0 acoustic environment functional area requirements.

b) Villages shall generally comply with type 1 acoustic environment functional area requirements, while villages where industrial activities are considerable and villages through which traffic arteries pass (i.e., areas other than those where type 4 acoustic environment functional area requirements shall be met) may partially or fully comply with the type 2 acoustic environment functional area requirements.

c) Towns shall comply with type 2 acoustic environment functional area requirements;

d) Industrial and warehousing concentration areas independent of villages and towns shall comply with type 3 acoustic environment functional area requirements;

e) Noise-sensitive buildings located within a certain distance of both sides of the tariff arteries (as determined by reference to GB/T15190 Section 8.3) shall comply with type 4 acoustic environment functional area requirements.

Table 1. Ambient noise limits in dB (A)

Category of acoustic environment functional area	Period	
	Daytime	Nighttime
Type 0	50	40

Type 1		55	45
Type 2		60	50
Type 3		65	55
Type 4	Type 4a	70	55
	Type 4b	70	60

2.4 Ambient Noise Emission Standard for Boundary of Construction Site (GB12523-2011)

Ambient Noise Emission Limit for Boundary of Construction Site, in dB (A)

Daytime	Nighttime
70	55

2.5 Relevant Laws and Regulations on Labor

- (1) Labor law of the People's Republic of China (adopted by the people's congress on July 5, 1994, implemented on 1 January 1995)
- (2) Labor contract law of the People's Republic of China (amended on 29 June 2007)
- (3) A number of provisions of the labor contract system implemented in Beijing (City Hall No. 1 Decree of 1995)
- (4) Industrial injury insurance ordinance (decree no. 375 of the state council of the People's Republic of China on April 27, 2003)

3 Main Environmental and Social Benefits

3.1 Project rationale

(1) Improve the energy performance in rural areas and enhance indoor environment, especially in-door air quality

Currently, the annual total domestic energy consumption in rural China exceeds 300 million tce, of which coal, power and LPG approximate 225 million tce, but the overall utilization efficiency is rather low, as the efficiency of extensively-used coal-fired heating boilers is merely 30%-40%, less than half of that of the large-sized boilers, causing serious pollution and emission problems while creating enormous energy waste. Although consuming a huge amount of energy, thermal environment inside rural buildings is generally poor, most of which fails to meet the thermal comfort requirements.

(2) Improve the atmospheric environment and reduce PM2.5.

At present, small-sized coal-fired stoves in use in rural areas have a PM2.5 emission intensity of up to 3.7g/kg fuel coal, with PM2.5 emission per unit fuel being four to ten times that of the large-sized coal-fired boilers. The total PM2.5 and SO2 emissions from small-sized coal-fired stoves are 6 times and 2.5 times the annual emissions from the former top four coal-fired thermal power plants in Beijing respectively. The PM2.5 mission from combustion of bulk coal in rural Beijing contributes 14.4%-18.5% to the pollutant emissions in Beijing. This project, once completed, will eliminate the use of 650,000 tons coal, accounting for 20% of the total residential coal consumption. Therefore, the completion of this project is very important to improving the clean energy

use in rural areas and the atmospheric environment in Beijing as well as reducing PM2.5 emissions. ¹

(3) Improve the rural environment and increase the level of residents’ health

Natural gas is a high-quality, clean and convenient source of energy and the gasification of rural areas is required to meet the growing needs of high-quality energy supply in the rural areas and improve the health conditions of rural residents.

(4) Improve the form of energy use in rural areas and increase the safety of energy use

Natural gas provides a clean and space-saving way of energy use and is relatively uneasy to concentrate at low levels compared with LPG as the main energy use in rural areas, with a wider explosion limit range than LPG, thus making it safer to use than LPG.

(5) Meet the gas demand in rural areas and increase the reliability in gas supply

The implementation of the rural “coal-to-gas” project needs to be supported from multiple perspectives including gas supply and post-construction operation and calls for improved infrastructure construction, which is important to increasing the overall reliability in gas supply.

3.2 Environmental benefits

According to the baseline survey of energy consumption among rural users at present, the average annual per-household raw coal consumption in rural areas is about 3 tons, or about 650000 tons for 216000 households

¹ Source: Annual Development Research Report on China Building Energy Conservation 2016, Tsinghua University Building Energy Conservation Research Center, China Architecture & Building Press.

involved in this project. According to the coal-to-gas implementation plan for this project, by 2020 when some of residents receive natural gas supply, the existing scattered coal-fired boiler rooms will be replaced, annual gas consumption will approximate 300 million m³ and consumption of 650000 tons coal will be avoided. Based on the natural-gas-fired boiler combustion efficiency, 113000 tons standard coal will be saved compared with coal-fired boilers.

According to Beijing 2013-2017 Clean Air Action Plan, by 2017, the total coal consumption citywide will be reduced by 13 million tons from 2012 and be kept below 10 million tons; the percentage of coal in energy mix will fall below 10% and the share of high-quality energy consumption will increase to more than 90%. By 2017, the annual average PM10 concentration in air citywide will be reduced by over 25% from 2012 and kept at about 60mg/m³.

Estimates suggest that the gasification project to be undertaken in 510 villages in 2017-2020 will provide natural gas supply to a total of 216751 households and about 760000 people, with annual natural gas consumption being about 300 million m³ in 2020. The rural Beijing will have 650000 tons coal replaced by natural gas and reduce pollutant emissions by 599000 tons, of which CO₂ emissions will be reduced by 590000 tons per year, SO₂ emissions reduced by 1487 tons per year, NO_x emissions reduced by 4442 tons per year and fume emissions reduced by 3699 tons per year, making it an important way to drive the energy restructuring, improve air quality and control the pollutant emissions.

Table 3.1. Energy Saving and Emission Reduction 2020

No	Item	Amount of energy saving and emission reduction
1	Coal replaced (10000 tons)	65

2	Coal consumption avoided (10000 tons standard coal)	11.3
3	Fume emissions avoided (ton)	3699
4	SO ₂ emissions avoided (ton)	1487
5	NO _x emissions avoided (ton)	4442
6	CO ₂ emissions voided (10000 tons)	59

3.3 Social benefits

(1) The rural “coal-to-gas” project is an important way to build a new socialist countryside, develop urban-type modern rural areas, drive the town planning and development and contribute to social harmony in rural areas. It helps Beijing gradually break the urban-rural binary structure, effectively guide the healthy development of urbanization and lead to a situation where cities are integrated with rural areas and grow in coordination with rural areas.

(2) The rural “coal-to-gas” project will provide rural users with clean, convenient and safe energy supply, helps narrow the urban-rural gap, increase the standard of living for farmers and increase the health benefits for people.

(3) The implementation of the rural “coal-to-gas” project is an important initiative in response to Beijing’s clean energy renovation plan and an important task undertaken by the government to benefit people.

(4) The implementation of the rural “coal-to-gas” project is an important measure undertaken by gas companies to fulfill their social responsibilities and is important to expanding the market share of gas companies.

(5) the construction activities of the Project also provide local residents possible employment opportunities to increase their income.

4 Environmental and Social Impact

4.1 Environmental Impact Analysis during Construction Period

This project involves laying low-pressure pipelines in villages and may require setup of construction sites including construction camps and material stockpiles. However, this project would not have new construction camps to be set up, as village committees can coordinate to find houses that are available in project villages for contractors, according to the past construction experience and construction organization model.

4.1.1 Impact on atmospheric environment

The ambient air pollutants to be generated from the construction process of the project will mainly comprise fugitive dust resulting during earthwork, onsite stockpiling and backfill, fugitive dust from the site due to foot and vehicular traffic, fugitive dust resulting from spillage from vehicles carrying earth and a slight amount of fume resulting from daily life of construction personnel.

(1) Fugitive dust resulting from excavation and stockpiling

The construction activities involved in this project will be conducted using open-air excavation process, whereby a large amount of backfill earth and a portion of abandoned earth will be piled up on ground, generally for 15-20 days on the construction site, possibly generating fugitive dust at the starting wind speed when dried. This type of fugitive dust is mainly characterized by the vulnerability to the wind speed at the time of operations, as the fugitive dust concentration one meter downwind from the construction site in windy conditions would reach more than $3\text{mg}/\text{m}^3$ and $1.53\text{mg}/\text{m}^3$ at 25 meters

downwind from the construction site, where TSP concentration exceeds the limit within 60 meters of radius, according to comparative surveys.

(2) Fugitive dust from transport vehicles

Related survey findings suggest that the fugitive dust from construction sites results mainly from transport vehicles in operation, accounting for 60% of the total volume of fugitive dust, as well as related to the road surface and driving speed of vehicles. Generally, the dust resulting from natural wind on construction sites and access roads affects a radius of 100 m. The dust volume can be reduced by 70%-80% if the construction site is enclosed or the road over which vehicles run is sprayed with water four or five times per day during the construction period, as a result of which the fugitive dust from construction activities can be effectively controlled and the TSP pollution footprint can be reduced to within 20-50 m radius.

In addition, as the fugitive dust volume on the roads is a function of the disturbance caused by running vehicles to the road surface and the vehicle speed such that the faster the speed the greater disturbance would be to the road surface and the greater the fugitive dust volume would inevitably be, the construction site should be enclosed and the speed limit enforced for vehicles accessing the construction site, partly in order to reduce the fugitive dust volume generated and partly out of the consideration for construction safety.

4.1.2 Impact on aquatic environment

Effluents during construction period mainly come from the domestic sewage generated by construction personnel on the construction site, effluents from pipelining operations and effluents from pipeline commissioning. In particular, the main pollutants contained in construction effluents are inorganic suspended substances (SS) and a very limited amount of oils, and the effluents

discharged will enter the sediment phase rapidly due to gravity and absorption, almost causing no harm to the surface and underground aquatic environments.

4.1.3 Impact on acoustic environment

The noise pollution sources during the construction period mainly comprise the operation of construction machinery and equipment and of transport vehicles. The main construction tools during the construction process comprise excavators, bulldozers and concrete mixers, the noise from which will produce certain impact on the surrounding environment. The construction contractor should employ low-noise construction techniques, make a reasonable construction schedule, avoid nighttime construction activities and employ such noise controls as enclosure when the noise from construction activities exceed the prescribed limit and cannot be avoided.

4.1.4 Impact of solid wastes

The incoming and outgoing vehicles and personnel activities during the conduction period will inevitably produce vehicle exhaust emissions and fugitive dust pollution, while construction debris and domestic garbage will be generated from wielding, earthwork, pipeline corrosion protection and construction personnel’s activities.

As the pipeline corridor is rather flat, the waste slags generated from the site clearing process will mainly comprise a limited amount of waste slags generated from damage to the existing hardened road surface, which can be transported to the centralized treatment site for disposal or disposed of onsite where appropriate through consultation with the local village committee. The abandoned earth generated from the construction process may be used for pavement in barren field surrounding the site or road hardening after completion of the pipelining activities.

Moreover, a limited amount of waste welding rods generated from welding and corrosion protection activities during the pipelining process may be stored in PE barrels at the temporary storage site for centralized treatment, while the correction-proof materials will be dealt with by the licensed hazardous waste treatment center, thus minimizing the environmental impact.

4.1.5 Impact on traffic and road

The pipelines involved in this project will be laid down along the roads in villages, where vehicular traffic is low. The pipelining activities will cause slight impact on local traffic and roads, as the road transport throughout the construction process is rather convenient. This section of pipeline will not require renovation or construction of roads for pipeline inspection. Suitable warnings and other measures should be made in areas where the residents' travel or daily life is adversely affected during the construction period, such as pavement of temporary roads and provision of bridging plates in order to ensure safe and convenient travel of residents.

The impact of the pipelining activities on the traffic will be local and temporary and will be eliminated along with the completion of the construction activities, therefore the social and traffic impact during the construction period is also acceptable.

4.1.6 Impact on ecological environment

The impact of construction activities involved in this project on ecological environment is mainly manifested by the temporary land occupation during the pipelining period. The construction site comprises village-level roads and the ground will be exposed during the excavation process, thus deepening the soil erosion and loss, but as this project involves only temporary occupation of land, the impact of the project on ecological

environment will be slight. The project footprint involves no scenic spots and the construction activities involved in this project will not adversely affect the environmental protection targets of the scenic spots, thus ensuring the minimum impact on the ecological environment.

4.1.7 Soil conservation

The construction process as part the project will involve pipelining activities, therefore a portion of soil loss will occur. The soil loss during the construction process is mainly manifested by the soil disturbance resulting from the pipelining and backfilling processes at the initial stage. The soil loss problem will be addressed mainly by a combination of engineering measures, vegetative measures, temporary measures and managerial measures, which will form a soil and water conservation system at the temporal and spatial levels.

4.1.8 Cultural heritage protection

The construction site of this project involves 510 villages in rural Beijing, where nationally undiscovered cultural relics might exist. If any cultural relics were discovered during the construction process, construction activities need to be stopped and related departments notified immediately, before cooperation is given to the related departments and experts in site survey and cultural relics protection. The construction activities will not be resumed unless the related experts give approval. If the discovered cultural relics are immovable, the construction plan shall be adjusted and a new routing plan selected before resumption of construction activities.

4.1.9 Workers' Safety and protection

Due to the wide spread of the project construction sites in the Municipality, it would be difficult to supervise workers' safety and protection,

although the construction activities are relatively simple and straightforward, mainly for digging trenches, laying pipes, installing gas meters, etc. The contractor shall train the workers prior to the commencement of construction. And during construction, the contractors shall be responsible for the inspection of the workers on a regular basis and timely, in order to find out the problems and strictly comply with the relevant laws and regulations of the Country and Municipality.

4.2 Environmental impact analysis during operation period

4.2.1 Impact of exhaust gas on environment

The exhaust gases generated during the pipeline operation period will mainly come from accidental leakage from pipelines, but the slight pipeline leakage will cause minimal environmental impact as the pipelines will be essentially buried. And the local companies will inspect the pipelines once per day and the patrol inspectors will repair any identified pipeline leakage due to third-party damage within the shortest possible timeframe, thus minimizing the impact of leakage on environment. The secondary standard limits set forth in the Overall Air Pollutant Emission Standard (GB16297-1996) can be met.

4.2.2 Impact of effluents on environment

The main effluents generated during the operation period of this project will comprise domestic sewage, which will be treated by septic tanks according to the requirements of the level 3 standards set forth in Overall Effluent Discharge Standard GB8978-1996 before being transported via sewage trucks to the urban sewage treatment plants, thus ensuring acceptable environmental impact.

4.2.3 Impact of noise on environment

The noise sources during the operation period of this project will mainly comprise noise from servicing equipment and vehicle noise, as detailed in Table 4.1 below.

Table 4.1. Key noise source intensities

Noise source	Noise level dB (A)	Controls	Noise level after control
Equipment area	80 ~ 85	use of low-noise capital equipment, base vibration reduction, vibration reduction and wall soundproofing	55 ~ 60
	80 ~ 85	Use of low-noise capital equipment, soundproofing shelters, base vibration reduction.	55 ~ 60
Vehicle	70 ~ 75	No honking within the factory premises	60 ~ 70

The main noise sources after the commissioning of the project will comprise noise from equipment when the pipelines are inspected and repaired, with a noise level of 80~85 dB (A) , for which the environmental impact assessment requires use of low-noise equipment and base vibration reduction, soundproofing and distance attenuation. The type 2 standard limits set forth in the Ambient Noise Emission Standard for Factory Boundary of Industrial Enterprises (GB12348-2008) will be met.

4.2.4 Impact of solid waste on environment

The solid waste involved in this project mainly comprises domestic garbage generated by employees at a rate of 0.5kg/d/person, which will be classified and stored in garbage cans for timely removal and transport to the garbage transfer station for centralized disposal by the sanitation department.

4.3 Social Impact

The construction activities of this project, including excavation, laying of natural gas distribution pipes, and repair, are mainly along the existing

village roads/foot passes, and will do not involve land acquisition, structure demolition and resident relocation. Therefore, there will not cause any negative social impacts. Instead, the project is very welcomed by the villagers/residents, as the benefits are experienced, such as much higher energy efficiency of natural gas, improvement of out-door and in-door air quality, clean surrounding environment and improvement of living standards, etc. In addition, since most Project construction activities are in the Project villages, local residents are given the opportunity to obtain employment and increase their income.

5 Main Mitigations

The design, construction and operation phases of the project will cause impact on local environment to different degrees but will not produce extensive environmental impact. Moreover, this project mainly involves deployment of low-pressure pipelines and will cause slight and controllable impact on environment. Furthermore, the related contractor has successfully completed gasification of 100 villages in rural areas with a large wealth of borrowable construction experience, organizational form and mitigation measures against environmental impact as well as well-defined responsibilities of related owners and regulators. The specific main mitigations are shown in Table 5.1 below.

Table 5.1. Main mitigations against environmental impact

Phase	Main environmental impacts	Measures	Owner	Regulator	Cost
Design phase	1、 Compliance of pipeline routing and safety selection with the prescribed safety requirements. 2、 Whether to avoid ecological protection areas or not. 3、 Pipe burying and restoration requirements. 4、 Minimize the impact of overhead pipelines on residents' daily life.	1、 Design strictly according to the national, local and corporate standards. 2、 BGG has developed the Rural Pipelined Natural Gas Supply Technical Specifications (QB/3D13-2016) for the rural “coal-to-gas” project.	Rural “coal-to-gas” project team of each design institute	Project owner/ design license issuer	RMB 18.48 million

	5、 Reasonable choice and compliance of pipe selection with safety and environmental requirements.				
Construction phase	<p>1、 Fugitive dust from earthwork and stockpiling.</p> <p>2、 Fugitive dust from transport vehicles;</p> <p>3、 Discharge of domestic sewage and wastewater from pressure testing.</p> <p>4、 Noise sources during construction period mainly comprise operation of construction machinery and of transport vehicles.</p> <p>5、 Construction debris and domestic garbage will be generated from welding, earthwork, pipeline corrosion protection and construction personnel’s activities.</p> <p>6、 The construction site mainly comprises roads at village level, with minimal impact on road traffic.</p> <p>7、 Construction activities shall be conducted strictly according to</p>	<p>1、 1. Prior to commencement of work, the workers should be trained, especially the local hired temporary staff, about environmental impact and mitigation measures, safety protection, labor protection, etc.</p> <p>2、 Avoid excavation or backfilling operations in windy conditions and reduce the open-air storage time of excavated earth. Endeavoring to excavate and backfill as needed is an effective way to inhibit such type of fugitive dust.</p> <p>3、 The dust volume can be reduced by 70%-80% if the construction site is enclosed or the road over which vehicles run is sprayed with water four or five times per day during the construction period, as a result of which the fugitive dust from construction activities can be effectively controlled.</p> <p>4、 The construction site should be enclosed and the speed limit enforced for vehicles accessing the</p>	Contractor/general contractor	Project owner/supervisor/district environmental bureau/work safety bureau and etc.	RMB 142.44 million

	<p>the constructional and design drawings.</p> <p>8、 Possible impact on cultural relics.</p>	<p>construction site, partly in order to reduce the fugitive dust volume generated and partly out of the consideration for construction safety.</p> <p>5、 Building materials such as cement, sand, lime and pipes to be piled up in a centralized manner and suitably protected from rain. The aforesaid building materials which have been spilled during transport process will be immediately cleared to prevent these substances from being running down by rain and polluting nearby water bodies.</p> <p>6、 Minimize excavation during rainy season and minimize the exposure time of bare soil by excavating and transporting earth in time in order to avoid direct runoff from rainfall.</p> <p>7、 The construction contractor shall use advanced low-noise equipment whenever possible and set up barriers around the noisy equipment to reduce the impact of noise on surroundings and residents.</p> <p>8、 The construction contractor employs state of the art construction techniques and makes reasonable choice of construction machinery. Careful arrangements to be made to avoid the duration of</p>			
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		<p>impact of construction noise and prohibit nighttime construction activities. If nighttime construction is required, obtain the construction permit from the competent authorities in time according to applicable Chinese laws and regulations.</p> <p>9、 Improve the maintenance and servicing of construction machinery to avoid increased machinery noise due to poor equipment performance. Place construction machinery away from the sensitive spots during the construction process.</p> <p>10、 Transport vehicles shall avoid sensitive spots during construction process and set up the entry and exit points for transport vehicles on the construction site away from the sensitive spots.</p> <p>11、 Set up temporary storage sites, and store corrosion-proof materials in PE barrels for centralized treatment.</p> <p>12、 Make reasonable construction arrangements, carefully organize the construction management and keep the construction areas strictly within the scope of immediate impact. Minimize the footprint</p>			
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		<p>without interference with construction activities.</p> <p>13、 Implement the “layered excavation principle” in pipelining activities, restore the landform and vegetation after construction to preserve the soil and prevent or minimize soil loss.</p> <p>14、 When laying and welding pipelines, improve the management of open flames and prevent fire due to sparks resulting from construction and welding operations.</p> <p>15、 In case of temporary land occupation in construction process, traffic signs shall be erected to ensure safe vehicular traffic.</p> <p>16、 Construct according to design requirements, conduct airtightness and strength tests according to requirements after construction, as well as appearance and radiographic inspection, among others.</p> <p>17、 Measures in case of discovery of cultural relics: (1) immediately cease the construction activities, (2) protect the scene, (#) key department and experts conduct site survey and take protective</p>			
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		measures, (4) resume construction activities after approval.			
Operation phase	<ol style="list-style-type: none"> 1、 Environmental pollution and safety hazards due to extensive natural gas emission resulting from pipeline leakage due to third-party damage. 2、 Considerable safety hazard exiting in urgent repair process 3、 Users receive gas supply strictly according to safety regulations. 	<ol style="list-style-type: none"> 1、 Local gas companies establish work safety responsibility system, safety rules and regulations and emergency response plan according to local conditions. 2、 The related department sends first responders strictly according to safety responsibility upon occurrence of leakage or other unexpected workplace accidents in order to identify the source of leakage and take suitable emergency measures strictly according to the emergency response plan and safety rules, with a view to minimizing the consequences. 3、 The urgent repair process shall be based on people and conducted according to safety rules to ensure personal safety. 	Local gas company’s related departments	Project owner/regulatory authorities	RMB 12 million

*This table to be included in the bid documents, contracts and related documents.

6 Public consultation and Information Disclosure

6.1 The need for public participation and information disclosure in ESMP

Public consultation and information disclosure is essential to ensuring the fair and obstacle-free information communication and exchange between the general public and the assessed party, and the effective use of public consultation and information disclosure in ESMP can promote the basic public understanding of the project and its implementation and ensure the impact of the project on the environmental interests of the general public will be minimized in the implementation process and promote and support the economic and environmental benefits and coordinated social development.

The degree of public consultation is the basic right of the general public to know the changes to their surroundings and life and to participate in decision making regarding such changes. Public consultation and information disclosure can provide motivation and basis for democracy implemented in ESMP as well as serve as the basic premise for ESMP quality improvement. Moreover, in the current process of project implementation, the project owner plays a leading role and needs to invest heavily in preliminary site survey prior to project kickoff due to lack of detailed local knowledge, while public consultation and information disclosure before, during and after the project implementation can improve the construction contractor’s local knowledge.

6.2 Form of public consultation and information disclosure

From the perspective of information disclosure, public consultation may take the form of hearing, workshop, demonstration meeting, expert panel

meeting and questionnaire-based survey. In such form of participation, the general public can participate in environmental and social impact assessment in the most effective, immediate and convenient manner, transmitting and communicating information with project stakeholders. In addition, the public feedback and complaint process will be communicated to the villagers and feedback and supervision from villagers will be received during the construction period. The environmental and social security measures management plan will be publicized as required after the finalization.

6.3 Beijing gas rural “coal to gas” public consultation in the implementation of measures

In response to the “energy saving and emission reduction and the rural coal to gas project”, as of 2016, Beijing gas completed a total of 105 rural areas, 31528 rural "coal to gas" work. According to the implementation of the project has the work experience, Beijing gas to carry out various forms of public consultation and information disclosure measures, including a work meeting of the villagers before "coal to gas" started, to carry out gas safety publicity and consultation activities, as well as the gas safety auditorium and other activities.

6.3.1 Held "coal to gas" work villagers' meeting

As the project will be implemented in rural areas, the most effective form of public consultation would be villagers’ meeting held by village committees. Prior to implementation, this project will enable public consultation in the form of villagers’ meeting, where the project details,

construction site, construction contractor, construction schedule and possible social and environmental impact will be disclosed to participating villagers and input solicited from villagers for correction to be made before construction activities.



Fig. 6.1 scene of villagers' meeting

Figure 6.1 is the Ai Guan Ying which belong to Yanqing register one's attendance at the villagers' meeting

6.3.2 Conduct gas safety publicity and consultation activities

Winter is the high incidence of gas accidents, even during the winter for security, in order to promote the residents of gas safety knowledge, enhance safety awareness, reduce gas safety accidents caused by mis-operation, establish the safety awareness in the masses. At the same time, to improve the residents' living health and safety level, Beijing gas will organize regular activities of the village and community gas safety publicity service week.

The event of the gas safety hanging banners, posters, propaganda personnel to provide users of natural gas safety manual, gas safety knowledge, gas using basic knowledge and other promotional materials, and provide on-site consulting services to answer. During the activity, the villagers participated actively. Publicity personnel actively answer questions raised by residents, and guide residents to use natural gas methods and steps, and focuses on gas appliance structure, scrap years, the use of attention items.



Figure 6.4 Beijing gas in rural areas "coal to gas" gas user safety and publicity manual



Figure 6.5 Beijing gas rural "coal to gas" gas safety publicity scene

Figure 6.5 is the Yanqing District villagers read the rural "coal to gas", gas safety brochures and on-site panels.



Figure 6.6 Beijing gas rural "coal to gas" gas safety publicity scene

Figure 6.6 is Yanqing District, Gas Co professionals to the villagers to seriously explain the rural "coal to gas" gas safety brochure.



Figure 6.7 Beijing gas rural "coal to gas" gas safety publicity scene

Figure 6.7 is Yanqing District issued to the villagers "coal to gas", gas safety brochures and other related items.

6.3.3 Carry out gas safety community auditorium activities

Beijing gas will rural coal gas gas safety work regularly carry out village community forum activities, centralized and unified training of villagers, will be based on knowledge of natural gas and use to explain the villagers trust degree of natural gas, and to solve the general problem of daily life the. In addition, the related work of Beijing gas supervision, feedback and complaint mechanism for information disclosure, to protect the user in the gas found in the course of any problems can be timely feedback to the Beijing gas, at the same time to supervise real-time operation of enterprises.



Figure 6.8 Beijing gas rural "coal to gas" gas safety auditorium activities site

Figure 6.8 is the Changping Dongxili Zhuang gas safety auditorium before the event began, the territory of the Gas Co to send training materials to the villagers.



Figure 6.9 Beijing gas rural "coal to gas" gas safety auditorium activities site



Figure 6.10 Beijing gas rural "coal to gas" gas safety auditorium activities site

6.3.4 Beijing gas rural "coal to gas" Information Disclosure Measures

In addition, BGG will enable information disclosure through its official website and the gas user safety manual. The gas user safety manual covers company profile, basic knowledge about natural gas, common sense about safe use of gas, daily gas facility protection and emergency response, service commitments and natural gas customer service guide. The user complaint process will be described therein, and the code of conduct, standard operating procedure and gas tariff will be published at the points of service for public supervision. Furthermore, related information disclosure documents in the project implementation process will be published via www.bjgas.com.



Figure 6.1 1 Beijing gas website information public column

7 Organizational Setup and Respective Duties

7.1 Organization

7.1.1 Formation of a leadership team at the corporate level

Team leader: senior executives of BGG

Members : Planning and Development Dept., Engineering Dept., Production and Operations Dept., After-sales Service Dept., Technical Information Dept., Legal and Audit Dept., Corporate Culture Dept., Corporate Safety Dept., Finance Dept., No 2 Subsidiary, No 3 Subsidiary, No 4 Subsidiary, No 5 Subsidiary, High-pressure Subsidiary, Construction Management Subsidiary, Huairou Branch, Miyun Branch, Pinggu Branch, Yanqing Branch, Changping Branch, Lvyuanda Co., Ltd, User Service Company, Beijing Gas and Heating Engineering Design Institute, Design Supervision Company and Beijing UGET Co., Ltd.

7.1.2 Leadership team office

Director: Chen Jun, Zeng Lijun

The office will be located at the planning and development department and engineering department of BGG.

7.1.3 Formation of specialized working groups

(1) Design team: a design working group will be formed out of the design supervision company and Beijing UGET Co., Ltd under the auspices of Beijing Gas and Heating Engineering Design Institute.

(2) Implementation team: an implementation team will be formed by leveraging the responsibilities of the local company and the specialized

strength of the construction management subsidiary. The suburban subsidiaries will establish implementation teams as instructed by BGG.

(3) Publicity team: a publicity team will be formed out of the planning and development department, corporate division department, after-sales service department, production and operations department, corporate safety department and local companies and suburban subsidiaries.

(4) Environmental and social management plan (ESMP) execution team: comprising members from the engineering department, production and operations department and their counterparts of local companies and suburban subsidiaries.

7.2 Job responsibilities and division of work

(1) Duties of the leadership team

1. Leadership and coordination of overall activities, overall planning for the rural coal-to-gas project implementation activities.

2. Coordination with the municipal government, municipal development and reform commission, municipal commission of planning and land, municipal commission of urban administration, municipal commission of construction, municipal commission of agriculture, municipal bureau of environmental protection, municipal work safety administration, municipal fire department and municipal bureau of quality and technical supervision.

(2) Duties of the leadership team office

1. Develop the overall implementation plan, work plan and work objectives of the project, assign and coordinate the related activities at each phase of the project and ensure the end-to-end process control.

2. Organize the interfacing with district governments and related administrations, define the household eligibility criteria and fiscal subsidy

criteria as well as preferential policies, determine the code of conduct and establish the coordination mechanism.

(3) Duties of working groups:

1. Design team: unify the design criteria, coordinate design resources and produce the bidding drawings and constructional drawings to the qualitative, quantitative and timing requirements and assist with household identification and onsite implementation.

2. Implementation team: assist with the project implementation in terms of project initiation, bidding, construction organization, commissioning and final acceptance and application for subsidy by leveraging the strengths of the local subsidiaries and the construction management branch.

Suburban subsidiaries will be responsible for implementing the project and applying for subsidy as well as interacting with BGG and each district’s agricultural commission as required by BGG.

4、 Publicity team: the publicity criteria will be unified under the leadership of the planning and development department and the corporate culture department. Each subsidiary and branch will conduct village-level publicity activities.

5、 ESMP execution team: responsible for implementation of ESMP in the construction and operation processes and supervising the construction team (contractor) to take suitable mitigation measures to ensure workplace safety and civilized construction practices.

(4) Duties of related entities:

1. Duties of technical information department

(1) Determine the related technical standards for the rural coal-to-gas program;

(2) Make arrangements for application of new technologies and materials in rural areas.

2. Duties of production and operations department

(1) Cause to be established the rural operation standards.

(2) Cause to be optimized and refined the rural operation model.

(3) Plan for and organize the final acceptance and other activities

(4) Coordinate the material supply;

(5) Cause to be prepared the publicity materials for the rural coal-to-gas program in light of its duties and assist in formulation of the unified publicity criteria of BGG for the rural coal-to-gas program.

3. Duties of after-sales service department:

(1) Determine the metering plan and meter selection;

(2) Cause to be established the patrol inspection and after-sales service criteria in rural areas.

(3) Organize the village-level publicity activities.

4. Duties of legal and audit department

(1) Responsible for bidding and contract audit and assisting with investment control activities;

(2) Deal with legal risks.

5. Duties of corporate culture department

(1) Assist in formulation of the unified publicity criteria of BGG for the rural coal-to-gas program.

(2) Cause to be formulated annual publicity plan.

(3) Conduct publicity activities.

6. Duties of corporate safety department

Cause to be prepared the publicity materials for the rural coal-to-gas program in light of its duties and assist in formulation of the unified publicity criteria of BGG for the rural coal-to-gas program.

7. Duties of the finance department

Interface with the municipal fiscal department and complete the application for and receipt of subsidies in time.

8. Duties of the construction management branch

(1) Procure and supply equipment and materials for capital works of the branch and subsidiaries involving sub-high pressure A and above.

(2) Organize and implement activities within the area of its responsibility and provide operational guidance to the local branches regarding the rural coal-to-gas program.

(3) Apply for fiscal subsidy for the project activities undertaken by it.

9. Duties of the local branches

(1) Interface with the local district governments and implement the “Tongzhou Model”;

(2) Overall coordination of the end-to-end process of the rural coal-to-gas program in respective area of responsibility;

(3) Organize and implement project activities within the area of its responsibility;

(4) Apply for fiscal subsidy for the project activities undertaken by it; confirm the number of households for CNG/LNG access with the local competent authorities and assist the finance department to complete the subsidization process.

(5) Assist the government identifying the participating villages and households and ensure technical disclosure and final acceptance to households signing up for the program.

(6) Make arrangements for final acceptance and commissioning of the project deliverables within the area of respective responsibility

(7) Conduct village-level publicity activities within the area of respective responsibility.

10. Duties of suburban subsidiaries

(1) Interface with the local district governments and implement the “Tongzhou Model”;

(2) Procure materials for respective part of the project activities and make arrangements for implementation, final acceptance and commissioning activities.

(3) Apply for fiscal subsidy for the project activities undertaken by it; confirm the number of households for CNG/LNG access with the local competent authorities and assist the finance department to complete the subsidization process.

(4) Assist the government identifying the participating villages and households and ensure technical disclosure and final acceptance to households signing up for the program.

(5) Make arrangements for village-level publicity activities according to BGG’s corporate criteria.

11. Duties of the user service company.

(1) Supply engineering materials and equipment at the household level.

(2) Assist with village-level publicity activities.

12. Duties of Lvyuanda Co., Ltd

(1) Assist with CNG and LNG planning, design and construction activities.

(2) Ensuring the reliable supply of LNG and CNG and assist in ensuring reliable supply of emergency gas sources.

13. Contractor:

(1) Responsible for the implementation of mitigation measures in ESMP.

(2) Responsible for the workers’ training, especially from local hired temporary staff, including environmental impact and mitigation measures, safety and labor protection in construction activities.

8 Implementation Arrangements

8.1 Project organization and implementation

8.1.1 Formation of the rural coal-to-gas project team

- (1) A work team will be formed out of the competent authorities, BGG offices and divisions, local branches, project owner, construction contractor, designer, supervisor and the village committee representatives.
- (2) Definition of duties (suggested as follows)

The government is advised to provide overall planning and coordination as well as a list of participating households (setting forth the number of participating households and their locations).

To accelerate the project progress, it is suggested that the government coordinate related agencies to provide the topographic maps; BGG’s related departments will interact with the government to determine the criteria for gas supply.

The local branches will organized related personnel to jointly confirm the gas supply plan before and after metering;

The designer will develop basic drawings and assist resolving technical problems onsite.

The project owner will involve the construction contractor in actively resolving onsite problems, driving the construction progress and implementing the ESMP plan.

The production and operations unit will make arrangements for the ESMP plan during the operation period;

The construction contractor will ensure the construction quality and progress and complete the collection and collation of as-built data; the

construction supervisor will supervise the construction quality and assist resolving problems onsite.

8.1.2 Initial activities

- (1) First-time household identification: prepare a uniform data collection sheet for household identification purposes, which will be collected, tabulated and delivered by the district agricultural commission to the municipal commission of agriculture for further delivery to BGG’s planning department, which will distribute the completed data collection sheet to the designer.
- (2) Sign-up: the government will provide the list of participating households and village-level contact persons to the local branches to complete the sign-up process.
- (3) Site survey: the members of the working team will jointly identify the locations of regulator boxes and the design personnel understand the architectural form and road conditions within villages in order to determine the subsequent design proposal.
- (4) Planning: estimate the gas consumption based on the overall heating area provided in the household identification data before the local branches prepare the plan based on the available gas source.
- (5) Design preparation: gas pipelines planned to be laid on the municipal roads need to be coordinated with the government’s planning department to complete the permitting process for the planned gas pipeline.
- (6) Wall-mounted boiler vendor bidding: it is suggested that the agricultural commission invite the wall-mounted boiler vendors to a public bidding as early as possible in order to confirm the mounting positions of wall-mounted boilers with the designer.

8.1.3 Design

- (1) Design bidding drawings for capital works: the designer will develop design bidding drawings based on the initial baseline survey findings, including the routing positions of the gas pipelines and basic workload, without the need to develop longitudinal section drawings.
- (2) Scheme confirmation: based on the design bidding drawings, the local branches will involve designer, construction contractors, village committee representatives and acceptance management department as well as wall-mounted boiler vendors in a field survey to jointly determine the routing of outer gas pipelines, locations of gas meters and post-meter pipeline direction and clearly leave traces for easy guidance on subsequent construction.
- (3) Design and constructional drawings for capital works: develop the constructional drawings based on the confirmed household-specific plan, indicating the routing positions of gas pipelines, entry points and workload.
- (4) Design and constructional drawings for user part: the designer will develop the post-meter constructional drawings based on the household-specific plan. The wall-mounted boiler vendors need to install wall-mounted boilers in the confirmed positions.

8.1.4 Construction

- (1) Construction disclosures: The local branches will involve designer, construction contractors, village committee representatives and acceptance management department as well as wall-mounted boiler vendors in design disclosure, where the design personnel will introduce the design rationale and approach and call attention to the implementation challenges and essential points. If necessary, BGG may train the construction contractor before the disclosure, detailing the implementation plan for the rural coal-to-gas project, construction rationale and organizational form.
- (2) Construction organization: The construction supervisor, as the project owner’s representative, will manage the construction quality onsite. The village committee representative will coordinate the relationship within respective villages to ensure normal construction activities of the construction contractor. The designer will work with the construction contractor to address emerging technical issues and problems, but the household-specific plan confirmed by the local branches, construction contractor, village committee representatives and acceptance management department as well as wall-mounted boiler vendors before production of the drawings may not be modified in principle. The construction contractor will act strictly according to the ESMP plan in the construction process, while the construction supervisor will supervise the mitigation measures and implementation effectiveness.

8.1.5 Acceptance

- (1) As-built data: The pre-meter gas pipelines will use the survey data provided by Dingxin Co., Ltd as the as-built drawings, while it is suggested that all parties sign the final acceptance form for the post-meter gas pipelines, accompanied by photos to be archived as as-built data, provided that the angle of photo taking and number of photos shall be specified. The as-built data shall also include the acceptance documents for environmental and social management, including the status of environmental mitigation measures, the environmental impact after project implementation and its rehabilitation as well as the resident feedback on the construction process.
- (2) For accepted pipelines, gas may not be supplied before the acceptance formalities are completed.

Environmental and Social Management Plan for Rural “Coal-to-Gas” Program during the 13th Five-year Plan Period in Beijing 2017/08

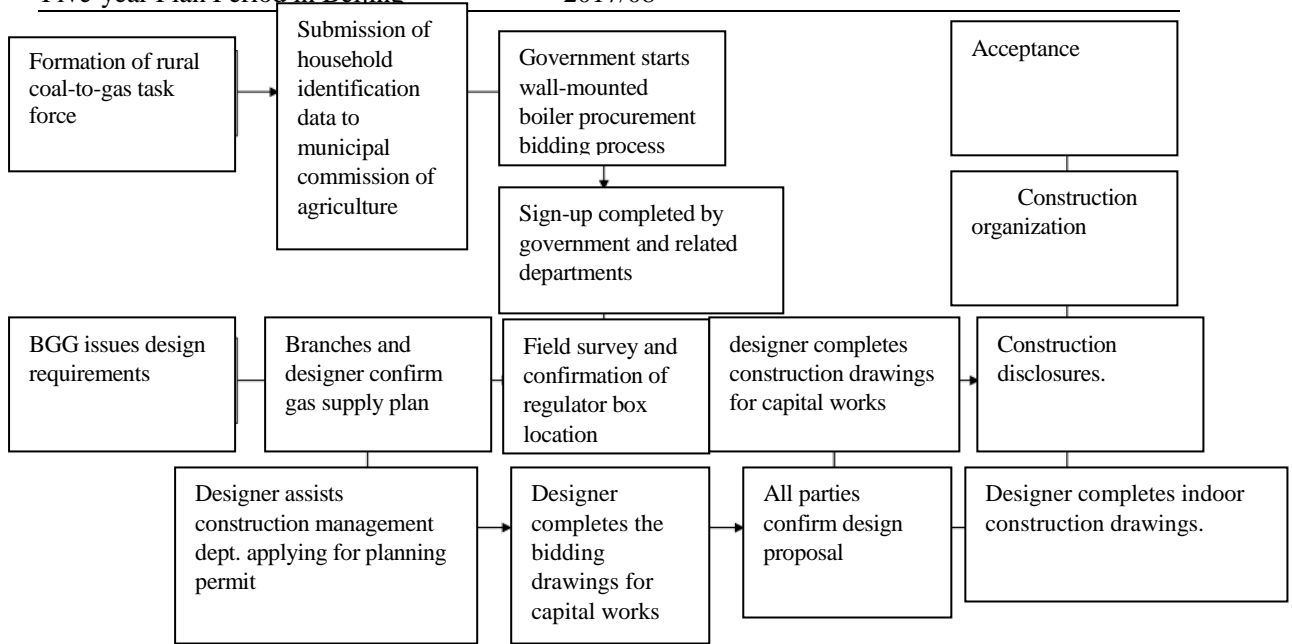


Figure 8.1. Project Organization and Implementation Flowchart

8.2 Operation mechanism for gas supply management

8.2.1 Pipelined gas supply operation model

For different geographic areas in which actors operate, two models based on user group and village size will be employed:

- (1) Integrated gas service center established for services inside and outside households

Applicable condition 1: remote location and concentration of several villages

Applicable condition 2: Over 1000 households within a 10-km radius.

Applicable condition 3: Long distance to the existing stations of each entity.

The organizational structure is as follows:

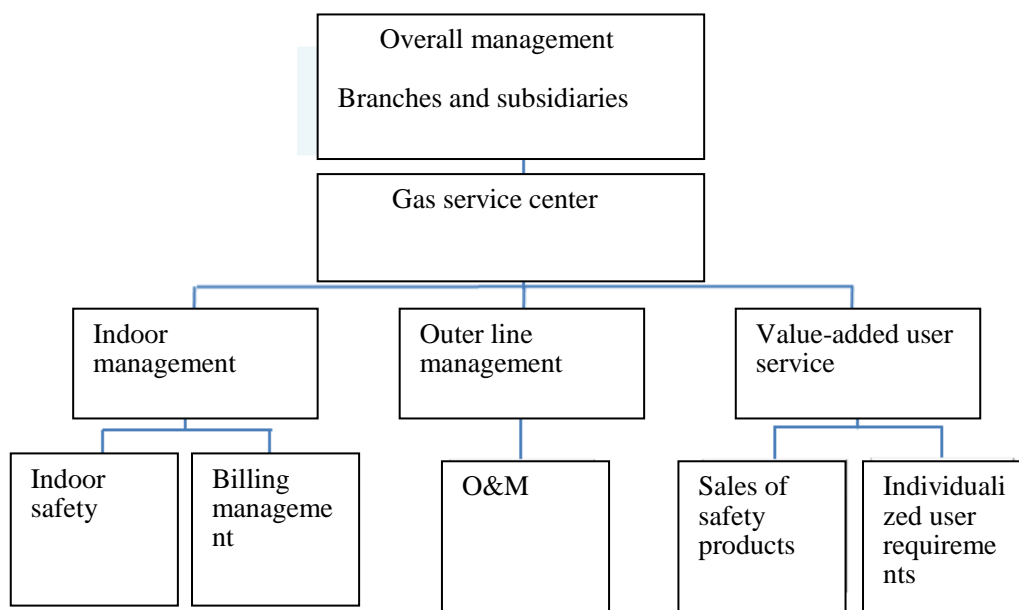


Figure 8.2. Organizational structure of gas service center management model

(2) Client management process

Eligibility criteria 1: remote and scattered geographic locations

Eligibility criteria 2: a village having less than 300 households.

Eligibility criteria 3: First responders shall be able to arrive within 60 minutes.

The organizational structure is as follows:

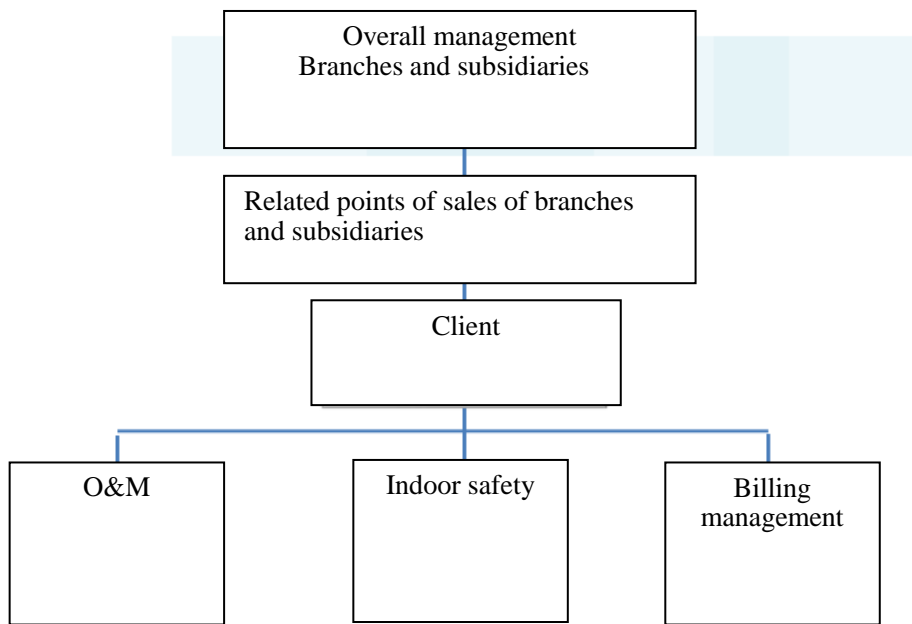


Figure 8.3. Organizational structure of the client management process

Each actor shall prepare the client’s terms of reference (interim) and training plan, take responsibility for operation of inner and outer lines in fixed areas, safety patrol inspection and metering and billing services on the multitasking basis, capable to initially resolve problems and establish a liaison mechanism. The branches and subsidiaries’ emergency response support shall be available within 60 minutes, supported by periodical ad-hock safety inspections. The operating costs shall be optimized while ensuring the overall operation of new socialist countryside.

8.2.2 LNG(CNG) gas supply operation model

When LNG (CNG) is a new gas source in rural areas, the local managerial duties of branches and subsidiaries need to be identified and performed in the first place. Lvyuanda Co., Ltd will sign the gas supply contract with the branches and subsidiaries of BGG at the level of gas station. Meanwhile, BGG branches will elect to sign the outsourced management

contract with Lvyuanda Co., Ltd at the level of gas station where appropriate in order to reduce their operating costs.

Based on whether the branches have the capability to operate LNG(CNG) gas stations, the new rural gas supply operation model using LNG (CNG) as gas source is divided into the following types:

(1) Integrated operation of gas station and backend

Eligibility criteria: has the capability to operate LNG(CNG) gas stations.

The organizational structure is as follows:

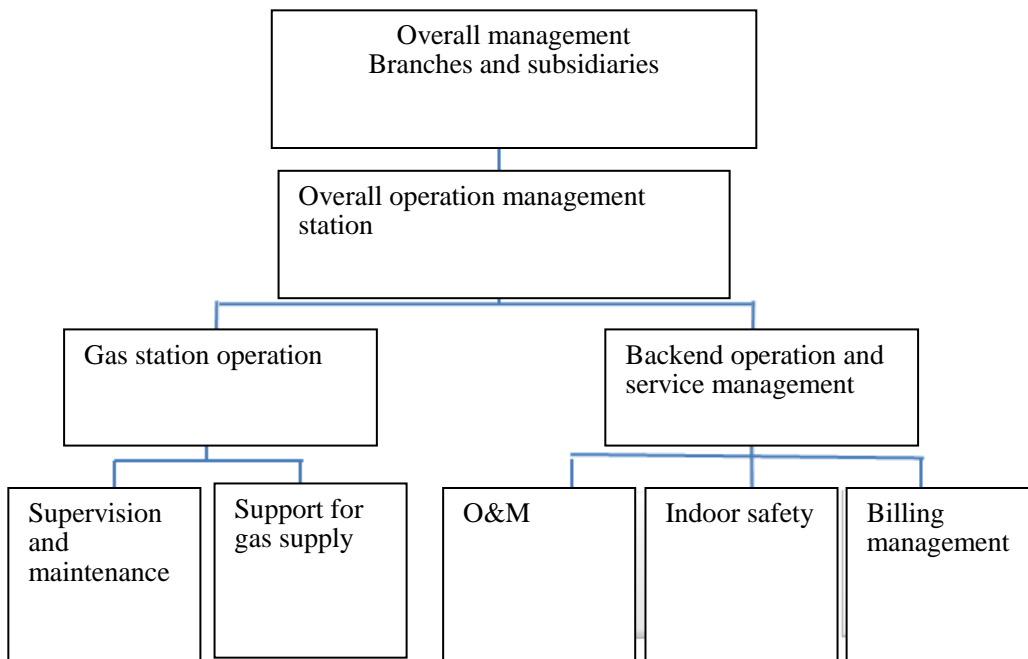


Figure 8.4. Organizational structure of integrated operation of gas stations and backend.

To reduce the operating costs, the branches and subsidiaries or gas suppliers may pursue integrated operation. The gas stations may be outsourced to branches and subsidiaries for operational purposes, while the user end may

also be outsourced to the gas suppliers for operation. The purpose is to integrate the resources and business using the gas stations.

- (2) Independent management of gas stations and backend management under the pipelined gas supply operation model

Provided that the frontend gas supply part is the responsibility of the gas supplier, the backend management model will be the same as the two models of pipelined gas supply, i.e.:

- ① Integrated gas service center to be formed for services inside and outside households.
- ② Client management process to be adopted for each village.

8.2.3 Overall work requirements

For patrol inspection of new rural users, the after-sales service department has developed the New Rural User Patrol Inspection Policy in light of the characteristics of new rural users and environment in order to ensure efficient patrol inspection in new rural areas. For operation of outer lines, user meter reading and other activities will be conducted according to the currently applicable operational policy.

Each actor shall estimate the personal workload on an individual basis based on the number of users and specific operations in order to quantify the workload completed and motivate employees to increase overall work efficiency on an equal pay for equal work basis.

Each actor shall sign the gas supply contract household by household and ensure effective interfacing and liaison process for newly acquired users in new rural areas. Branches and subsidiaries of BGG will conduct targeted safety education activities prior to gas supply to ensure safe use of gas by new rural users.

9 Monitoring Arrangements

9.1 Air pollution monitoring

The air pollution control on construction site focuses on fugitive dust pollution control. The Green Building Guidelines promulgated by the Ministry of Construction in April 2007 provide that:

(1) Earth, garbage, equipment and building materials shall be transported without damaging or staining the offsite roads. Vehicles transporting materials prone to spillage, escape or leakage shall be made airtight to ensure the vehicles are clean.

(2) At the earthwork phase, spraying and covering and other measures shall be taken to ensure the visually measured fugitive dust height within the work area is no more than 1.5 meter and no fugitive dust will be disseminated outside the site.

(3) Piled materials prone to generation of fugitive dust shall be covered and the powdery materials stored in sealed places. Materials and building debris likely to cause fugitive dust within site shall be equipped with dust suppression measures when being handled, such as covering and water spraying.

(4) The non-operating areas of the construction site shall meet the requirements of absence of visible fugitive dust by taking such measures as clearing of accumulated dust, water spraying and setup of barriers.

(5) The difference between the monthly average concentration of total suspended particle (TSP) measured at the barrier height on the perimeter of the boundary and the urban background value shall be no more than 0.08 mg/m^3 .

This project involves no remarkable air pollutant emissions, although some fugitive dust will be produced in the earthwork and transport process, which can be kept within the prescribed limits using managerial measures without producing any gases affecting the suspended particles and PM10 in the air. Therefore, there is no need to measure such suspended particles in air such as PM10.

9.2 Ambient noise pollution monitoring

The Ambient Noise Pollution Control Law of the People’s Republic of China promulgated in October 1996 provides that emission of construction noise into surrounding living environment within the urban areas shall comply with the national standard for noise emission from the boundary of construction site.

The Ambient Noise Emission Standard for Boundary of Construction Site (GB12523-2011) promulgated after revision in December 2011 provides that the ambient noise at the boundary of construction site in the construction process may not exceed the specified emission limits, i.e., 70dB(A) during daytime and 55dB(A) during nighttime. The maximum sound level of nighttime noise may not exceed the limit by more than 15dB(A). The definition of daytime and nighttime by the government at the county level or above for the purposes of ambient noise pollution control shall govern in case of conflict with that in the national standard.

The main construction activities involved in this project comprise laying of low-pressure natural gas pipelines on village-level roads, where the main construction machinery and equipment are welding machines that generate low ambient noise, therefore there is no need to provide for noise monitoring.

9.3 Complaint handling mechanism

During construction and operation stages, if there is inadequate construction and site operation behavior experienced, or there encounter any problems in gas use, villagers can call the contractor public phone which is requested to be provided to public, making complaints and advice to the contractor. If the Contractor fails did not make reply within the prescribed time, concerned local people can continue to local Gas Co. or complaints through 96777. Beijing gas 96777 hotline in accordance with the different business and gas attributes, divided into a number of incoming and outgoing groups, 24 hours a day non-stop for the public to provide gas advisory services. The way of complaint should be explained in the information publicity material.

Based on the differences between local companies, local gas companies will launch and maintain local dedicated complaint, inquiry and warranty repair hotlines while operating the service hotline 96777. In addition, the contractors' contact telephone numbers shall be clearly indicated on the construction site as a way for the general public to lodge complaints.

10 Reporting System and Costing

10.1 Reporting system

(1) Regular meeting

The leadership team office will hold regular meetings based on the project schedule to plan for activities at various phases and coordinate to promote various activities.

(2) Information submission process

The designer, implementer and local branches will report to the leadership team office on a weekly basis from March 1 onwards, detailing the latest progress and the problems encountered and their solutions.

(3) Oversight mechanism

The leadership team office will cause the activities at various phases to proceed as scheduled according to the objectives of each phase.

(4) Performance rating process

The leadership team office will appraise job performance according to the project schedule and the work objectives of each phase.

(5) Supervision process

The leadership team office will submit the project progress report to AIIB on a semiannual basis, as well as environmental and social impact summary, including the contractor-provided employee training, user complaints and the project operation reports submitted by the operator to the project management organization.

10.2 Environmental and social impact costing

10.2.1 Initial and design phases

At the initial and design phases of the project, the costs of environmental and social impact incurred will mainly cover the environmental and social management plan preparation and review, site preparation and temporary facilities, including environmental impact consulting service fee (covering the preparation and assessment of the environmental impact report), occupational health and safety review fee, site preparation and temporary facility fee, geological hazard assessment fee and energy saving document preparation and review fee, which totals about RMB 18.48 million.

Table 10.1 Schedule of environmental and social impact costs at the initial and design phases

No	Item	Amount (in RMB 10000)	Billing basis
1	environmental impact consulting service fee	79	Reference price [2002]No 125
1.1	preparation of the environmental impact report)	69	
1.2	assessment of the environmental impact report)	10	
2	occupational health and safety review fee	273	Engineering fee ×0.1%
3	site preparation and temporary facility fee	1367	Engineering fee ×0.5%
4	geological hazard assessment fee	9	Development and Reform Office Price (2006) No 745
5	energy saving document preparation and review fee	41	Jingfagai [2007]No. 286
6	Total	1848	

10.2.2 Construction phase

To fully implement and comply with the letter and spirit of Beijing Air Pollution Control Regulations and Beijing 2013-2017 Clean Air Action Plan,

improve HSE performance, pursue green construction practices, effectively control the fugitive dust pollution on construction sites and enhance the standards-based management performance, the related costs incurred to mitigate the social and environmental impact shall be billed and charged during the construction period according to the currently applicable policies, regulations and norms, i.e., HSE fee.

HSE fee refers to cost required to purchase and update the safety protections and facilities and improve production conditions and work environment for onsite safety according to the currently applicable national and Beijing municipal standards and provisions regarding construction safety, construction site environment and health, including the cost for environmental protection, civilized construction, work safety and temporary facilities. HSE fee covers any and all aforesaid costs and expenses incurred by the general contractor and specialized contractors from commencement of construction to completion of construction.

According to the Circular of Beijing Municipal Commission of Housing and Urban-rural Development on Adjusting the Health, Safety and Environmental Fee (Jingjianfa [2004] No 101), the HSE fee involved in municipal pipeline projects outside the fifth ring road of Beijing shall be 5.21% of the estimated construction cost, of which 1.08% shall be billed as environmental protection fee, 0.84% as civilized construction fee, 1.27% as work safety fee and 2.02% as temporary facility fee. The estimated construction cost involved in this project is RMB 2734.04 million, therefore the HSE fee used to mitigate the environmental and social impact at the construction phase is about RMB 142.44 million.

10.2.3 Operation phase

To establish a long-acting mechanism for corporate investment in work safety and ensure public benefits, the Corporate Work Safety Expense Accrual and Utilization Regulations jointly enacted by the Ministry of Finance and the State Administration of Work Safety ([2012]No 16) requires domestic companies and other economic organizations engaged in coal production, non-coal mining, construction projects, dangerous goods production and storage, transport, fireworks production, metallurgy, machinery manufacturing and development, production and test of weapons and military supplies (including civil aviation and nuclear fuel) to accrue work safety expense in their production and operations. The work safety expense is funds exclusively used to improve the conditions of companies or projects for work safety.

According to Article 14 of the aforesaid Regulations, small and medium-sized companies and large-sized companies may defer the accrual of or accrue less work safety fee with the approval of the local administration of work safety at the county or above level, coalmine safety watchdog and the fiscal department when the balance of the work safety expense at the end of the previous year reaches 5% and 1.5% of their business income of the previous year respectively. At the operation phase of the project, the work safety expense used to mitigate environmental and social impact will accrue at 1.5% of the sales revenue, estimated at about RMB 12 million per year.