

Feasibility analysis on the application of PPP mode in the shale gas industry

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Abstract

With the increasing demand for energy and rich shale gas resources, China gradually began to pay attention to the development and research of shale gas. But there are some problems existing in the management system of shale gas, such as monopoly, which hinder the development of shale gas in China. Through the analysis of China shale gas development industry financing present situation, combining the characteristics of PPP, creatively using PPP mode in the development of the energy industry, and make analysis of technical feasibility, economic feasibility analysis and regulatory flexibility analysis, and proves its feasibility. Using SWOT method, analysis application of PPP mode in shale gas development industry advantages and disadvantages, opportunities and challenges, then puts forward the application of PPP model exist methods to solve the problems, provides a new idea for the development of shale gas development industry management system.

Keywords

PPP mode; Shale gas development; Feasibility research.

1. Introduction

In recent years, China's demand for natural gas into explosive growth, the annual growth rate of more than 10%. Thus, shale gas as an important unconventional natural gas resources in shale formation has gradually aroused people's attention, which set off a boom of shale gas exploration and development. While China is actively developing shale gas, there are two major problems: the first one is the serious shortage of funds, the second one is the monopoly of mining rights [1]. As the shale gas is the project of large investment and long payback period of investment. Investment is faced with huge risks. Banks and other financial institutions in the choice of loan projects will try to avoid such projects, so the source of funding difficulties. However, the exploitation of natural gas and other energy resources are basically monopolized by the Chinese oil, Sinopec, CNOOC and other large enterprises, which caused the lack of effective investment in the industry, the employment rate fell and other issues [2]. Therefore, in order to solve the difficulties faced by shale gas development at this stage, it is necessary to break the monopoly of shale gas mining rights, the introduction of new financing model, to ensure that the shale gas development industry to carry out effective healthy competition.

In June 2011, China's first open tender for shale gas exploration held, 4 blocks of only 6 state-owned enterprises to compete, but none of the private enterprises. In December 2012, second shale gas prospecting open tender held, although the number of state-owned enterprises still account for the absolute advantage, it has opened the door to private enterprises. The private enterprises to participate in the bidding of the total tender of the company's 1/3. This shows that the country has begun to pay attention to the management system of mining right of our country to carry on the reform.

2. Current situation of shale gas development and financing in China

China's current financing methods of shale gas industry mainly include three major categories: equity financing, debt financing and innovative products [3]. Equity financing is the enterprise achieve

through the expansion of all the rights and interests, and the consequences of dilution of existing shareholders' control of the enterprise. Bond financing is realized by enterprise to sell bonds to individuals as well as institutional investors, to raise funds and capital operating expenses, and individuals and institutional investors have the funds to become the company's creditors, and access to the company's commitment to debt service. Innovative products mainly refers to the trust funds and industry funds. These traditional financing methods are single, lack of flexibility and lack of effective exit mechanism. Some experts have suggested that the project financing methods applied to the shale gas development industry, this will be a future development direction of shale gas.

During the period of "13th Five-Year", the target of China shale gas production is to reach 30 billion cubic meters per year by 2020. Such a huge amount of mining is accompanied by a huge funding gap, relying on state-owned capital is not enough. Thus, seek effective and feasible way of financing for shale gas industry, introduction of social funds and actively mobilize social forces is imperative.

3. The introduction of PPP mode

3.1 PPP model profile

PPP (public private partnerships) mode is a project cooperation model of in the public sector and private sector cooperation as the foundation, let the private sector resources involved in the provision of public goods and services, so as to realize the function of the public sector and the interests of the private sector, where financing is a part of the PPP mode. Private sector using its own technology, capital, management, and other advantages, under the guidance of the public sector completed the construction of public goods, the two sides through reasonable and effective risk sharing mechanism, interest distribution mechanism and contract governance mechanism to achieve a win-win results. PPP mode is divided into many categories, such as the traditional DBO, DB mode is a kind of outsourcing PPP; and BOT, BOOT, TOT and so on are belonging to the franchise class PPP. PPP model is mainly used in the field of infrastructure construction, and so far has not been used in the field of resource development example. However, the use of PPP is very wide, and its form is not fixed, in general, It is of great significance to reduce financial pressure, broaden the financing channels, the transformation of government functions and enhance the efficiency of management. Therefore, combination of China's actual situation, to explore new PPP application mode, the application of PPP financing model in shale gas development industry is an innovative measure.

3.2 Develop PPP mode operation mode

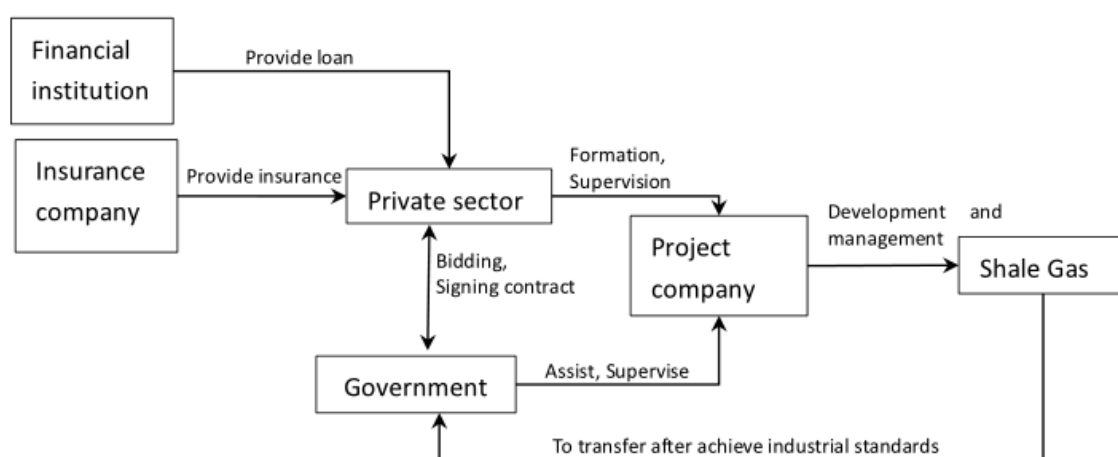


Fig.1 shale gas development project PPP mode operation mode

4. Feasibility analysis of the application of PPP model in shale gas development

4.1 technical feasibility analysis

Foreign shale gas extraction technology has been carried out a more in-depth study, but also achieved a lot of results, such as, horizontal well technology, multistage fracturing technology, micro seismic

technology, seismic reservoir prediction technology, as well as effective completion technology and a series of advanced technology in the development of shale gas has been successful in the United States. During 2009 to 2013, China has been drilling in shale gas development in the experimentation area has 62 ports, which indicates that China is strengthening the shale gas mining technology. In recent years, through the study of foreign advanced technology and experience, our country has successfully completed a number of shale gas drilling and development. Some implications are also obtained, which has accumulated some experience for the development of shale gas in China. This has laid a certain foundation for the introduction of PPP model for shale gas development industry.

4.2 Economic feasibility analysis

The exploitation of shale gas in China is at the initial stage, which needs a lot of capital investment. In 2012, the national development and Reform Commission, the energy economy and development strategy research center is expected to 2020 only gas wells drilled to bring the funding needs of more than 400 billion yuan. At present, our country in the pipeline construction, natural gas trunk pipeline about 100 million kilometers, about 1/10 of the United States, but also the need to invest hundreds of billions of dollars of infrastructure. In view of this, the shale gas development and investment funds alone is not enough, which need to introduce more financing channels. So the government in order to encourage enterprises to participate actively in the development of shale gas industry, put forward a certain financial subsidies, which will mobilize the enthusiasm of private enterprises. So that the introduction of PPP mode is feasible in economy.

4.3 regulatory feasibility analysis

In PPP mode, the government is mainly plays an assist and supervise as well as be responsible for the overall planning of the project, Organization bidding, straighten out the various participation responsibilities and obligations between the parties, the joint of each project to control and reduce the overall risk of the project.

Government as a policy maker, it provides legal protection for the effective operation of the project, and improve the legal supervision system. Bring in the private sector, to mobilize social forces, to take full advantage of market competition and to promote the development of shale gas development industry. Moreover, the development of shale gas most troubled by its impact on the environment, and the government could through the development of relevant laws and regulations to effectively make the impact of shale gas development on the environment to the lowest point. At present, China has introduced a number of policies related to shale gas, to promote the effective operation of the shale gas industry. So the introduction of PPP model in the regulatory mechanism is feasible.

4.4 The SWOT analysis of PPP mode application

S refers to the strengths, W refers to the weaknesses, O refers to the opportunity and T refers to the threats. Using SWOT analysis, from these four aspects can be from all aspects of the exact analysis of the research objectives, so as to develop the corresponding development strategies, planning and countermeasures, and so on.

4.4.1 Strengths analysis

(1) Absorb the capital of private enterprises is helpful to alleviate the financial pressure.

In 2012, the private economy in the proportion of GDP in China has more than 60%, which can be seen that the private enterprise capital has a great investment potential. The shale gas development projects require huge capital investment, through the PPP financing model, broaden the financing channels, bring in private capital to achieve diversification of investment subjects, so that the government can share costs and ease the financial pressure. And the government can use the funds for more infrastructure construction, in order to ensure the good operation of the society.

(2) Effective risk sharing mechanism

In the PPP mode, the government and the private sector through the contract to establish a partnership, according to their own understanding of the value of risk, risk tolerance and attitude to risk to share the risk of the project. Risk sharing should be symmetrical with the control force, that is, when the

risk sharing of PPP projects, the risk should be shared to such a large risk control party. This is in cooperation with the private sector, while the division of the corresponding obligations and responsibilities, so that the development of shale gas more smoothly and effectively.

(3)Helps to improve the efficiency of development, so that the interests of the community to maximize

In the United States, there are about 8000 oil and gas companies, while 85% of the shale gas is developed by the small and medium oil companies. Due to the low rate of return of shale gas industry, high cost pressures, these small and medium companies have continued to carry out technological innovation, which promote the rapid growth of shale gas development technology momentum. This has brought some enlightenment to the development of shale gas in China. The introduction of private enterprises to participate in the development of shale gas, not only to broaden the financing channels, but also actively mobilize the whole society to develop shale gas, to achieve maximum social benefits.

(4)Establish corporate image and win social reputation

Private enterprises who bear a greater risk than the general project involved in shale gas development projects. It not only exercise the ability to develop shale gas companies, but also enhance the enterprise's own management capabilities. And it laid a solid technical foundation and social reputation for the community to provide more energy supply and for the development of enterprises.

4.4.2 Weaknesses analysis

(1)The exploration level is backward and the core technology is not mature.

Although shale gas resources in our country have great potential, but it also need large-scale exploration and development , further optimize the exploration technology, determine the specific area of exploration, resource type and exploration depth and so on. At present, the situation is the geological evaluation of the lag, the situation is not clear, our development is blind to do nothing.

(2)Development costs are high, the investment is facing a great risk

Shale gas production is different from conventional natural gas, and the gas production of shale gas well is very rapid. Shale gas wells generally higher production capacity can only last two years or so, and two years after the production capacity will be reduced sharply to 10% of peak production capacity. So, in order to maintain a high production capacity, it is necessary to develop new wells, but because of this, it will increase the cost of shale gas. This shows that the development of shale gas investment is bound to face a great risk.

4.4.3Opportunities analysis

(1)The government's policy support and encouragement

National economic and social development "12th Five-Year" planning clear requirements to "promote shale gas and other unconventional oil and gas resources development and utilization", vigorously encourage the exploration and development of shale gas, increase the supply of natural gas resources, ease the contradiction between supply and demand of natural gas in China, adjusting energy structure, promote energy conservation and emission reduction. The government has also introduced a number of policies to support and encourage, as shown in Table 1.

(2)Shale gas content is very rich in China and own a good foundation for the operation

World Energy Research Institute (WRI), a new study shows that China's shale gas reserves of up to 30 trillion cubic meters, ranking first in the world, is almost two times the United States. It's a good news to celebrate for China who is the world's number one energy consumer. Such a huge reserve brings us a good foundation to operate. Effective and reasonable exploitation can make the problem of shortage of energy demand can be alleviated.

(3)Large demand for funds

Because of the development of shale gas in China is still in the initial stage, our exploration and development level there is a lot of room for improvement. Therefore, the demand for funds is very large. However, it is far from enough to provide funds only by the government .This provides an opportunity for private enterprises to enter the shale gas development industry.

Table 1 the recent development of the shale gas industry and related policies in China

Time	Policies and regulations as well as contents
June 2011	Ministry of land and resources to carry out the first round of bidding for shale gas exploration
October 2011	National Development and Reform Commission and other four ministries jointly issued guidance on the development of natural gas distributed energy (hair change energy [2011]2196) file
December 2011	The State Council approved shale gas as independent minerals, And the Ministry of land and resources and issued "new minerals have been discovered in 2011 thirtieth on public
December 2011	The national development and Reform Commission (NDRC) released the catalogue for the guidance of foreign investment industry (revised in 2011)
March 2012	Ministry of land and resources held a national assessment of the potential of shale gas resources and favorable areas of the results of the press conference
March 16, 2012	The national energy board released the shale gas development plan (2011-2015)
March 21, 2012	The Ministry of land and resources issued a notice on the collection of compensation fees for oil resources in China and foreign countries.
May 17, 2012	Ministry of land and natural resources issued shale gas exploration rights tender notice
August 2012 ,13	Ministry of land and resources issued < shale gas resources / reserves calculation and evaluation of technical requirements (Trial) (Draft) >
November 5, 2012	The Ministry of Finance issued a notice on the introduction of shale gas development and utilization subsidy policy.
April 17, 2014	Notice of the Ministry of land and resources on the issue of the technical specification for shale gas resources / reserves calculation and evaluation

4.4.4 Threat analysis

(1)System construction needs to be improved

At present, there are still many problems in the construction of shale gas in China, such as, the definition and mineral mining rights management is not clear; the access mechanism needs to be broadened; the lack of relevant supporting policies. These have become a threat to the PPP mode used in the shale gas development industry.

(2)It is difficult to eliminate the environmental impact

Environmental protection is an important issue of energy development have to consider. And how to produce shale gas under the influence of the environment as little as possible, which is the problem of any shale gas development companies can not be ignored.

5. Problem solving

In the weaknesses analysis noted that exploration level is backward and the core technology is not yet mature are some problems of China's shale gas. Therefore, we should put efforts to promote large oil companies development, at the same time, we should make use of PPP mode to study the United States through the allocation of mining rights to the small and medium-sized private enterprises. So that it would continue to carry out technical innovation in order to complete the project.

For high development costs and investment risks, the most important task of the PPP model is to establish a risk sharing mechanism. It requires the government and the private enterprises complete two things: Firstly, they should clear that shale gas development may produce the risk. Secondly, they must understand their risk resisting ability. To determine the reasonable and effective distribution of risk through communication, and the risk allocation to the risk control of a large party.

Imperfect system construction is a major threat to the shale gas development industry using PPP model. And the relevant system is constantly improving them with the country's attention to shale gas development. For example, in 2012, the Ministry of land and Resources announced the shale gas resources / reserves calculation and evaluation of technical requirements (Trial) (Draft), which preliminary plan about shale gas reserves calculation and evaluation of the technical requirements. And in 2014, the Ministry of land and resources on the release of shale gas resources / reserves calculation and evaluation of technical specifications recommended industry standards notice. It suggests that the government of China attaches great importance to the system construction for shale gas development. So, this threat factor can be solved gradually.

The environmental impact factor is also can be regulated through the relevant government policies and laws and regulations as well as to enhance the technical innovation. In the United States, Canada and other shale gas mining country, the companies control the impact of development of shale gas on the environment through the introduction of a series of environmental protection laws and regulations. At the same time, its continuous technological innovation as well as the use of more advanced and effective technology to exploit shale gas. So that to minimize the impact on the environment.

6. Conclusions

PPP mode has made great achievements in the construction of public facilities. In this paper, we discussed the feasibility analysis of the PPP mode in the technical, economic and regulatory aspects combined with the characteristics of the shale gas development market and the PPP mode and obtain the conclusion that it is feasible to use PPP model in shale gas industry. This provides a development thought for the management system of shale gas development in our country. Then use the SWOT analysis method to comprehensively analyze the development situation of the PPP mode in shale gas development industry. It is found that there are some problems in the application of PPP mode. And the methods of solving these related problems are proposed to provide reference for the further research in the future.

The reserves of shale gas resources are very abundant in China. After a preliminary assessment, the potential of shale gas resource of China's land is 134.42 trillions cubic meters and the potential of the exploitation of resources is 25.08 trillions cubic meters. Today, shale gas development is only in the initial stage of exploration, and many supporting infrastructure and management system construction has not kept up. It requires us to learn from the experience of foreign management, at the same time, in the actual work, combined with China's national conditions, construct a set of effective development and management system of our country.

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