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The competition situation analysis of shale gas industry in China: Applying Porter's five forces and scenario model



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ABSTRACT

With the increasing of energy demand and environmental pressure, China government has been exploring a way to diversify energy supply. Shale gas development is becoming an important energy strategy in China in recent years due to giant shale gas reserves. However, the shale gas market is preliminarily shaping in China, so that many factors have great influence on its competition. To find these factors and to control them rationally is good for the cultivating Chinese shale gas market. Five forces model for industry analysis puts an insight into the competitive landscape of shale gas market by showing the forces of supplier power, buyer power, threat of substitution, barriers to entry, and degree of rivalry. Illustrating the key factors that affect competitive landscape provides a view into the situation of shale gas industry. The variation tendency of shale gas industry is analyzed by setting various scenarios. Finally some suggestions are proposed in order to keep the development of shale gas industry positively.

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1. Introduction

Facing the pressure of resources and environment, many countries are developing new energy industry actively in the world. Shale gas (SG), as a new kind of natural gas, has received widespread concern [1]. Especially, that China fuels are chiefly polluting coal has led to the environmental deterioration or may further threaten the health of human life while it can deliver economic growth to developing China. Moreover, China overly dependence on oil and gas imported due to limited reserves of oil and gas. Energy security risk of China has been increasing over time [2,3]. Fortunately China with larger reserve of SG resources is expected to alleviate the above two problems effectively.

The SG resource is about two times of conventional natural gas resources in China, equivalent to nearly 100 billion tons of crude oil. It is mainly distributed in Sichuan basin ($17.716 \times 10^{12} \text{ m}^3$) [4], Tarim basin ($6.113 \times 10^{12} \text{ m}^3$), Junggar basin ($1.019 \times 10^{12} \text{ m}^3$), Songliao basin ($0.453 \times 10^{12} \text{ m}^3$), and another $6.283 \times 10^{12} \text{ m}^3$ distributes in Yangzi [5], Jiangnan and Subei districts [6–8]. Marine shale strata, sea–land–interaction strata and land–coal strata also have certain reserves [6]. Chongqing area and Sichuan basin located in the upper Yangtze region have the best development prospects [9]. However, Chinese SG resource is deep burial and most is situated in folds and faults areas bring great exploitation difficulty.

China government starts to develop SG in 2009. And it has experienced a wave of investment boom since 2012 [10,11]. However, Chinese SG market influenced by many factors is not mature, which is just in infancy stage, so that it may cause monopoly capital. In order to prevent monopoly and attract more investments, the government allowed the private enterprises to enter this industry in 2012. The winning enterprises found that there are still a variety of resistances to achieve SG commercialization, such as technology, policy and capital [12].

Nowadays, there are many enterprises in the SG industry, including state-owned company, private company and multinational petroleum company. The competition landscape of the SG industry changes fast in China. What are factors affecting Chinese SG industry? How do they affect the industry? What's the development trend? All of these are the core problems to be solved in this study. But comprehending the role of SG in the natural gas market is difficult due to the complex interactions of various forces. In this respect, using Porter's five forces model can provide a perspective on the SG industry and shed light on the myriad forces affecting SG market competition.

2. Porter's contribution to industry competition

In 1980, Michael Porter introduced a model of competitive strategy to explain an industry's position in a complex strategic environment. Porter's five forces model provides one way to present the current position of the SG industry which is called the potential stocks in the energy sources. The five forces presented in this model are the supplier power, the buyer power, the entry barriers to entry, the threat of substitution and the degree of rivalry [13]. Placing the industry of SG in a framework offers a unique insight into the bargaining position. This framework (see Fig. 1) sought to relate

the average profitability of the participants in an industry to competitive forces. Given the impact of Porter's five forces framework on industry completion landscape, the framework in short is presented by Karagiannopoulos [14].

2.1. Force 1: Supplier power

The power of suppliers refers to the ability of bargaining power and controlling power of resources. The bargaining power of suppliers is the ability to raise prices. The controlling power of resources is reflected by the difficulty that other enterprises obtain this kind of resources. Suppliers are powerful if: suppliers have stable market position; products or services are unique so that the customers are hard to change suppliers or cost of changing suppliers is high; suppliers are easier to form strategic alliances.

2.1.1. Force 2: Buyer power

Buyers can threaten the industry by bargaining down prices or raising the costs by demanding better quality. The most important determinants of buyer power are the size and the concentration of customers. Buyers are powerful if: buyers are fewer but they need to buy many products; buyers need standard products which can be purchased from different suppliers; buyers are easier to form strategic alliances.

2.1.2. Force 3: Barriers to entry

New competitors may trigger fierce market competition. Fierce market competition may decrease profit level or endanger some enterprises' survival. Threat of potential entrants is reflected by two factors: barriers to entry and reaction of enterprises in the industry with new entrants. The most common forms of entry barriers, except legal obstacles or government policy, are usually the scale and the investment required to enter an industry as an efficient competitor.

2.1.3. Force 4: Threat of substitutes

The threat that substitute products pose to an industry's profitability depends on the relative price-to-performance ratios of the different types of products or services to which customers can turn to satisfy the same basic need [14]. The lower price or better quality, the stronger competitiveness the substitutes have.

2.1.4. Force 5: Degree of rivalry

Intense rivalry among established companies constitutes a strong threat of profit-ability. The intensity of rivalry is relevant to the presence of various factors such as industry competitive structure, industry demand and capacity to meet the demand, differentiation among companies, and the height of exit barriers [15].

Porter's five forces model has been widely applied to analyze industry competition in various markets. For example, Akcagun and Dal analyzed Turkish apparel industry by using Porter's five forces model. And a number of strategies were recommended to Turkish apparel industry to adopt for the competition [16]. Sumpio used the Porter's five forces analysis to identify the sources of competition, the

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