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China Shale Gas: Can the Pace Be Sustained?

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SYNOPSIS

China has ambitious plans for shale gas production but faces many constraints above and below ground. The shale gas industry is still at the prospective stage and the full commercial viability of this resource is not yet certain. Sinopec and PetroChina currently dominate the nascent shale gas industry. Whilst this may secure short-term success, more foreign and Chinese players are needed in order to reach and sustain a high level of production. This in turn will require radical change in the way shale gas is governed in the country.

KEY POINTS

- China may have vast resources of shale gas, but the geological conditions are less favourable for extraction than in the United States.
- The short term output target of 6.5 bcm per year in 2015 can probably be achieved. However, the initial official target of 60 to 80 bcm per year for 2020 was reduced to 30 bcm in August 2014, reflecting the medium to long term challenges the industry faces.
- The industry is currently dominated by the Chinese national oil companies, Sinopec and PetroChina, with limited participation from international oil companies. This will constrain the pace of development and the quality of the reservoir management even if international service companies are involved in all projects.
- Policy amendments and regulatory changes will be needed in order to encourage investment by a larger number of companies.
- A key uncertainty is the quality of environmental management and community engagement, and any resistance that may arise through poor practices in these respects. Considerable effort will be needed to secure the necessary social licenses to operate in densely populated areas.

INTRODUCTION

According to the 2013 United States Energy Information Administration estimates, China has the highest technically recoverable shale gas resources in the world at 33.5 trillion cubic metres (tcm). The Chinese government is hoping to replicate the shale gas boom of the US and has launched a campaign to exploit this potentially valuable resource. The motivations are two-fold: first, to constrain the country's growing dependence on imported gas; and second, to reduce air pollution by increasing the rate at which gas replaces coal in the energy mix. If successful, this strategy will reduce the rise of China's carbon emissions and provide commercial opportunities for foreign companies while dampening the country's demand for LNG imports. The 12th Five Year Plan (2011-2015) signalled the government's plan to develop unconventional gas including shale gas and in March 2012, China issued a development plan for the nascent shale gas industry and set a target of 6.5 billion cubic metres (bcm) per year in shale gas output by the end of 2015 and a highly ambitious goal of 60 to 80 bcm per year by 2020. In August 2014, the 2020 target was halved to 30 bcm, a reflection of

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the many challenges the industry faces. Output for this new production target will most likely come from China's two largest National Oil Companies (NOCs), PetroChina and Sinopec, given that they have the expertise and hold better quality blocks, compared to the other independent shale gas players. Thus far, the Fuling shale gas block in Sichuan Province operated by Sinopec is the only commercial block in the country, with production expected to reach 5 bcm in 2015 and 10 bcm in 2017. According to China's Ministry of Land and Resources (MLR), total shale gas output for China in 2013 was 200 million cubic metres (mmcm), up from 25 mmcm in 2012. In October 2014, China's National Energy Administration indicated that the country is on track to produce 1 to 1.5 bcm in 2014.

ANALYSIS

Government Strategies

The central government was quick to provide enthusiastic support for the exploitation of shale gas. In 2010, the MLR classified shale gas as an 'independent mineral resource'. This allowed the government to by-pass certain regulations affecting the oil and gas sector, in particular removing the requirement for investors to cooperate with one of the Chinese NOCs. Now, foreign oil companies and oilfield service companies are permitted to cooperate with Chinese companies. Local governments have also been keen to support exploration for shale gas in the hope that it will boost their economies. By 2010, Sinopec and PetroChina were starting to explore for shale gas in areas where they held resource rights, with a focus on Sichuan Province. In an effort to stimulate competition with the NOCs, China allowed private Chinese companies to participate in shale gas exploration and conducted two licensing rounds over other areas. The first licensing round outside these areas was held in June 2011. Only two blocks were awarded, both in the Sichuan Basin, to Sinopec and the Henan Provincial Coal Seam Gas Company. The results of a second round were announced in December 2012 and sixteen companies were awarded licenses over 19 blocks. None of the NOCs won a block. The winners included a range of energy companies mainly owned at the provincial level and involved variously in gas, coal and electricity with limited exploration expertise. Many of the provincial companies were allocated blocks in their own provinces. As an incentive, the central government announced in November 2012 that it would pay shale gas producers a subsidy of RMB0.40 per cubic metre (US$1.84/mmBTU) on top of the prevailing well-head price.

Geological and Technological Challenges

It is estimated that China may have very large technically recoverable reserves of shale gas. In general terms, there are large areas of thick, organic-rich and gas-prone shales. Most of these have sufficiently high quartz content and sufficiently low clay content to make them brittle and therefore suitable for hydraulic fracturing. The Sichuan Basin likely contains more than 50% of the technically recoverable reserves of shale gas in China. Despite the large volume of risked, technically recoverable reserves, China's shale gas basins have a number of unfavorable characteristics compared to the most productive shale gas plays in the US, such as the Marcellus and Barnett shales.

First, most of China's prospective shales lie at depths greater than 3,000 metres, in contrast with those in the US which tend to lie above 3,000 meters. Second, the total organic content of Chinese shales tends to be less than the best US shales, as is the gas content, and also the permeability and estimated resource abundance per cubic kilometre. Third, many of the prospective basins in China are structurally complex compared to the best US basins. These difficulties have kept drilling costs as high as US$15 million per well, compared to US costs which can be as low as US$3 million. In the short-term, China's NOCs lack the advanced technology, skills, experience and supply chains to support the rapid and efficient exploitation of shale gas in the most efficient manner. Most of the other Chinese companies with rights to shale gas resources have no experience in the oil and gas business at all. As a result, most, if not all shale gas enterprises probably had to establish partnerships with or hire foreign oilfield service companies such as Halliburton, Weatherford, Schlumberger and FTS International.

Dominant Position of NOCs

PetroChina and Sinopec occupy a dominant position in the shale gas industry in two

respects. First, they hold the historical rights to oil and gas resources over large tracts of the country, and these include what are regarded as the most attractive zones for shale gas. No other companies, Chinese or foreign, can explore for shale gas in these areas except in collaboration with these NOCs. The NOCs are willing to work with foreign oil companies, but the legal arrangements for cooperation are ambiguous and unfavourable for the latter. The restriction of other Chinese companies to less favourable acreages offered in the licensing rounds limits the rate at which prospective areas are explored and developed, especially as the NOCs have many other projects to consider which are more profitable than shale gas. The second aspect of the NOCs' dominant position arises from their ownership and control of nearly all the nation's long-distance gas pipelines, and the lack of clear regulations providing mandatory third-party access at a reasonable tariff.

Obstacles Faced by Foreign Investors

International oil companies have shown interest in China's shale gas and their participation can take different forms. Several oil companies have signed Joint Study Agreements (JSAs) with China's NOCs as a first step to assess whether they wish to take out a full Production Sharing Contract (PSC). In general, these JSAs lie in areas where the NOCs hold long-standing resource rights. In some cases they provide the opportunity to carry out exploratory seismic surveys and drilling. In March 2012, Shell signed the first shale gas PSC with PetroChina covering the Fushun-Yongchuan Block on the Sichuan basin, but it took a year to receive formal approval from the Ministry of Commerce. ConocoPhillips and Total both have JSAs with Sinopec which involve drilling. In addition to its PSC with PetroChina where drilling has started, Shell has signed a letter of intent with Hunan Huasheng Energy to explore for shale gas in Hunan in a license won in the second round of bidding.

Foreign investors face a number of legal and regulatory uncertainties, in addition to the geological, geographic and infrastructural constraints described above. First, the business model enshrined in China's PSC, as in other countries using this contractual form, is not well suited to shale gas operations. Second, the government has yet to clarify whether it prefers that holders of licenses that won the first and second rounds to use PSCs or Joint Ventures (JV) as vehicles to cooperate with foreign investors. Even if the JV becomes the preferred vehicle, there are still many uncertainties, not least being the issue of what resource rights the JV will hold after the initial 3-year license period lapses.

Community and Environmental Challenges

A further set of challenges arises from the nature of shale gas development which requires thousands of wells to be drilled (albeit from pads of 6-8 wells each) in the form of a wave which spreads across tens of thousands of square kilometres of land. The oil companies will need to build new roads upon which large numbers of heavy trucks will travel. They will temporarily requisition farmland for operations and possibly resettle villages. Hydraulic fracturing requires large quantities of water to be used and then managed or disposed of safely. Companies operating in highly populated, agricultural areas like Sichuan will have to adhere to very high standards of water and environmental management, compensate farmers for loss of income when their land is used, and compensate communities for disturbance to their lives. Many other prospective areas in the north and north-west of the country are sparsely populated but very dry. Here too, very careful water management will be needed, including re-use and recycling. To date, there have been no reports of community-based resistance to shale gas operations, unlike in other countries. However, there was one western media report of a fatal, uncontrolled release of methane from a well in Sinopec's Fuling block in Sichuan Province in April 2013; but this incident was never confirmed by the Chinese authorities. Should similar accidents occur in future, or if shale gas operations cause unacceptable damage to water, land or community life, especially in highly populated regions, local communities may start to resist future development plans, as exemplified in other industrial projects in China. There is a need for specific national technical and environmental standards and regulations to address shale gas.

Progress and Policy Developments

The key achievement in 2013 was Sinopec's success in bringing its Fuling block in Sichuan

onstream with an annual production of 200 mmcm. Though lagging behind Sinopec, PetroChina is ramping up its investment and hopes to produce 2.6 bcm in 2015. In contrast, progress in the first and second round blocks remains slow for a combination of reasons: the lack of experience of the license holders, the poor prospectivity of the blocks and the reported difficulty in gaining access to geological data. By the end of 2014, about 400 wells had been drilled, mainly by the NOCs. As of November 2014, only 50 wells had been drilled in the 21 blocks auctioned in the two licensing rounds.

In order to address some of the observed policy constraints noted above, the central government has taken the following steps:

- In February 2014, the State Council removed the need for approval from the MLR for foreign joint ventures (or PSCs) relating to the exploration and exploitation of minerals, including shale gas. The requirement for approval from the Ministry of Commerce remains in place for shale gas, despite being withdrawn for conventional oil and gas and for coalbed methane.
- In April 2014, the National Development and Reform Commission issued new measures concerning the construction and management of natural gas infrastructure. This document encourages pipeline operators to provide other entities with access to their pipelines in a fair and open manner, but the provisions are ambiguous and probably not enforceable.
- In an effort to compel operators, the MLR fined Sinopec and Henan Provincial Coal Seam Gas Company in November 2014 for failing to meet the required investments on the blocks acquired during the first licensing round and reduced the size of their shale gas acreage.

In addition, two other important issues have been discussed. First, is the possibility of requiring PetroChina and Sinopec to relinquish areas over which they hold resource rights but are not actively exploring or exploiting. Second, as a result of the slow scale of development, the MLR is pondering how to further stimulate shale gas development and no launch date has been given for the third shale auction which was initially expected in 2013. It has been reported that there have been discussions for the bidding process to be delegated to individual provincial governments.

WHAT TO LOOK OUT FOR

- The extent to which the technical and commercial success of Sinopec's flagship Fuling shale gas block can be replicated elsewhere and by other operators.
- Whether there will be a new format for the next round of bidding of shale gas licenses which could stimulate China's shale gas development and energise investor interests.
- Announcement of measures requiring PetroChina and Sinopec to relinquish their rights over prospective shale gas areas.
- Clarifications in the legal framework for foreign investors.
- Signs of resistance from communities affected by shale gas operations.
- Application of new measures to enforce third-party access to gas pipelines.

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This brief is part of the Energy Studies Institute's project on non-geological constraints on unconventional gas developments in East Asia. To learn more about this research, visit the ESI website.