

China Coalbed Methane: Slow Start and Still Work in Progress

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SYNOPSIS

China has large potential reserves of coalbed methane (CBM) but despite more than 20 years of exploration, progress has been slow and production from surface wells in 2013 amounted to only 3 billion cubic metres (bcm). CBM surface well production is unlikely to meet the official target of 16 bcm set for 2015. In the last two years, the central government has removed a number of structural and administrative obstacles, and these moves support the measures introduced earlier aimed at stimulating CBM exploration and production. China's CBM production from surface wells could rise substantially in the long-term but the prevailing technical challenges and above-ground policy and management constraints remain, impeding near-term growth.

KEY POINTS

- China has substantial potential resources of CBM, but serious technical challenges and above-ground constraints remain despite more than 20 years of exploration.
- In the 12th Five Year Plan released in 2011, the central government set an ambitious target for CBM production from surface wells at 16 bcm for 2015, but CBM producers are unlikely to meet it given that annual production for 2013 amounted to only 3 bcm.
- The central government has reduced many economic and regulatory constraints but there are still issues which undermine the commercial attractiveness of the CBM industry. They include the need for cooperation between coal mining and CBM companies, addressing the incompatible nature of the Production Sharing Contract (PSC), and instituting obligatory third-party access to the gas pipeline network.
- While Shanxi Province is the epicentre for China's CBM development, the central government has recently expanded its exploration focus towards Xinjiang Province.

INTRODUCTION

With the third largest coal reserves in the world, China has great potential for coal-related methane resources. According to China's Ministry of Land and Resources (MLR), China has an estimated CBM resource of nearly 40 trillion cubic metres (tcm), with technical recoverable reserves of about 10 tcm. This figure includes resources from both CBM surface well extraction (hereafter "CBM") and coalmine methane (hereafter "CMM") which are drained by coal operators for safety purposes. In December 2011, China's National Energy Administration (NEA) released the 12th Five Year Plan (2011-2015) for the

Development and Utilization of CBM (hereafter "12th FYP") which outlined China's plan to produce 30 bcm with 16 bcm through CBM and 14 bcm from CMM by 2015. This policy brief examines the details of China's CBM production efforts; CMM issues fall beyond the scope of this analysis.

The 12th FYP indicated the central government's plans to invest RMB20.3 billion (US\$3.18 billion) in the eastern Ordos Basin and RMB37.8 billion (US\$5.9 billion) in the Qinshui Basin to boost China's proven geological reserves of CBM to 1 tcm by 2015, and develop these two basins located in

Shanxi Province as the CBM industry production base. In 2013, China produced 3 bcm of CBM, compared to 12.6 bcm of CMM, and aggregate CBM/CMM output was 15.6 bcm. However, actual consumption of CBM/CMM amounted to just 6.6 bcm since most of the CMM was vented into the atmosphere and therefore wasted, because coal mine operators do not find it profitable to capture and transport the CMM they extract. CBM extraction was 2.7 bcm in the first nine months of 2014, far below the official production target of 16 bcm for 2015.

ANALYSIS

Early Development

Whilst CMM has been produced from coal mines in the past for safety reasons, it was only in the 1990s that the central government started to promote CBM exploration by surface drilling. In 1996, the Ministry for Coal Industries and China National Petroleum Corporation (CNPC) together established the China United Coalbed Methane Company (CUCBM) to act as the national champion with a monopoly over cooperation with foreign companies to develop CBM. When the Ministry for Coal Industries was abolished in 1998, its share in CUCBM was taken over by a state-owned enterprise which eventually came to be known as the China National Coal Group Corporation (also known as ChinaCoal), following asset restructuring. Through CUCBM, a number of major US oil companies such as Chevron, Conoco, Philips Petroleum, Arcos and Texaco explored for CBM in China during the 1990s, but a combination of poor flow rates, low demand for gas and low gas prices resulted in them moving out and passing the opportunity to smaller foreign players such as Green Dragon (owned by the Dutch, Greka Energy), Sino Gas and Energy, and Far East Energy in the early 2000s. By 2005, annual CBM production remained low at just 0.03 bcm. The most important reason for the slow progress was the low level of exploration activity undertaken by CUCBM, which was poorly capitalised due to the lack of interest in CBM by its two shareholders.

Liberalisation from 2007 Onwards

This slow progress prompted the central government to introduce a number of supportive policies, based on two motives. The first was to encourage coal mine

companies to degas the coalbeds before the start of mining operations to reduce the risk of methane-related mining accidents. The second was to boost the production of natural gas in China for both energy security and environmental reasons. In 2007, the central government removed CUCBM's monopoly on joint ventures with foreign cooperation. A year later, PetroChina (the listed company of CNPC) withdrew from CUCBM and following a division of assets with ChinaCoal, PetroChina became a CBM player in its own right. CUCBM lost 40% of its CBM rights but remains the largest state-owned CBM producer. Sinopec, the Henan Provincial Coal Bed Methane Development and Utilization Company (also known as Henan CBM) and other Chinese companies have also started CBM exploration activities. In 2010, the China National Offshore Oil Corporation (CNOOC) bought a 50% stake in CUCBM and this was increased to 70% in 2013, signalling CNOOC's desire to step up its participation in the CBM sector.

In addition to breaking CUCBM's monopoly, the central government progressively introduced a number of favourable fiscal policies. Since 2008, CBM producers have received a direct price subsidy of RMB0.2/m³ (US\$0.92/mmBTU). An additional subsidy of RMB0.05/m³ (US\$0.23/mmBTU) has also been available in Shanxi. In 2011, the central government eliminated Value-Added Tax (VAT) and import duties on CBM equipment. In areas where there is no pipeline access available, producers are now permitted to liquefy the gas in small-scale LNG plants, then sell it for use in the transport sector or transport it to where it can be regasified and fed into urban distribution networks or industrial sites. However, CBM that is sold into trunk pipelines for city gas use receives a much less favourable price due to the lack of obligatory third party access policies.

Geological and Technological Challenges

Despite the large scale of the resource, the geological conditions of China's CBM resources are less favourable than those in the producing basins of the USA and Australia. Traditionally, the area with the most favourable geological and logistical conditions for CBM production is believed to be in north-central China, with Shanxi identified as the epicentre for CBM development. There is the

Ordos Basin, which cuts across five provinces, including Shanxi, and the adjacent Qinshui Basin also in Shanxi, which is seen as the most prospective basin for CBM in China.

In the Qinshui Basin, the overall gas content of the high-rank coals is high and their depth is favourable at 400-1,000 metres over large areas, but the permeability is very low and the coals are under-saturated with respect to methane. As a result, plateau production rates and recoverable reserves per well are both low in this basin. Further difficulties arise from the structural complexity of many Chinese basins and the greater burial depths of some coals. In addition, only 20% of the country's coals are high-rank. The rest are low and medium rank, and are considered difficult to exploit. The generally poor geological conditions of China's CBM resources pose serious technological and cost obstacles, slowing down development efforts.

Overlapping Resource Rights and Illegal Extraction

Two types of conflict that constrain CBM development relate to overlapping rights and illegal extraction. Coal and CBM are officially identified as two independent mineral types. CBM licenses are approved by the MLR while provincial governments can only approve coal mines. As a result, significant areas of overlap may exist between CBM and coal mining licenses resulting in acute conflicts over coal mining and CBM extraction between the different rights holders. Coal operators are particularly concerned that nearby CBM production could affect the safety of their coal mineshafts and tunnels. The situation has partially improved now that the MLR has become more proactive in helping to resolve such conflicts when they arise. Local protectionism is another related problem whereby CBM companies owned by local governments have been reported to operate without license. Such behaviour deters licensed operators, affects the proper governance of the CBM industry and risks damaging the CBM reservoirs.

Obstacles Faced by Foreign Investors

Foreign operators have the potential to accelerate CBM production, but they are obliged to enter into a Production Sharing Contract (PSC) arrangement with a Chinese

partner. Also, the PSC system places all the exploration risks on the foreign company and as a result, the foreign companies that are smaller and medium in size have either been deterred or are mostly unable to afford to run large-scale operations involving multiple blocks. Furthermore, the business and approval processes embedded in a PSC have been designed for conventional oil and gas programmes with their distinct phases of exploration, appraisal, development and production. These processes are incompatible with CBM exploitation where the phases are essentially contemporaneous. This is exemplified by the decision of some CBM companies to start commercial production of gas before the Outline Development Plan (ODP) is approved by the government, as operators deem the approval process to be complex and time-consuming.

Local Environmental and Community Issues

The process of CBM production disrupts sub-surface aquifers and requires the disposal of large quantities of water containing natural but often toxic ingredients. Investigations in Shanxi have shown that CBM production affects local water resources and the environment in a number of ways: declining flows from shallow and medium depth water wells, drying up of spring water flows, the pollution of surface and sub-surface water, the destruction of vegetation, and soil erosion. Whilst there appear to have been no reports of serious obstruction or resistance to CBM extraction from local communities to date, the intense land requirements require operators to engage closely with local populations to address their expectations and concerns, adding to transaction costs.

Recent Policy Developments

New Administrative Measures

The central government has in 2013 and 2014 taken a number of administrative steps to further support CBM development and to improve its governance. In 2013, the NEA in March, and the State Council in September issued guidelines detailing the following:

- Obliging coal mining and CBM enterprises to cooperate;
- Requiring CBM to be extracted before coal mining begins;
- Setting higher standards for technical and management qualifications from CBM

enterprises as well as stricter reporting requirements;

- Requiring all CBM projects to carry out an environmental impact assessment and a risk assessment of social stability for projects which might cause significant community disruptions.

Further measures have included the following:

- In May 2013, the State Council removed the need for approval from the Ministry of Commerce for foreign joint ventures (or PSCs) relating to the exploration and exploitation of oil and gas (including CBM);
- 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 CBM);
- In April 2014, the National Development and Reform Commission issued new measures concerning the construction and management of natural gas infrastructure. This document encouraged pipeline operators to provide other entities with access to their pipelines in a fair and open manner, but the provisions are ambiguous and are most likely unenforceable.

Expanded Focus on Xinjiang Province

The central government has recently expanded its exploration focus towards Xinjiang Province. According to information provided by the MLR in 2013, Xinjiang has 9.5 tcm of CBM resources, accounting for 26% of China's total but little has been converted to proven reserves due to limited development. The NEA prepared a development plan for Xinjiang in 2013 which targets 900m³/year of CBM by 2020 from the province. Three factors drive the latest shift in official thinking: first, progress in Shanxi has yielded limited results. Second, there is already a gas pipeline network connecting Xinjiang to markets in eastern China. Third, Xinjiang possess mid-to-low-rank coals, similar to the type found in the United States where commercial CBM development attained breakthrough. Although they are lower in gas content compared to the high-rank coals found in Shanxi, they are less technically challenging because they have better permeability.

WHAT TO LOOK OUT FOR

- Whether the central government is prepared to raise the level of subsidy for CBM production to improve its commercial attractiveness.
- Whether the central government can move fast enough to accelerate the development of a nation-wide gas pipeline network and put in place an open access policy to enable CBM producers to reach various centres of consumption.
- Whether the central government will be more active in helping manage, and where necessary, find negotiated solutions in CBM-related disputes with affected mining operators and local communities.
- Whether the central government is prepared to address the incompatible nature of the PSC to make it more viable for foreign CBM developers.
- Updates on Xinjiang Province's CBM prospects.
- How excitement and disappointment in China's nascent shale gas industry may affect the CBM industry.

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