

## Shale Gas Development in China - 1

### Summary

China's natural resources reserves are estimated at 134.420 trillion cubic meters, with approximately 25 trillion cubic meters of exploitable shale gas. Being the largest shale gas reserves in the world, the distribution is largely across the Sichuan basin, the Tarim basin, the Ordos Basin, the western Hubei-Eastern Chongqing area and the provinces of Guizhou and Hunan.

In 2011, the National Development and Reform Commission (NDRC) announced that the government targeted to increase shale gas production to 6.5 billion cubic meters annually by 2015 and 100 billion cubic meters annually by 2020.

On December 31, 2011, Ministry of Land and Resources (MLR) announced the legal status of shale gas as the "172th independent mining resource". The result of such legal qualification is that shale gas is now exempted from the restrictive legal regime currently in effect for exploration and hydrocarbon production in China. Furthermore, the revised Foreign Investment Industry Guidance Catalogue (the "Catalogue"), which took effect on January 30, 2012, specifies that foreign investments in the exploration and development of shale gas and shale liquids now fall in the "encouraged" category of the Catalogue, which allows foreign investors to set up joint ventures with their Chinese partners and to enjoy certain administrative and tax benefits.

Two rounds of bidding for the commercial development of shale gas in China were tendered by the MLR in 2011 and 2012 respectively. Except for two private companies, the successful bidders are state-owned enterprises (SOEs) in power generation or coal mining industries in the second round. Although international energy companies with developed advanced technologies and extensive experience were not allowed to directly participate in these rounds of bidding, they were encouraged to form joint ventures with Chinese companies and to provide technology/services in the exploration and production of shale gas. Alberta companies interested to further partnership and /or create new relationships should consider to capitalize on this opportunity

## Current Situation

**Complex Geological environment** The shale gas deposits in China are generally located in mountainous, rocky desert and are buried deep underground. The transportation and installation of heavy equipment required for the operation of these deposits will be a complicated and expensive process.

**Infrastructure** Most shale gas reserves have to be connected to the existing network of pipelines. Although China has already increased the development of its pipeline network in recent years, the identification of new routes, the construction of new pipelines and their connection with the existing network will inevitably be a long-term process. Such bottlenecks, coupled with high development costs, could also slow the development of shale gas.

**Environmental Impacts** The process of hydraulic fracturing requires large volumes of water. However, many shale gas fields in China are located precisely in areas facing serious problems of water shortages. The large-scale development of shale gas in these regions will need to take into account the availability of accessible water supplies. Both the use of chemically treated water to extract the gas and the disposal of waste water after extraction require primary attention.

**Chinese Manufacturing Capability** China claims to have technologies and equipment for shale gas development and has relatively stronger technologies and production capability in fields of manufacturing of drilling machine, hydraulic fracturing vehicle and the tools used at the bottom of a well. For example, the drilling machines manufactured by Sichuan Honghua Petroleum Equipment Company have been exported to US in batches for shale gas development; Jiangnan Fourth machinery's drilling machines have been in operation for the shale gas exploration well located in Weiyuan, Sichuan and 3,000 horse-power hydraulic fracturing pumping units have been manufactured by Jereh. Despite the above mentioned equipment, there are no systematic technologies which can offer the full package for shale gas development as well as the experimental apparatus for measuring and testing the parameters obtained during exploring and developing. The technologies including oilwell servicing technique and equipment such as rotation-guided technologies, well drilling-measuring technology; fracturing separated components are lagging behind the international advanced standards.

## International cooperation of two National Oil companies in shale gas area

- CNPC: worked with US Newfield and Shell in Weiyuan block and Fushun-Yongchuan block; training agreement with US PRC company
- Sinopec: jointly study shale gas development with ConocoPhillips in the onshore Qijiang block, Sichuan Basin over the next two years pertaining to exploration,

development and production. Pursuant to Shell and Chevron, ConocoPhillips is the third major international oil company into China's shale gas development.

### **Opportunities and Challenges for International energy companies**

The Chinese government intends to replicate the coal bed methane legal regime for shale gas. This would imply a reduction or exemption of user charges for prospecting, exemption of customs duties for the import of some high-tech equipment needed for the exploration of blocks of shale gas, implementation of a certain degree of liberalization in the price of natural gas, fast-tracking of the approval process for land use rights qualification, etc.

Foreign companies willing to participate in the exploration and production of shale gas in China will face major challenges in complex geological environment, water shortage, the lack of infrastructure network as well as legal vacuum because no detailed rules have so far been enacted to regulate the licensing, exploration or production of shale gas. Investors will thus likely face significant environmental and business challenges, and high development costs, which is estimated to be 4-5 times higher than those in USA.

Although foreign companies are not yet permitted to participate directly in China's domestic shale gas licensing round, this is a positive development for overseas energy companies that are interested in leveraging their technology know-how, equipment expertise to gain access to the Chinese shale gas market, in particular their experience with horizontal wells and fracturing or "fracking" and technical services. Further regulatory developments in transferring and marketing the right of the independent mining resource may be in the near future, creating opportunities for international energy companies as well as domestic Chinese private companies to participate in the Chinese oil and gas market in ways impossible before.

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References:

## **Background on Shale Gas Policies from Chinese Government**

### **1. 12<sup>th</sup> Five-Year Plan on Shale Gas from 2011-2015**

Following the launch of China's 12th Five-Year Plan, which signals the Government's initiatives for the development and utilization of shale gas and other types of unconventional gas, in March 2012, the National Development and Reform Commission (NDRC), the Ministry of Finance, the Ministry of Land and Resources (MLR) and the National Energy Administration (NEA), jointly issued a development plan (the Plan) designated for China's shale gas development activities and initiatives from 2011 to 2015.

Providing background information on the current status of China's shale gas prospects, the Plan also lays out an overall target and four milestones to be achieved by China from 2011 to 2015, including

- completion of a nationwide shale gas survey and appraisal;
- production output to reach 6.5 billion cubic metres by 2015;
- development of appropriate methods, technologies and equipment for China's shale gas survey, appraisal, exploration and production;
- establishment of technical standards, rules and policies regulating the following activities in relation to China's shale gas development, such as reserve survey, appraisal and certification, test and analysis, exploration and production, and environmental measurements.

The Government will adopt five steps to achieve the target and milestones set out in the Plan:

- Increasing Government investment in shale gas survey and appraisal

The Government will set up designated funds to support shale gas survey and appraisal; selection of shale gas trial areas and exploration technology demonstration projects; shale gas geology study; and international co-operation.

- Developing shale gas technology

The Government will increase support for innovation and improvement of shale gas technology, classify shale gas technology research and development as a significant national project, promote the shale gas exploration demonstration project, encourage the establishment of a shale gas research and development centre and international co-operation and exchanges.

- Developing new shale gas exploration and production systems

The Government will accelerate the process of permitting substantial investors of various backgrounds to participate in China's shale gas development, and will set up the relevant qualification standards and tender regulations for shale gas mineral rights auctions. The existing mechanism and contract management system are also required to ensure that holders of oil and gas and coal mineral rights and/or exploration licences will invest and develop shale gas reserves within the same blocks which they were awarded originally, for the exploration and production of oil and gas or coal.

- Introducing incentive policies

The Government will study and introduce shale gas subsidies following the example of the subsidy policy for coal-bed-methane projects. Legitimate holders of shale gas exploration and development licenses can

apply for reduction or waiver of the relevant licence fees. In respect of any imported shale gas equipment (including the associated technologies) that are not available or cannot be produced in China, the importer may apply for the customs duties to be exempted. The wellhead price for shale gas will be the market price. The shale gas developer will be given priority when applying for a land use permit.

- Improving shale gas infrastructure

Solutions for improving shale gas infrastructure will depend on the location of the reserves. For reserves close to the existing natural gas pipeline network, the Government will encourage construction of transportation pipelines at the shale gas production field connecting to the existing natural gas pipeline network. For reserves far from existing natural gas pipeline networks, or new wells, (production output of which is ramping up), the Government will encourage the construction of small-scale LNG or CNG facilities to capture the gas produced to avoid flaring the gas. The construction of transmission pipelines will take into account the production phase of the relevant shale gas wells.

The Plan is intended to build a solid foundation for the 13th five-year plan for China's shale gas development. Building on the results of the Plan (including completion of a nationwide survey of the shale gas reserves and development of suitable shale gas technology), the Government will increase or encourage greater investments in shale gas reserves from 2016 to 2020, including expanding the production scale in 19 exploration blocks so the total shale gas output by 2020 could reach to 60 to 100 billion cubic metres.

## **2. Financial Subsidy from Chinese government**

The Ministry of Finance and the National Energy Administration (under NDRC) jointly issued a notice dated November 1, 2012, which stipulated companies will receive a subsidy of Yuan 0.4 (6 cents)/cubic meter of shale gas production from 2012 to 2015.

The notice stated that the "subsidies will be adjusted according to the development of the shale gas sector," adding that finance bureaus at the local government level will be able to set appropriate subsidies according to the pace of gas utilization and development in each region.

Applications for funding have to be submitted to the local finance bureaus before the end of January every year. Companies also have to submit reports on the previous year's development plans, including coring and logging data.

## **3. Two Rounds of Bidding by Ministry of Land and Resources (MLR)**

China has launched 23 exploitable shale gas blocks in total until the end of 2012.

China held the first round auction of exploration rights for four shale gas blocks in June of 2011 by inviting six state-owned enterprises to participate. Usually the bidding process will begin with a preliminary review, followed by a detailed review of the invested capital, equipment, personnel, hydraulic fracturing technology at a later stage. Based on the winning bids in the last round, bidders who promised to drill the most wells with the largest capital investment were selected.. Both CNPC and Henan Provincial Coal Seam Gas Development and Utilization Co., Ltd in the last round entered into a Transfer Agreement of Shale Gas Exploration Permit with the MLR ("Transfer Agreement"). The content of such Transfer Agreement was not released to the public. However, an exploration permit valid for three years was granted with possibility to extend ..

The second round of tender was held in October 2012. The blocks covered 20,002 square kilometers in Hunan(5 blocks), Guizhou (5 blocks), Chongqing (3 blocks), Hubei(2 blocks), Henan (2 blocks), Jiangxi (1 block), Zhejiang (1 block), and Anhui (1 block). Among these blocks, 11 blocks are larger than 1,000 square kilometers. Hefeng Shale Gas Block in Hubei is the largest block, covering an area of about 2,306 square kilometers.

Similar to the previous round, each bidder is required to have a registered capital of more than 300 million RMB and must possess oil and gas exploration qualifications or partner with an entity with such qualifications. A maximum of two blocks is allowed each bid. A total of 83 enterprises participated in the second round, and a third of them are from private enterprise.

Result of the second round was announced on December 7, 2012 with two Chinese private firms and fourteen state-owned enterprises as successful bidders. Huaying Shanxi Energy Investment Co., Ltd, a subsidiary of Wintime Energy Co., Ltd and Beijing Taitantongyuan Natural Gas Technology Co., Ltd, two private enterprises, won the biddings of two blocks in Fenggang, Guizhou. A total of 14 state-owned enterprises got the remaining 17 blocks. Most of them are engaged in electricity or coal mining. Huadian Corp, China's electricity giant, turned out to be the largest winner with three of its subsidiaries seizing exploration rights of four blocks. None of the traditional oil companies won the bidding, and CNPC was only awarded the 3rd candidate for a shale gas block in Hunan.

The successful bidders have to establish an exploration company and start evaluation on the designated area before forwarding the exploration proposal. The proposal will include key statistics on gas condition, storage condition and effectiveness to transform the formation, then followed by the selection of the drilling site and appropriate directional drilling equipment, optimum fracturing design as well as the completion methods.