

Is China ready to develop its shale gas resources ?

Generalities

The technically recoverable reserves^{1,2,3} would be comprised between 700 and 1000 TCF (120 and 180 Gboe) with 600 TCF (100Gboe) in the Sichuan Basin and 210 TCF(36Gboe) in the Tarim Basin (**Figure 1**). However, the geology of these shale gas resources is considerably less favorable than in the US : most Chinese shale basins are structurally and tectonically complex with numerous faults some of which are seismically active. The southwestern quadrant of the Sichuan Basin would be the most promising play: more favorable geology, water resources, existing pipelines and access to major urban markets.

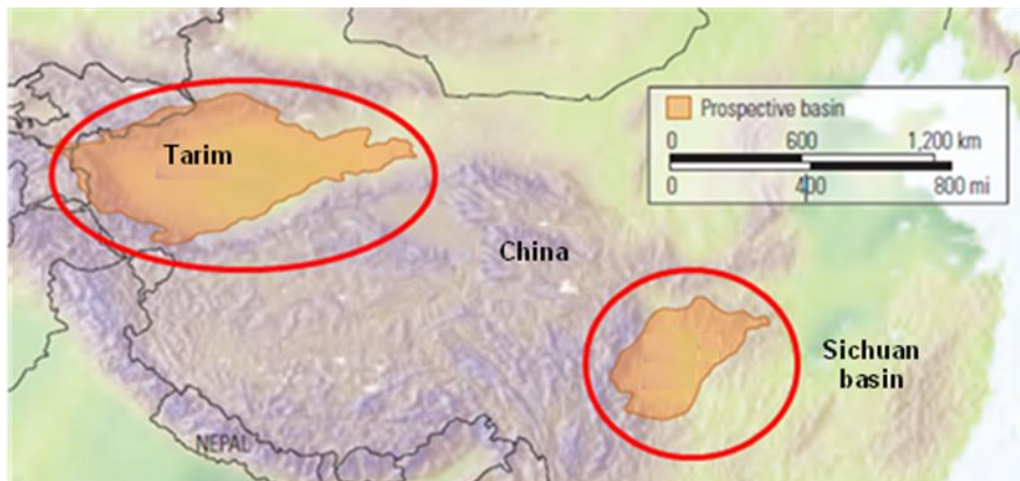


Figure 1 – Sichuan and Tarim basins

Large difference in contexts between the US and China

In the US, the O&G industry is **vertically separated** insofar as operators are independent from services companies and do not own or operate natural gas pipelines. There are no restrictions to develop natural gas. As a consequence, many independent firms exist, some of which are small while others are large (Devon, Chesapeake). Such independent (i.e. Mitchell energy) have played in the past a critical role in overcoming the innovation problem, lowering costs and make profitable shale oil & gas development. The US minerals law (subsurface belongs to land owners and not to the state) incentivized all players to invest in shale gas drilling.

By contrast, in China all segments (exploration, production, services, refining, gas transport) are dominated by three major national oil companies: CNPC (60%), Sinopec (23%) and CNOOC (14%) control 97% of gas production. The three NOCs are **vertically integrated**. They control 90% of the upstream, service and pipeline sectors. The three NOCs are majority-owned by the Chinese state and, the top leaders are directly appointed by the central government. However they are not directly run by a governmental agency. Despite some instances of coordination, they have a high degree of independence. The Chinese state owns all subsurface (oil and gas) rights. Surface (i.e. land) rights belong to the state in urban areas but are collectively owned in rural areas which can lead to conflicts between NOCs and local interests.

¹ Ministry of Land and Resources

² Energy Information Administration 2013

³ Dong, D., C. Zou, H. Yang, Y. Wang, X. Li, G. Chen, S. Wang, Z. Lu, and Y. Hong. 2012. "Progress and Prospects of Shale Gas Exploration and Development in China," *Acta Petrolei Sinica* 33(S.1): 107–14

Current Shale Gas Policies in China : taxes, prices, pipeline & R&D

China currently produces (47% of world) and consumes (51% of world) massively coal for its electric power. Displacing coal to gas to limit its GHG emission is therefore for China the key challenge for the next 30 years. Consequently, in 2012 and 2013 the Chinese government started to promote shale gas development and declare these resources **as a new national strategic goal**. This policy comes in several actions :

- ***Opening to new entrants*** : an O&G industry owned by the “big three” is viewed as a major factor hindering the development of shale gas in China. The appropriate response is therefore to open shale gas development to new entrants. A first round was launched in 2011. Six (the big three + 3 others) firms were invited to bid on four shale gas blocks. In 2012, a second round open to domestic but also international companies (the majority of which are controlled by domestic companies) was launched for 20 shale gas totaling about 20,000 square kilometers. These blocks had however worse geology and infrastructure than those already registered by the big three. Among 83 bidding companies, 16 shared the 20 blocks. Winners have the obligation to explore their blocks within three years to have the right to further develop it.

The first results are however disappointing insofar as new entrants are slow to make the investments (seismic surveys, drilling campaigns) they promised in their bids. This is explained by the fact that most new entrants come from the finance or power generation business. Without any experience in geology, drilling and fracturing they hesitate to jump into shale gas operations. Furthermore, given the limited size of the blocks, the quite poor geology and infrastructures it is very likely that the new entrants will undergo large amount of losses in the short run. Some are pure speculators who intend to sell the exploration rights without making the promised investment. Others bet on making profits in the long run by keeping the blocks as long as possible without fulfilling their obligations but expecting at the same time new cost-effective technologies to arrive on the market. To discourage speculation in the future it is therefore imperative that the winners in the first two rounds lose their blocks if they do not make the promised investments.

- ***Natural gas price policy*** : the price of natural gas in China is regulated and set below the equilibrium market price⁴. This matter of fact boosts demand, discourages production and creates shortages which does not complies with the goal of replacing coal with natural gas to reduce GHG emissions. Deregulating natural gas prices would generate stronger incentives to the NOCs to invest in developing all type of gas (conventional, tight and shale). A first deregulation step would consist in linking gas prices to the import prices of fuel oil and LPG but only applied to incremental volume consumption (as opposed to existing volume consumption) and nonresidential users only. The ultimate goal is to establish a system in which all natural gas wellhead prices are determined by the market. The transportation price would still be regulated.
- ***New fiscal policy*** : Chinese authorities announced a fiscal subsidy policy of US\$1.81/MBTU (21% of the citygate gas price) to be adjusted according to the development status of shale gas. The new fiscal policy also reduces fees and waives import taxes for equipment that cannot be domestically produced.
- ***Gas transport*** : the lack of both pipeline and open access to existing pipelines is a hindrance to shale gas development. Chinese authorities encourage therefore private companies to invest in gas infrastructure projects and urge pipeline operators to provide fair and

⁴ The domestic natural gas price lower than its imported price

nondiscriminatory services to all customers. A new policy requires pipelines operators to provide **unused** pipeline capacity to new customers on a fair and nondiscriminatory basis. It does not however apply to used facilities which represent 90% of the Chinese network. In the short run, a nondiscriminatory service will be hard to implement in China.

- **Innovation** : for similar reasons (in particular lack of oil & gas experience) innovation will not rely on new entrants but essentially on CNPC and Sinopec who have acquired some advanced expertise in horizontal drilling and hydraulic fracturing when developing the huge Chinese tight gas resources. NOCs are also advantaged as, contrarily to new entrants, they can sign up production sharing agreements with IOCs. Authorities have created a specific national shale gas R&D center to encourage using most existing advanced technologies, developing domestically new technologies and launching demonstration pilots. CNPC has launched three pilots (Changning-Weiyuan, Zhaotong and Fushui-Yongchuan in cooperation with Shell for CNPC, Fuling for Sinopec). Both NOCs also gained in innovation by signing international JVs (purchase of Canada's Nexen Inc, partnership with Canadian Encana in British Columbia, shale gas assets bought from Chesapeake Energy and Devon Energy). Compare to new entrants, NOCs can take the required financial risks⁵ and control the majority of service and gas pipelines companies in China. However, in spite of their size, the big three will have to select and share their investments between domestic shale gas, tight gas and coalbed methane⁶ as well as international O&G projects. Sinopec's commercial incentive in investing shale gas appears to be stronger than that of CNPC because of its much smaller natural gas production volume and proven reserves. This is perhaps part of the reason why Sinopec is the first to achieve major breakthroughs.

⁵ CNPC is the fifth-largest oil and gas company in the world, and Sinopec is twenty-third

⁶ Some Chinese stakeholders argue publicly that it is logical to prioritize the development of these reserves over shale gas