China's Gas Expansion

KEUN-WOOK PAIK traces China's growing role in driving world natural gas demand

At a gas conference in Kuala Lumpur on 5 June 2012 the IEA stated that consumption of natural gas could rise by 17 per cent by 2017, and that Asia will be by far the fastest growing region, driven primarily by China, which will emerge as the third largest gas user by 2013. The driving force of this expansion is the Chinese authority's effort to reduce its heavy dependence on coal use and to increase significantly the role of gas in the country's energy balance.

According to BP's *Annual Statistical Review of World Energy*, at the end of 2009 China's total proven gas reserves were 2.9 tcm, and the reserves-to-production (R/P) ratio was 29.0. This somewhat conservative estimate, however, has done little to dent Chinese confidence in its ability to expand domestic capacity. In November 2004, an authoritative report on China's energy future was prepared by the State Council's Development Research Centre (DRC) under the title 'Research on National Energy Strategy and Policy in China'. This advocated the greater use of natural gas as a clean alternative to coal, in particular in the power and residential sectors. It also stressed the importance of raising natural gas to 10 percent of the energy mix by 2020.

During the 2000s an effort was made to bring about a gradual price reform and to a certain extent this has helped the expansion of gas use in China. According to CNPC's analysis, during the period 2000–2009, China's natural gas consumption increased from 24.5 bcm to 88.7 bcm, with an annual growth rate of 15.4 percent. Annual average growth was 4.5 bcm during the period 2000–2005 and 10.5 bcm in 2005–2009. The share of natural gas in China's energy consumption mix increased from 2.4 percent in 2000 to 3.8 percent in 2009.

The two most important institutions in China's energy bureaucracy that supervised this unprecedented gas expansion were the State Council and the National Development and Reform Commission (NDRC), while the three NOCS – CNPC, SINOPEC and CNOOC – are the main vehicles for implementing the expansion. Like Gazprom in Russia, CNPC is exclusively authorised to handle the transnational pipeline development negotiations with both Russia and the Central Asian Republics – mainly Turkmenistan, Uzbekistan, and Kazakhstan. SINOPEC as the latecomer in the gas upstream business is increasing its presence in both the Sichuan and Tarim basins. In the case of offshore gas field developments and the LNG import business, CNOOC is at a real advantage. It is worth noting that the Ministry of Land and Resources is responsible for the current initiative for shale gas development in China. However, the gas expansion drive by the three NOCs was, is, and will be significantly affected by NDRC Price Department's stance towards the long delayed gas price reform.

Maximisation of Domestic Gas Production

Among the three Chinese NOCs, CNPC was the driving force behind the expansion of gas production in China during the 2000s. In July 2009 a prominent Chinese energy expert, Jia Chengzao, chairman of the Chinese Petroleum Society (CPS) gave a strong indication that China's gas production capacity will reach 250 bcm by 2030, and consequently China will have to import 150 bcm of gas in order to cover the 400 bcm/y gas demand in that year. Xinhua News Agency's 'China Natural Gas Report' pointed out that the country's gas development is driven by four key regions – the Tarim basin, the Sichuan basin, the Ordos basin and the South China Sea basin. At their peak, production in these regions will, respectively, reach 75–80 bcm, 55–65 bcm, 40–45 bcm and 40–50 bcm. The total could be in the range of 210–240 bcm. During the December 2011 World Petroleum Congress in Doha, PetroChina's vice president Ning Ning said China's gas production will reach 150 bcm by 2015, of which 43 bcm or 29 percent will come from unconventional gas production. He predicted that by 2030 the figure would be 250–300 bcm, of which 100–150 bcm will be from unconventional gas.

Beijing planners have high expectations for coalbed methane (CBM) and shale gas production. According to the National Energy Administration (NEA)'s CBM industry development plan for the 2011–2015 period, China's CBM is projected to reach 20–24 bcm by the end of 2015, of which 10–11 bcm from surface wells and 11–13 bcm from underground sources. This target figure was reconfirmed in NDRC's 12th Five Year Plan. The draft plan envisages 21.5–23.5 bcm/y production by 2015. In the case of shale gas, in March 2012 China officially unveiled shale gas production targets, with the NEA's 12th Five Year (2011–2015) Shale Gas Development Plan calling for output to reach 6.5 bcm/y by 2015 and between 60 and 100 bcm/y by 2020 (the initial projection was 80 bcm/y).

Western institutions are not as convinced about the rosy picture of the shale gas revolution in China during the 2010s. Wood Mackenzie projected that by 2020, China's CTG (coal to gas) and CBM production will reach 27 bcm and 17 bcm respectively against only 11 bcm of shale gas production. These projections suggest that China could fall considerably short of its shale gas production goals. Wood Mackenzie also predicted that CTG and CBM will each deliver more output than shale into the Chinese gas market right up to 2024, and added that shale gas development is a long-term story in China that will only accelerate after 2020 to provide a major boost to domestic gas output. By 2030, it could potentially contribute around 150 bcm. It remains to be seen whether this ambitious target can be achieved. The shortage of water supply in the northern part of China, however, will restrict shale gas production significantly.

Unprecedented Demand Growth

Despite the rapid rise of domestic capacity, the level of gas demand outpaced it. According to the CNPC, natural gas consumption in China recorded an annual growth of 16 percent during the 2000s, reaching 107 bcm, 4.4 times the use in 2000. It constituted 4.4 percent in the total use of primary energy, up from

2.4 percent in 2000. China's production during the 2000s recorded 14 percent annual growth, reaching 94.5 bcm in 2010, 3.6 times higher than in 2000. Demand in 2011 reached 130 bcm, with production at only 110 bcm.

In 2010, the NEA predicted that China would witness an unprecedented increase in gas use, and that demand in 2015 would reach 260 bcm, 8.3 percent of China's primary energy mix. Immediately after the 12th Five Year Plan (2011–2015) announcement, the Energy Research Institute (ERI) projected that China's natural gas supply by 2015 would be as high as 230–240 bcm/y, of which 150 bcm would be domestic production, 30 bcm imports in the form of LNG, and 50 bcm imports by pipeline. CNPC projected that demand in 2030 would reach 392 bcm. This figure is based on the reference scenario; under the high growth scenario the figure is 438 bcm, and under the low growth scenario, 341 bcm. Wood Mackenzie went so far as to state that total gas demand would rise from 93 bcm in 2009 to 444 bcm in 2030, a compound annual growth rate of 7.5 percent, most of the growth coming before 2020.

Against CNPC's 2010 projection of 392 bcm/y of gas demand by 2030, ERI and SINOPEC's 2011 projection easily passed the 400 bcm benchmark, reaching 430 bcm and 467 bcm respectively. A year later CNPC's projection reached 500.0 bcm for the first time. What is not clear at this stage is how large a contribution domestic production will make in China's gas expansion in the coming decades. During the World Gas Congress conference in Kuala Lumpur in early June 2012 Wood Mackenzie predicted that China's gas demand would increase from just over 150 bcm today to more than 600 bcm in 2030 – accounting for almost 30 percent of incremental global gas demand growth over that span. Even with unconventional gas growth, Wood Mackenzie added that China would still require over 130 bcm of uncontracted imports by 2030.

Uneven Distribution of the Gas

Despite massive gas expansion, the benefits will not be equally shared among provinces. Natural gas comprises 12 percent of Beijing Municipality's energy mix, the highest ratio of China's 31 regions. Shanghai ranks a distant second with natural gas forming 4.12 percent of the municipality's energy mix last year. In the prosperous economies of Tianjin Municipality and Guangdong Province gas accounts for approximately 3 percent of energy consumption. Several regions in west China, including Shaanxi, Shanxi, Qinghai and Gansu provinces as well as the Ningxia Hui Autonomous Region, boast higher proportions of natural gas in their energy mixes due to proximity to major gas production bases. Due in part to substantial newly discovered gas reserves, Sichuan Province boasts a higher ratio of gas utilisation than other Chinese regions at an estimated 2.71 percent.

According to CNPC, eastern China areas would see higher demand for natural gas than western areas, while more than 65 percent of the nation's total demand for natural gas would come from central and southern China by 2030. It also forecast that carbon dioxide emissions are to be reduced by 300 mt, 470 mt, and 67 mt respectively by 2015, 2020 and 2030, while sulphur dioxide emissions are to be reduced by 5.05 mt, 7.68 mt, and 10.97 mt assuming that all the natural gas consumed is used to substitute for coal. This projection confirms that the Beijing authority is serious about reducing pollution levels in China; and the short cut to dealing with the issue is to reduce the country's dependence on coal.

"Beijing planners have high expectations for coalbed methane (CBM) and shale gas production."

Table 1 shows the ERI's projection that gas demand by the power sector will reach 80 bcm/y by 2030, while the demand by city gas (town gas) will be only 70 bcm. However, the ERI projection is very different from that of the Chinese NOCs such as CNPC and SINOPEC, which envisaged a much greater demand by city gas in the coming decades.

Gas Import Options: Pipeline vs LNG

The figures of 500 bcm/y projected by CNPC and 600 bcm/y by Wood MacKenzie are very encouraging in terms of slowing down China's heavy dependence on coal use. A significant volume of pipeline gas and LNG would have to be imported to meet the demand. Beijing planners prefer to maximise pipeline gas imports as it does not require sea lane supply. However, Beijing's preference does not necessarily mean that the maximisation of pipeline gas imports in the coming decades will save the market for 68 bcm pipeline gas supply from Russia to China. China is already committed to import a total of 100 bcm/y of pipeline gas from the Central Asian Republics, of which 65 bcm/y from Turkmenistan, 25 bcm/y from Uzbekistan, and 10 bcm/y from Kazakhstan. In April 2011, NEA indicated that construction of the third, fourth and fifth West-to-East pipelines (WEP) will begin during the period 2011–2016. If the construction of WEP III, IV and V are completed by 2020, the maximum supply capacity will be 120 bcm/y (30 bcm/y x 4). As WEP II and III are already allocated for the

Table 1: ERI's Projection of China's Gas Demand by Sector (Unit : bcm)

	2010	2020	2030
Town gas	19.0	33.5	69.0
Service	8.5	16.9	35.0
Heating	6.0	13.2	26.0
CNG	4.0	14.3	27.0
Industry	35.0	98.0	147.33
Power Gen	23.0	71.2	80.13
Fertiliser	21.0	40.8	45.44
Sub-Total	116.5	287.9	429.9
Oil field's self use	5.0	5.9	7.5
Total	121.5	293.8	437.4

Source: Energy Research Institute, NDRC, China (2011)

pipeline gas supply from the Central Asian Republics, the space for Altai gas from Russia's west Siberia can be identified only after WEP IV and V are completed. It remains to be seen whether an integrated package deal (based on cooperation in upstream, midstream and downstream sectors) offered by the Chinese side during the first half of 2012 will open the door to the pipeline gas supply from Russia to China during the second half of the 2010s.

Apart from the 110 bcm of pipeline gas (including that from Myanmar), China is determined to expand its LNG supply very rapidly. Until 2011, a total of five LNG terminals were in operation, and four more terminals are now under construction. The total LNG receiving capacity for the nine terminals will be around 30 mt/y (with the second stage development, it will be at least 50 mt). If the additional eight to ten proposals to build LNG terminals are approved by NDRC, the scale of LNG supply to China will be massive. Interestingly, Wood MacKenzie made a cautious projection on China's LNG expansion. In the mid-term, China's position is stronger than that of regional buyers like Japan and India, with LNG demand reaching only 18 bcm by 2017. Long-term LNG demand will accelerate, requiring an additional 33 bcm by 2020 and 50 bcm by 2030. Considering that Chinese NOCs are very sensitive about the price of imported LNG, price competitiveness will play a critical role in LNG expansion. In this context, Russia's Asia strategy to prioritise LNG export will be heavily affected by the price factor. One thing for certain is that the price of Vladivostok LNG based on the long distance pipeline gas supply from East Siberia will not be competitive.

In short, China is set to witness a massive gas expansion during the 2010s as Beijing is determined to increase the role of gas in China's energy balance. It remains to be seen whether China will be the beneficiary of the shale gas revolution. The result of unconventional gas development in China during the 2010s will balance the level of pipeline gas and LNG imports to China. One thing for sure is that China will not simply wait for the pipeline gas supply from Russia; if there is no breakthrough by the end of 2012 it will give maximum attention to alternative gas supply sources, in particular LNG. For this reason many western observers are very interested in understanding the role of Russia's pipeline gas in China's gas expansion in the coming decades. If the breakthrough is made in 2012, the impact on regional and global gas trading will not be small. ■