

A Review of Recent Trends in China's Gas Sector and a Glimpse into the 14th Five-Year Plan



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Executive Summary

China's economy has rebounded since April 2020 and China is one of the few countries in the world that is expected to avoid a recession in 2020. With low imported gas prices, progress with the gas market liberalization and success in pushing up shale gas production, the window to a golden age of gas has opened up again in China.

The Chinese gas market is moving against the global trend. Natural gas demand has continued to rise, albeit at a slower pace. It is expected to grow by 4% in 2020 and reach 320 billion cubic meters (bcm), mainly boosted by city gas consumption. Gas production has continued its significant growth and is likely to reach close to 190 bcm in 2020, driven by a surge in shale gas production. More domestic output means less room in China's gas supply mix for imports which have slowed down – with negative consequences for its central Asian pipeline suppliers at the high end of the supply cost. Boosted by low LNG prices, LNG imports have remained strong. China's dependence on imported gas has declined for the first time in 2019 and has continued its contraction in 2020. Investment in key infrastructure such as pipelines and gas storage has accelerated.

Major gas reforms have come thick and fast over the past 12 months across the entire gas value chain. A crucial landmark was the establishment of China Oil & Gas Pipeline Network Corporation (PipeChina) in December 2019. The new national pipeline company will be responsible for the development and management of transportation of gas, crude oil, refined products as well as re-gasification and underground gas storage. PipeChina will consolidate a large part of midstream assets held by the three national oil companies (NOCs), who have started to swap assets. It will operate the infrastructure assets as an independent business and will provide efficient third-party access, facilitating market access to suppliers and end consumers. Ultimately, a coordinated, efficient, and flexible "one network across the country" will improve pipeline transmission efficiency and reduces final energy costs.

Upstream, in an effort to encourage investment into exploration and production (E&P), foreign companies have been allowed to explore and develop oil and gas resources since July 2019 without having to partner with one of the NOCs. China will also open up more acreage through competitive bidding and tenders.

Downstream, restrictions on foreign investment have been further relaxed and gas market pricing has continued to move towards greater marketisation. In March 2020, the government has introduced the possibility to move from benchmark city-gas pricing to market pricing, starting with provinces where there is enough competition on the supply side (typically coastal regions with multiple LNG receiving terminals).

The picture that emerges from these reforms is an industry structure in which almost all midstream infrastructure remains under government control, while the upstream and downstream sectors are increasingly exposed to competition—a whole new commercial dynamic in Chinese gas.

During the 13th FYP period (2016-2020), the main pillars of the reform of the gas system have been designed. The 14th FYP will focus on the implementation of the new policies. More supporting measures, implementation rules and market supervision will be introduced to enforce these new reforms. The gas industry will have to adapt to the new rules. Market players will have to adjust their business strategies. Already, competition is developing in the retail market and downstream consolidation with integration under way.

The growth of domestic gas production, its availability and the benefit of low gas prices in the post-pandemic period augur well for future gas demand, which is expected to increase by 7% to 9% annually to reach 450 bcm to 500 bcm by 2025. Policies focused on clean air will provide growth opportunities for the gas industry in this decade. Likewise, natural gas, which is cleaner than coal, will help China to control carbon emissions.

Growing trade and political tensions as well as the COVID-19 pandemic have elevated national energy security to a new level of concern, making safeguarding energy security and improving energy self-sufficiency top priorities. With heightened concerns on national security and supportive upstream policies, the outlook for Chinese gas production in the 14th FYP looks upbeat. Domestic natural gas production is expected to reach 260 bcm by 2025. Shale gas has driven the growth of gas production in the past two years and is expected to drive China's gas output growth over the next five years.

Despite the strong increase in domestic gas production, gas imports will increase to fulfil the rising supply/demand gap during the 14th FYP period. In addition to the ramp up of pipeline gas deliveries from Russia – which started at the end of 2019 – LNG imports will continue to expand. The low LNG prices environment provides a good opportunity for China to import more LNG, favoring LNG imports over pipeline imports. Indeed, China is expected to become the world's leading LNG importer in 2023.

Table of Contents

INTRODUCTION	6
THE IMPACT OF COVID-19 ON THE CHINESE GAS MARKET	8
Gas demand expected to increase by 4% in 2020.....	8
Natural gas production continues its significant expansion	9
Reliance on imported gas falls	12
The infrastructure build out continues	12
MAJOR STEPS IN GAS MARKET REFORMS	14
Upstream: removal of restrictions on foreign companies	14
A landmark reform in the midstream.....	16
Downstream: More access for foreign companies	19
Towards full market prices	19
LOOKING AHEAD: THE 14TH FIVE-YEAR PLAN FOR NATURAL GAS... 	21
Market reforms: rules to ensure a smooth implementation	21
Growing gas demand in response to air pollution and climate change .	23
High contribution of domestic gas production to the national energy security.....	25
The key role of LNG on the Chinese market	27
CONCLUSION	29

Introduction

In September 2019, the Centre for Energy & Climate published a report on China's quest for gas supply security and another on China's quest for Blue Skies.¹ Since then, the COVID-19 pandemic has inflicted high human costs across the world and has had a major impact on global and China's economic, social and energy developments, notably a sharp decline in China's economic activity and energy consumption in the first quarter of 2020.² Deteriorating external relations with the European Union, a confrontation with the United States and a fall in oil and gas prices are also part of the new landscape. This note updates the above-mentioned reports and focuses on recent trends in China's gas market and gas market reforms. It also gives a glimpse of the upcoming 14th Five-Year Plan (FYP) for Natural Gas Development (2021-2025), to be issued in 2021.

The pandemic has underlined how important exports are to the Chinese economy. It has also exacerbated existing frictions between China and other countries, highlighting how dependent China has become on imports of key components, resources and materials. On the other side, the pandemic has exposed how reliant global supply chains have become on Chinese-made inputs. To some extent, events this year have merely accelerated trends in deglobalization that were already underway.³

But China's economy has recovered rapidly. Economic activity, energy and electricity consumption have rebounded since April 2020. In response to the COVID-19 impact, China adopted fiscal and taxation support, financial support, and comprehensively strengthened employment priority policies. In March 2020, the government announced major infrastructure programs and stimuli. Alongside urban renewal and major transport and water conservation projects, the government is also prioritizing investment

1. S. Cornot-Gandolphe, "China's Quest for Blue Skies: The Astonishing Transformation of the Domestic Gas Market", *Études de l'Ifri*, Ifri, September 2019, available at: www.ifri.org; S. Cornot-Gandolphe, "China's Quest for Gas Supply Security: The Global Implications", *Études de l'Ifri*, Ifri, September 2019, available at: www.ifri.org. Important analysis on China's hydrogen economy can also be found in a recent report by Kevin Tu: K. Tu, "Prospects of a Hydrogen Economy with Chinese Characteristics", *Études de l'Ifri*, Ifri, October 2020, available at: www.ifri.org.

2. K. Tu, "COVID-19 Pandemic's Impacts on China's Energy Sector: A Preliminary Analysis", Center on Global Energy Policy, Columbia/SIPA, June 2020, available at: www.energypolicy.columbia.edu.

3. S. Lewis, "Insight from Shanghai: China Chases New Economic Model with High-Tech Infrastructure Push", Platts, September 23, 2020, available at: <https://blogs.platts.com>.

in “new infrastructure” (such as 5G, data centers, artificial intelligence, the industrial internet, inter-city and urban rail, new energy vehicle charging infrastructure and ultra-high-voltage grids). These policies have already shown results and should contribute to support the economy. The World Bank baseline forecast (July 2020) envisions an annual economic growth of 1.6% in 2020.⁴ China is one of the few countries that will register a positive growth in 2020, although the forecasted rate would mark the slowest expansion of the Chinese economy since 1976.

4. World Bank, “China Economic Update – July 2020”, available at: www.worldbank.org.

The Impact of COVID-19 on the Chinese Gas Market

Gas demand expected to increase by 4% in 2020

The latest report of the International Energy Agency (IEA) predicts that global natural gas demand will fall by 4% year-on-year (y/y) in 2020, a decrease of approximately 150 bcm.⁵ But in China the basic conditions and supporting factors that promote the coordinated and stable development of China's natural gas industry have not changed.⁶

Contrary to global trends, natural gas demand in China is expected to grow by 4% in 2020 and reach 320 bcm, up 13 bcm from 2019.⁷

Chinese GDP fell by 6.8% during the first quarter of 2020 (Q1 2020) because of quarantines and lockdowns—the first time there has been a contraction on this scale since the cultural revolution. The growth rate of apparent gas demand dropped significantly in Q1 2020 but remained positive (+1.6% y/y), reflecting the “resilience” of the natural gas market. Since then, apparent gas demand has resumed relatively strong growth (211.6 bcm in the first eight months of the year, up 6.4% y/y), although at slower pace than in 2019. Real gas consumption was 155.6 bcm in the first half of 2020, up 4% y/y.⁸

There are large differences between end-users. City gas consumption has maintained steady growth. Industrial gas consumption has been severely impacted by the pandemic, as the lockdown and weak demand for Chinese exports outside of China lowered gas use by manufacturers.

5. IEA, *Gas 2020: Analysing the Impact of the Covid-19 Pandemic on Global Natural Gas Markets*, Fuel Report, June 2020, available at: www.iea.org.

6. CNPC, “China's Natural Gas Industry Performed Well in 2019” (in Chinese), CNPC News Center, May 9, 2020, available at: <http://news.cnpc.com.cn>.

7. All statistical data and forecast for 2020 in this section come from: National Energy Administration (NEA), Oil and Gas Department, Development Research Center of the State Council, Ministry of Natural Resources, *China Natural Gas Development Report (2020)*, September 2020, available at: www.chinapower.com.cn supplemented by monthly data published by the Chinese National Bureau of Statistics (NBS) and the General Administration of Customs of China (GACC).

8. OF Week, “Analysis on the Supply and Demand Status and Development Trend of China's Natural Gas Industry in 2020” (in Chinese), September 2020, available at: <https://chuneng.ofweek.com>.

Industrial gas demand has gradually recovered from its decline in the first months of the year. Gas demand for power generation and as feedstock in the chemical industry contracted in the first half of 2020.

At the beginning of the pandemic, in response to the decline in natural gas consumption momentum, the government reduced natural gas prices for industrial and commercial users and various regions introduced natural gas price adjustment policies to stabilize natural gas consumption. International oil prices fell sharply, and gas prices fell to record lows, objectively creating conditions for promoting natural gas consumption.

China's gas consumption growth was slowing already before COVID-19, with growth rates dropping from highs of 17.2% in 2018 and 15.1% in 2017, to 9.4% in 2019. Gas demand amounted to 306.7 bcm in 2019, accounting for 8.4% of the primary energy consumption. Growth was dampened by the economic slowdown and the slower pace of implementation of "coal-to-gas" projects. The strong drive to improve air quality ("Blue Skies" policy) has remained a priority, but natural gas is no more the only energy to replace coal; it is complemented by coal-to-electricity and even by the use of clean coal.

Natural gas production continues its significant expansion

Natural gas production was 122.5 bcm during the first eight months of 2020, an increase of 8.8% y/y. Despite the impact of the pandemic on energy demand and the collapse in oil prices, Chinese NOCs⁹ have maintained E&P efforts to ensure a stable supply of natural gas and contribute to the COVID-19 prevention and control and to economic and social development. To reduce energy dependence on imports, in 2019, NOCs formulated the first ever "Seven-Year Action Plans" (2019-2025) aiming to increase oil and gas reserves and production. This followed President Xi's instructions to China's NOCs in July 2018 to intensify E&P to strengthen national energy security. Driven by this directive, in 2019, NOCs invested 334.8 billion yuan (\$49 billion)¹⁰ upstream, up 25.5% from 2018. Natural gas production (including unconventional gas but excluding synthetic gas from coal) reached 174.3 bcm in 2019, a significant increase of 16.9 bcm over 2018. Upstream investment led to several gas discoveries in various natural gas-rich basins and offshore areas. In 2020, under the pressure of lower demand and the challenge of low oil prices, NOCs have

9. i.e., China National Petroleum Corporation (CNPC) and its subsidiary PetroChina, China Petrochemical Corporation (Sinopec) and China National Offshore Oil Corporation (CNOOC).

10. 1 Chinese yuan (CNY) = 0.146433 USD (\$) (as of September 25, 2020).

reduced their capital spending budgets. PetroChina has budgeted a CAPEX of 200 billion yuan in 2020, compared to 230 billion spent on E&P alone in 2019.

Domestic gas production growth is being largely driven by shale gas output, which was already starting to surpass expectations by the end of 2018 (see Box 1). China will likely miss the target established in 2018 of reaching a total production of more than 200 bcm by the end of 2020, but not to a great extent. China's natural gas production is expected to reach 189 bcm in 2020 (excluding synthetic gas from coal), a year-on-year increase of about 9%, and overall a rapid growth trend. It is above the target of 181 bcm established by the National Energy Administration (NEA) in June 2020 in its guidelines for energy work in 2020.

Box 1: The spectacular growth of shale gas production

Chinese shale gas production is registering exponential growth. It grew by 5.1 bcm (up 37% y/y) in 2019, with output reaching 15.4 bcm. In the first half of 2020, shale gas production was 9.1 bcm, up 35% y/y and is expected to reach 19 bcm in 2020. The production could even be higher as CNPC and Sinopec are targeting a combined shale gas output of 22 bcm in 2020. Although it is well below the target of 30 bcm, established in the government's Shale Gas Development Plan (2016-2020) for 2020, the last two years have seen an impressive growth in shale gas output and resources. Shale gas production is projected to reach 80-100 bcm by 2030, according to the Shale Gas Development Plan.

Virtually all current production comes from the Sichuan basin in Southwest China, which holds around 80% of China's technically recoverable shale gas resources. PetroChina operates the Weiyuan and Changning fields in the southern part of the basin and Sinopec operates the Fuling field in the eastern part of the basin and has got approval to develop the Weirong field. Output has been rising as Sinopec and PetroChina's own oilfield service companies gain more experience drilling and extracting gas from the complex geology of the mountainous Sichuan Basin.¹¹ Recent growth in output has also been supported by a number of policy changes. Since 2018, the government

11. S. Lewis, "Insight from Shanghai: Can Shale Gas Secure China's Energy Security?", Platts, April 28, 2020, available at: <https://blogs.platts.com>.

has cut the resource tax for shale gas by 30%. In addition, since 2019 a bonus scheme has been introduced for the production of unconventional gas. International oil companies (IOCs) have had less success with shale at the beginning of the 2010s and most of them quitted shale gas exploration in China when the oil price fell in 2014.

Shale gas is expected to play an increasingly important role in China's gas production. China has the world's second largest technically recoverable shale gas resources after the United States (or even the first depending on sources). However, China has challenging geology, including deep reservoirs, faults, and low permeability, all of which add to production costs. The current commercial development of shale gas is limited to the middle and shallow layers in the Sichuan basin. But much of China's shale reserves and resources are locked more than 3,500 m underground, deep in the basin. The potential to significantly expand Chinese shale output depends on being able to economically extract gas from this deep shale. Sinopec has successfully achieved high flow rates from an exploration well over 4,200 m deep in the Sichuan basin.¹² But drilling deeper means more time and cost. The ambitious goal for shale gas production is supported by local governments. The Sichuan Provincial and Chongqing Municipal Development and Reform Commissions have announced a joint plan to produce 63 bcm of natural gas in Sichuan and Chongqing in 2025 and build China's first 100 bcm/y natural gas production base in 2035 with a total investment of 710 billion yuan, of which 270 billion yuan will be invested during the 14th FYP period.¹³ Natural gas production in the Sichuan-Chongqing region was 49.4 bcm in 2019 (excluding coalbed methane), accounting for 28% of the national natural gas output.

12. Global Times, "Sinopec Discovers 124.7 bcm Shale Gas Reserve in Sichuan", March 26, 2019, available at: www.globaltimes.cn.

13. Coal resource, 990 billion to the energy sector, Sichuan and Chongqing will build 100 billion cubic meters of natural gas production bases and tens of billions of gas storage bases (in Chinese), July 22, 2020, available at: www.coalresource.com.

Reliance on imported gas falls

Natural gas imports are expected to reach close to 140 bcm in 2020, a slight increase from 2019.¹⁴

After a steep slowdown in growth in Q1 2020, as some buyers declared force majeure on pipeline deliveries and tried to divert shipments of LNG, imports have resumed growth since April 2020. Total gas imports were up 3.3% y/y in the first eight months of 2020 to 65.07 Mt, or 89.1 bcm.¹⁵ LNG imports have resumed strong growth, boosted by low international spot LNG prices. China's LNG imports during August 2020 stood at 5.96 Mt, up 16.3% y/y. LNG imports during the first eight months of the year were 42.17 Mt, up 10% y/y. The competitiveness of LNG and the rising import capacity of LNG receiving terminals in China should enable to maintain relatively high import levels until the end of the year. Meanwhile, China's pipeline gas imports during January-August period were 22.9 Mt, down 7.4% y/y. LNG is expected to reinforce its dominance in 2020 with close to 65 Mt imported, while pipeline gas imports could fall marginally. More domestic output means less room in China's gas supply mix for imports – with negative consequences for its central Asian pipeline suppliers at the high end of the cost supply. China's dependence on imported gas declined for the first time in 2019, from 44.3% in 2018 to 43.1% in 2019. Over the first eight months of 2020, China's reliance on natural gas imports has continued its downward trend (42.1%).

With the commissioning of the Sino-Russian Eastern pipeline (that connects to Power of Siberia) at the beginning of December 2019, China imported pipeline gas from Russia for the first time (around 4-5 bcm are expected to be delivered in 2020 and 38 bcm/y at plateau level in 2025). With this new import route, China has completed its four major import channels (west, north and south by pipeline and east in the form of LNG).

The infrastructure build out continues

After the gas shortage that affected northern China in winter 2017-18, Beijing vigorously supported the construction of key gas infrastructure. In 2019, the infrastructure layout further improved and continued to be better interconnected. At the end of 2019, China had built more than 87,000 kilometers of trunk gas pipelines (of which 53,300 km built by

14. Gas imports amounted to 132.3 bcm (96.56 Mt) in 2019, a growth rate of 6.5% (+8.1 bcm), representing a decrease of 28.5 percentage points compared with 2018. With a share of 62% in total imports, LNG imports reached 81.6 bcm in 2019, an increase of 12.4%. Pipeline gas imports were 50.7 bcm, down 1.7%.

15. Conversion: 1 bcm=1.37 Mt.

PetroChina), with a transmission capacity of more than 350 bcm/y. China had 27 underground gas storage with a working gas capacity of 10.2 bcm, a year-on-year increase of more than 3 bcm and 22 LNG receiving terminals with a regasification capacity of 78 Mt/y.

The construction of major infrastructure projects has continued to be promoted in 2020. In February 2020, the “Notice on Accelerating the Advancement of Key Petroleum and Natural Gas Infrastructure Projects in 2020” was issued to promote the construction of major projects such as the Sino-Russian Eastern pipeline. The government issued the “Implementation Opinions on Accelerating the Construction of Natural Gas Storage Capacity” and allocated 1.692 billion yuan to support local gas storage capacity construction throughout the year.

The situation of gas shortage has completely been reversed. Combined with low international LNG prices, the new situation provides an ideal opportunity to revive the coal-to-gas policy at a much speedier pace. It also provides a favorable space for the continuous deepening of the reform of the natural gas system.

Major Steps in Gas Market Reforms

Since 2019, substantial steps have been taken to accelerate and deepen gas market reforms under the principle of opening the upstream and downstream markets and regulating the midstream. Crucial milestones were the establishment of the national pipeline company, PipeChina, in December 2019, the removal of restrictions on foreign participation in upstream since July 2019, and the announcement in March 2020 of a gradual move from regulated city-gate gas pricing to market pricing, starting with provinces where there is enough competition.

The picture that emerges from these reforms is an industry structure in which almost all midstream infrastructure remains under government control, while the upstream and downstream sectors are increasingly exposed to competition—a whole new commercial dynamic in Chinese gas.¹⁶

Upstream: removal of restrictions on foreign companies

The Chinese government has been committed to reform the upstream oil and gas sector and unveiled its plan in May 2017 (“Several Opinions on Deepening Oil and Gas Sector Reform”). The goal is to open up more acreage to qualified companies to diversify investment and participation upstream and ultimately create a market that is led by Chinese NOCs supplemented by foreign companies and domestic non-NOCs. Currently, the sector is dominated by the three NOCs that produce most oil and gas and also own most of the exploration rights for China’s conventional oil and natural gas.¹⁷ Non-NOCs were only granted E&P licenses in the field of unconventional gas (shale gas and coalbed methane).¹⁸ Until recently, foreign investment upstream has been restricted to joint ventures or cooperation with Chinese companies. IOCs have been involved in tight gas

16. Petroleum Economist, “China’s Challenge: Securing Sufficient Gas”, June 1, 2020, available at: www.petroleum-economist.com.

17. E. Downs and S. Yan “Reform Is in the Pipelines: PipeChina and the Restructuring of China’s Natural Gas Market”, Center on Global Energy Policy, Columbia/SIPA, September 2020, available at: www.energypolicy.columbia.edu.

18. In China, tight gas is included in conventional gas.

projects for over a decade, with both Shell and Total successfully partnering with CNPC through production sharing contracts in the Ordos basin. They also explored shale gas basins, mainly at the beginning of the 2010s, but without commercial finds.

Besides stimulating upstream investments with tax break and subsidies, several policies were issued in 2019 to make upstream access easier, and to promote the competitive transfer of exploration rights. In June 2019, the National Development and Reform Commission (NDRC) issued the “Special Administrative Measures for Foreign Investment Access (Negative List) (2019 Edition)”. The policy document removes the restriction that foreign investment in oil, natural gas, and coalbed methane E&P is limited to joint ventures and cooperation. The Ministry of Natural Resources (MNR), established in 2018 to own and manage all natural resources in China, issued in December 2019 the “Opinion on Several Matters Concerning Promoting the Reform of Mineral Resources Administration (for Trial Implementation)”, which is effective from 1 May 2020. All companies incorporated in mainland China (either domestic or foreign invested) with net assets of at least 300 million yuan (\$44 million) shall be qualified to apply for oil and gas exploration rights. The opinions will play a long-term role in opening the upstream to all companies – including foreign players. The new MNR policy means IOCs and other foreign companies will be allowed to explore for and produce oil and gas in the country by themselves for the first time, opening up the segment on a large scale to firms other than the NOCs.

The MNR also issued the “Guiding Opinions for the Reform on Coordinating and Promoting a Property Right System for Natural Resources Assets” in April 2019,¹⁹ aiming to build a property rights system for natural resource assets with confirmed ownership, clarified use rights and responsibilities, strict protection, smooth transfer and effective supervision by 2020. The MNR also stresses the decisive role of the market in the grant of exploration rights (by competitive bidding and tenders).

The first proven reserves report of oil and gas blocks belonging to a private enterprise (Zhongman Petroleum) was successfully approved by the MNR in September 2020.²⁰ With the acceleration of the reform, more and more companies, including foreign companies, are expected to participate in the upstream. However, the current low oil prices environment is not conducive to the participation of IOCs, which are cutting CAPEX. In addition, until there is greater sharing of geological data, more

19. See www.gov.cn.

20. Chongqing Petroleum and Natural Gas Trading Center, “The Country’s First Private-Owned Oil and Gas Field Proved Reserves Approved” (in Chinese), September 11, 2020.

transparency around the competitive bidding and transfer of exploration rights, and laws to ensure equal treatment of private and foreign companies, there is likely to be very little competition for the NOCs in the upstream sector.²¹

A landmark reform in the midstream

The biggest shake-up of China's oil and gas industry in two decades is underway after Beijing finally kickstarted its long-awaited pipeline reform with the multi-billion-dollar transfer of major energy infrastructure assets to the new national pipeline network, PipeChina. PetroChina and Sinopec agreed in July 2020 to swap various midstream assets worth a combined 391 billion yuan (\$57 billion) to PipeChina (see Box 2). PipeChina was incorporated on 9 December 2019 and started operations at the end of September 2020. The company will be responsible for the development and management of transportation of gas, crude oil, refined products plus re-gasification and underground gas storage. PipeChina will consolidate a large part of midstream assets held by the three NOCs. It will operate the infrastructure assets as an independent business and will provide efficient third-party access, which will make access to the infrastructure (and thus to upstream supplies and downstream markets) available to more players. Third-party access to terminals and pipelines has previously been restricted, or unavailable, to independent Chinese firms. The creation of PipeChina breaks a near-duopolistic control that PetroChina and Sinopec had over downstream users, and the dominant position that CNOOC had on LNG terminals.

The consolidation of China's midstream infrastructure under PipeChina sits at the center of reform efforts by President Xi Jinping. The specific objectives Beijing has set for PipeChina further include:²²

- Growing China's natural gas output by expanding the number of companies involved in the upstream (E&P);
- Reducing natural gas prices and increasing natural gas use by creating a more competitive downstream (processing, sales and distribution);
- Developing a unified national pipeline network to more efficiently distribute natural gas around the country.

21. S. Lewis, "Insight from Shanghai: Can Shale Gas Secure China's Energy Security?", *op. cit.*

22. E. Downs and S. Yan, "Reform Is in the Pipelines: PipeChina and the Restructuring of China's Natural Gas Market", *op. cit.*

In the past, China's NOCs developed their gas pipeline infrastructure to optimize their production and supply. As a result, the existing transmission network does not well serve vast areas of the country—particularly inland provinces and southern non-coastal regions, nor is well interconnected. The establishment of PipeChina is an important factor in accelerating the construction of long-distance pipelines during the 14th FYP, especially in areas that contains untapped potential for market demand growth. It will also play a key role to better interconnect regional natural gas pipeline networks, with the ultimate goal of realizing “one network across the country”. The goal of PipeChina is to optimize gas flows in the whole country and reduce transmission costs. At the end, a coordinated, efficient, and flexible “one network across the country” will improve pipeline transmission efficiency and reduces final energy costs.

Given that the new pipeline company is dedicated to holding assets in the midstream sector and not to be involved in upstream or downstream activities, its establishment is a significant milestone in China's move towards opening pipeline and terminal assets to third party access. However, the success of the company going forward will depend on various factors, including the tariff setting and other conditions of access offered to the market, and the manner in which management rights will be exercised in order to ensure the pipeline company's independence from its major shareholders in terms of the operation and management of its assets.²³ How these factors will develop and manifest in final form, whether through corporate structuring or regulatory oversight, will be watched by market players with keen interest during the 14th FYP period. If PipeChina delivers the expected outcomes—which depends, in part, on the enforcement of third-party access rules—there will be an increasing number of new participants in China's natural gas markets, especially LNG importers.

Box 2: PipeChina's assets and shareholders

PetroChina and Sinopec agreed in July 2020 to swap various assets worth a combined 391 billion yuan billion (at premiums to their book value) for cash and shares in PipeChina.²⁴ PetroChina will transfer all 20 of its units that own oil and gas pipelines, which are valued at

23. G. Zhao *et al.*, “LNG Terminals in China – Project Development, Third Party Access and Foreign Investment Issues”, KWM, February 18, 2020, available at: www.kwm.com.

24. Argus, “PetroChina, Sinopec Transfer \$56bn Assets to PipeChina”, July 24, 2020, available at: www.argusmedia.com; Reuters, “PipeChina to Take on \$56 billion of Pipelines to Boost Network Access”, July 23, 2020, available at: www.reuters.com; Natural Gas World, “China Creates a Common Carrier”, September 8, 2020, available at: www.naturalgasworld.com.

268.7 billion yuan. These include the major 77 bcm/y West-to-East pipeline network and the Chinese portion of the 38 bcm/y gas pipeline from Russia. In return, PetroChina will receive a 29.9% stake in PipeChina, worth 149.5 billion yuan, plus a cash payment of 119.2 billion yuan. The 3 Mt/y Dalian terminal in Liaoning and the under-construction 3 Mt/y Shenzhen Diefubei terminal are also expected to be transferred to PipeChina. These assets are owned by PetroChina subsidiary Kunlun Energy and are not included in the July deal, with Kunlun still in talks with PipeChina on the asset transfer. Kunlun also owns four Shaanxi-Beijing gas pipelines with a combined capacity of 60 bcm/y, which are also expected to come under PipeChina's ownership.

Sinopec will sell its natural gas and crude/fuel pipeline units and the 6 Mt/y Beihai LNG terminal for 122.6 billion yuan. It will receive a 14% stake in PipeChina and 52.7 billion yuan in cash in return. The sale includes Sinopec's 15 bcm/y Sichuan-Shanghai and 30 bcm/y Xinjiang-Guangdong natural gas pipelines. In a separate deal, PipeChina acquired a 100% stake in the 900 km long Yulin-Jinan natural gas pipeline from Sinopec Kantons for 3.2 billion yuan.

CNOOC is the only major firm yet to announce an asset sale to PipeChina (at the time of writing). It agreed to an asset management transfer with PipeChina in April 2020 but has not revealed details of the transaction. Several of CNOOC's LNG receiving terminals are expected to be transferred to PipeChina. These include the 2.2 Mt/y Tianjin floating storage and regasification unit, the 2 Mt/y Yuedong and the 4 Mt/y Diefu terminals in Guangdong, the 600,000 t/y Fangchenggang terminal in Guangxi and the 3 Mt/y Yangpu terminal in Hainan. Two of CNOOC's under-development terminals, the 3 Mt/y Zhangzhou project in Fujian and the 5 Mt/y Longkou facility in Shandong, will also be transferred to PipeChina after the first phase of construction is completed.

Overall, among the current 22 operating terminals, 7 are to be assigned to PipeChina. Another 3 terminals under construction are expected to be transferred to PipeChina.

The deals with PetroChina and Sinopec, plus cash injections from other investors, value PipeChina at 500 billion yuan (\$73 billion), making the state-owned firm one of the largest pipeline companies in the world. The agreements leave PetroChina and Sinopec as the two largest shareholders, with 29.9% and 14% respectively. CNOOC will own just 2.9% of PipeChina. The other shareholders are investment

firms China Chengtong Holdings and China Reform Holdings, each with 12.87% stakes; the national social security fund with 10%; China Insurance Investment with 9%; regulatory watchdog the State-owned Assets Supervision and Administration Commission (SASAC) with 4.46%; and sovereign wealth funds CIC International and the Silk Road Fund with 2% each. All are state-owned.

Downstream: More access for foreign companies

The downstream market of the gas industry (including city gas utilities) is much more diversified. The provincial state-owned enterprises (SOEs) play an important role in the intra-provincial pipeline networks, especially in the coastal provinces such as Guangdong and Jiangsu. For city utility businesses, there are many private investment players (such as ENN and Guanghui), and SOE conglomerates (such as China Resources Gas, or CR Gas). Three companies—China Gas, ENN and CR Gas—account for 30% of the total gas distribution market. In this segment, full market competition has begun to emerge, although in most of the cities there is only one provider.

In a further step to enable foreign investment in China, the NDRC Negative List of June 2019 also eliminated the requirement that the construction and operation of city gas businesses with a population of more than 500,000 must be controlled by Chinese parties. It is stipulated that city gas investment will be fully opened to foreign capital and the city gas segment will be fully liberalized. Foreign companies can now develop city gas businesses through sole proprietorship, equity participation, and cooperation.

Towards full market prices

Regarding gas pricing, China has worked towards greater market-based pricing since 2010. Following several gas pricing reforms, prices for more than half of Chinese gas consumption are set by the market (offshore gas, shale gas and coalbed methane, synthetic natural gas, LNG, gas sold to direct end users, gas for the production of fertilizers, gas from storage facilities, pipeline gas imported after 2015 and obviously gas traded through trading platforms). The remainder falls under the city-gate price

regime.²⁵ The NDRC sets benchmark city-gate prices by province²⁶ for domestic pipeline gas and imported pipeline gas that began delivery before 2015. Buyers and sellers can also negotiate prices as much as 20% above the benchmark with no floor. Since May 2018, the harmonization of city-gate prices between residential end-users and non-residential users has started in regions where there was a substantial gap between the two prices. Before the reform, residential customers prices were capped at substantially lower levels than benchmark prices for industrial and commercial users.

In addition, the new version of the “Central Pricing Catalogue”, issued by the NDRC in March 2020 and in effect from May 2020, indicates that Beijing intends to abolish city-gate prices. The new catalogue includes “oil and gas pipeline delivery” (i.e. transportation and distribution) while the previous edition (2015) listed “natural gas” as an item subject to price controls. This change implies Beijing will liberalize natural gas city-gate prices, while regulating transmission fees. Natural gas city-gate prices are expected to be liberalized step by step, first in areas where conditions permit, typically coastal regions with multiple LNG plants.

The final aim of the gas pricing reform is to achieve market-oriented gas prices. To create a benchmark price adapted to the Chinese gas market, trading of natural gas and LNG on exchanges is encouraged. China has successfully established two trading exchanges in Shanghai and Chongqing. However, spot trading is still thin, with a few bidding transactions, and futures trading has not yet started. In view of creating an LNG benchmark price, Shanghai Petroleum and Natural Gas Exchange (SHPGX) started the trial run of its online platform for LNG trading in August 2020.

25. Shell, “China’s Gas Pricing Evolution”, presentation by Xianfang Ren at the World Gas Conference, Washington, June 2018.

26. The one exception is Fujian province, where the NDRC stopped setting city gate prices in November 2016 and instead allowed them to be negotiated between the supplier and consumers.

Looking Ahead: The 14th Five-Year Plan for Natural Gas

The 14th FYP for natural gas development, to be issued by the NEA in the second half of 2021, will be critical to gas market liberalization and the future role of gas in China's energy transition and efforts to tackle climate change and air pollution, which President Xi has given new impetus following his recent announcement that China would be carbon neutral by 2060. The ongoing preparations of the plan already enable to give a glimpse of the future direction of gas market reforms, natural gas demand, natural gas production, and the role of LNG.²⁷

Market reforms: rules to ensure a smooth implementation

During the 13th FYP period, gas market reforms have accelerated and the main pillars of the reform of the gas system have been designed. The 14th FYP will focus on the implementation of the new policies to enable a high-quality development of the gas industry. More supporting measures, implementation rules and market supervision will be introduced during the 14th FYP period.

The establishment of PipeChina is a milestone in the deepening of gas market reforms in China. The establishment of the network company is not the end of the midstream reform, but rather a new starting point. In the next step, on the one hand, it will be necessary to complete the assets transfers to ensure that the company enters substantive operation. On the other hand, it will be necessary to establish new operational rules and detailed regulations, determine the rights and obligations of new market players, establish capacity mechanisms and congestion procedures, introduce supporting rules to ensure the fair and transparent opening of

27. See for instance: M. Liu, "Thoughts on the Development of Natural Gas Industry During the 14th Five-Year Plan" (in Chinese), Polaris Power Network News, December 2, 2019, available at: <http://news.bjx.com.cn>; China Economic Times, "The "14th Five-Year" Natural Gas Reform Focuses on Four Aspects of Interest Adjustment" (in Chinese), August 20, 2020, available at: <http://energy.people.com.cn>; Chongqing Petroleum and Natural Gas Trading Center, "After the Establishment of the National Pipeline Network Company, How to Reform the "14th Five-Year Plan" for Natural Gas?" (in Chinese), December 27, 2019, available at: www.chinacqpgx.com.

the network, and last but not least set transport tariff.²⁸ Supervision and enhanced regulatory function will be required to promote efficient third-party access.

Upstream, it will be necessary to complete the property rights system, accelerate the competitive transfer of exploration rights and support E&P, especially in the context of low oil prices. Downstream, the reforms will continue to promote full competition in the retail market and the marketisation of gas prices, likely to be tested in provinces with several gas supply sources.

The natural gas industry has entered a new stage characterized by market opening up, strong supervision, more competition, and lower returns.²⁹ The 14th FYP period will be marked by a step change as the industry will have to adapt to the new rules. The main change is the establishment of the pipeline network company. Market players have now to adjust their business strategies to this new player. The open market will unleash unprecedented opportunities in various segments. The changing landscape is already visible in the retail sector.³⁰ The retail market is both consolidating and experiencing more competition. In 2019 and 2020, some major city gas companies took the opportunities of the new rules to acquire new supplies (e.g. recent sales and purchases agreements signed by ENN, Guangdong Energy Group and Foran Energy). City gas companies are also developing their own LNG receiving terminals (e.g. ENN, Guanghai Energy, Shenzhen Gas, Beijing Gas, Hangzhou Gas, Jiaxing Gas). In 2019, privately owned LNG terminals received 5.65 Mt of LNG, accounting for 6% of total imports. New actors are entering the LNG business, such as supply chain companies and trading houses, hoping to intervene in the international trade of LNG through their LNG receiving terminals (e.g. Hentong Logistics, Sinoenergy). Mergers and acquisitions have become another feature of the retail sector, with big city gas utilities acquiring smaller players and the three NOCs further integrating downstream. Consolidation and integration will continue to progress in the future.

28. L. Yang, "Steps Towards Liberalization of China's Natural Gas Market in the 14th Five-Year Plan", *Oxford Energy Forum*, Issue 125, Oxford Institute for Energy Studies (OIES), September 2020, available at: www.oxfordenergy.org.

29. M. Liu, "Thoughts on the Development of Natural Gas Industry During the 14th Five-Year Plan", *op. cit.*

30. China Gas, "The Influence of the Establishment of the National Pipe Network Company on the City Gas Industry and Policy Recommendations" (in Chinese), July 17, 2020, available at: www.chinagas.org.cn.

With the ongoing digital revolution in China, the gas sector will also harness industrial internet, big data and artificial intelligence to increase efficiencies and reduce costs.

Growing gas demand in response to air pollution and climate change

Beijing has committed to peak its CO₂ emissions by 2030 or earlier, and, in September 2020, Chinese President Xi announced that China would commit to reach carbon neutrality by 2060. The announcement is a significant step in the fight against climate change. It will boost and accelerate the development of clean energy sources in China. Natural gas, as an efficient, lower-carbon and secure energy source, is expected to take a crucial role in China's response to climate change. Already in April 2020, the draft Energy Law recommended that the State Council took measures to increase the share of natural gas in primary energy consumption.

The government's development goals and supporting measures to develop a green and low-carbon economy, increased efforts to control environmental pollution in rural and urban areas, the accelerated construction of key infrastructure, the extension of gas access to new areas, and the ongoing marketisation of the gas market will contribute to a growing Chinese gas market during the 14th FYP period.

Moreover, the growth of domestic gas production and the availability - and the benefit - of low gas prices in the post-pandemic period augur well for future gas demand, which is expected to reach 450 bcm to 500 bcm by 2025 (+130 bcm to 180 bcm compared to the expected 320 bcm in 2020).³¹ This corresponds to an annual average growth rate of 7% to 9%, which is lower than before, but still represents an annual growth of 26 bcm to 36 bcm. The highest range clearly depends on enabling policies in favor of coal replacement, which currently are still uncertain.

Clean air policies have provided an impetus for gas consumption during the 13th FYP. Policies focused on clean air will still provide growth opportunities for the gas industry in this decade. The potential for bulk coal replacement in households and industry (coal-to-gas) and diesel replacement in the transport sector (oil-to-gas) still represents the equivalent of more than 600 bcm.³² Likewise, natural gas, as a lower-carbon energy source, will help China to control carbon emissions. In

31. M. Liu, "Thoughts on the Development of Natural Gas Industry During the 14th Five-Year Plan", *op. cit.*; Petroleum Economist, "China's Challenge: Securing Sufficient Gas", *op. cit.*

32. "Policies to Limit Natural Gas Consumption Need to Be Adjusted" (in Chinese), Polaris Power Network News, March 24, 2020, available at: <http://news.bjx.com.cn>.

addition to industry and households sectors, the promotion of natural gas power generation, in accordance with local conditions, and the acceleration of the use of gas in the transportation sector will continue to increase gas demand.

Natural gas has been slow to develop in the power sector. In 2019, it represented only 3.2% of total power generation, against 62% for coal. Currently, gas power suffers from its lack of competitiveness. Low gas prices will improve its competitiveness, but the decisive factor will be the country's environmental protection policy and the improvement of the national carbon market. While the role of coal in the power sector during the 14th FYP is still debated in the country, the role of gas-fired power generation as a flexible resource to complement growing renewable generation is becoming more established. Under the 'blue sky' action plan, the government had actively promoted gas-fired combined heat and power (CHP) projects. The preference now appears to be towards dedicated gas-fired peaking plants in coastal areas.³³ To some extent, this should support gas demand in the power sector. With the completion of the Sino-Russian Eastern Route and the urgent need to control pollution, gas-fired cogeneration could also be developed in the Northeast region. In addition, several big cities (e.g. Beijing, Shenzhen) focus on building a clean energy system, and have banned new coal-fired power plants and coal-consuming projects.

In the transport sector, given the advantages of LNG in terms of cleanness and efficiency, the government will promote the use of LNG in heavy trucks and marine fuels. China is expanding its fleet of LNG-fueled trucks (already the largest in the world with 431,000 vehicles as of 2019).³⁴ This trend is supported by local diesel bans and subsidies in many parts of China, as well as by favorable economics compared to diesel trucks. In maritime transportation, the recent regulation on sulfur restriction of the International Maritime Organization (IMO), which took effect in January 2020, opens up growth opportunities for LNG to be used as marine fuel. The government intends to build an LNG green transportation industry chain with its economic, social and environmental benefits and will support the construction of the midstream infrastructure and increase financial support to LNG vehicles and ships.

33. Hellenic Shipping, "Forget the Lack of a GDP Target, China Is Ready to Go It Alone", May 28, 2020, available at: www.hellenicshippingnews.com.

34. IEA, *Gas 2020: Analysing the Impact of the Covid-19 Pandemic on Global Natural Gas Markets*, *op. cit.*

High contribution of domestic gas production to the national energy security

Energy security is a longstanding objective of the Chinese government. This includes both increasing domestic production and diversifying sources of foreign supply. Growing trade tensions and the COVID-19 pandemic have elevated national energy security to a new level of concern, which make safeguarding energy security and improving energy self-sufficiency top priorities.

Concerns over energy security in China relate to the vulnerability of global supply chains and particularly oil supplies – more so than gas.³⁵ As a result, and in line with the policy to boost energy reserve capacity – including storage capacity to guard against supply disruptions – over the last few months China has been building its crude oil stockpile and taking advantage of the low oil prices. Increased energy security is also a factor behind government support for new technology (e.g. hydrogen) and new sources (e.g. gas hydrates).

Regarding natural gas, security of supply concerns are not new, but are of different nature. After the gas shortage that hit China in winter 2017, the State Council recommended actions on the internal and external dimensions of security of gas supply.³⁶ These actions included strengthening domestic gas exploration, deepening international gas co-operation and encouraging the construction of gas pipelines, storage facilities and LNG import terminals. The supply of natural gas should be guaranteed by coordinating production, storage, transportation and sales. The "Guiding Opinions on Doing a Good Job in Energy Security in 2020", jointly issued by the NRDC and the NEA in June 2020, reiterated the focus on expanding domestic gas production, accelerating the construction of gas pipelines, LNG receiving terminals and gas storage facilities, and improving the emergency peak shaving capability of natural gas.³⁷

With heightened concerns on national security and supportive upstream policies, the outlook for Chinese gas production in the 14th FYP looks upbeat. Domestic natural gas production capacity is expected to be

35. C. Ellinas, "China and Energy Security", *Natural Gas World*, June 26, 2020, available at: www.naturalgasworld.com.

36. See S. Cornot-Gandolphe, "China's Quest for Gas Supply Security: The Global Implications", *op. cit.*

37. See www.ndrc.gov.cn.

around 260 bcm/y by 2025.³⁸ Compared with the expected production in 2020 (189 bcm), this corresponds to an average annual growth rate of 6.6%, which seems reachable, based on the growth rates observed in the period 2018-2020 and the ongoing reform of the upstream segment. Such production level would enable not crossing the “red line” of a 50% dependency on imports. However, if oil prices stay lower for longer, they are likely to affect China's energy security by creating challenges for domestic oil and gas producers.

During the 14th FYP, the focus will be put on expanding the four major oil and gas production bases in Bohai Bay, Sichuan, Xinjiang and Ordos, and promoting the steady increase of conventional natural gas production, and the rapid development of shale gas and coalbed methane. Shale gas has driven the growth of gas production in the past two years and is expected to drive China's gas output growth over the next five years (See Box 1).

Regarding external supplies, China is increasingly relying on countries it considers to be long-term reliable partners, such as Russia, central Asia and the Arabian Gulf for its energy imports.³⁹ Slowly and inevitably, Russia and China are forging a closer alliance. The ramp-up of the Power of Siberia gas pipeline from Russia will eventually increase gas imports at the expense of LNG. When fully developed by 2025 according to the official schedule, it could be supplying up to 38 bcm/y, about 8% of China's gas demand. Moreover, Moscow has proposed to build a new pipeline to China, named Power of Siberia 2, this time crossing Mongolia (which would substitute the proposed West Route pipeline). It would send another 50 bcm/y to China. While Power of Siberia connects eastern Siberian fields with China directly, the new pipeline would run through Mongolia to China, carrying gas from the Yamal Peninsula directly to the main markets in China. Although, from the time being, China hardly needs this gas, it could become a strategic supply, enabling PipeChina to better allocate imported flows. Gazprom is also considering, with Chinese partners, to increase the capacity of its Power of Siberia gas pipeline to 44 bcm/y from the current design capacity of 38 bcm/y. All in all, progress or delays in these projects will affect China's LNG import needs, and interest in ramping up Central Asian supplies by pipeline.

On the other hand, commercial tensions make it less attractive for China to buy more US LNG. China resumed US LNG imports in April 2020 after stopping for a year, but at a very low pace. China is significantly behind on purchases of US energy products, comprising LNG, crude oil, refined

38. Chongqing Petroleum and Natural Gas Trading Center, “After the Establishment of the National Pipeline Network Company: How to Reform the 14th Five-Year Plan for Natural Gas?”, *op. cit.*

39. C. Ellinas, “China and Energy Security”, *op. cit.*

products, and coal, as part of the phase one economic and trade agreement signed in January 2020. The energy purchase targets have been set in dollars and not tons. With the fall in energy prices, it is extremely unlikely that China will be able to meet its targets. And with US-China tensions deteriorating again over a range of issues – from the outbreak of COVID-19 in Wuhan to Hong Kong's new national security law – any failure by Beijing to keep up with purchases could collapse the agreement and accelerate the US-China decoupling.⁴⁰

The key role of LNG on the Chinese market

With the expected rise in gas demand – and despite a strong increase in domestic gas production – gas imports will increase to fulfill the rising supply/demand gap during the 14th FYP period (190 bcm to 240 bcm by 2025). China will have to increase its imports by an additional 50 bcm to 100 bcm by 2025 compared to 2020. Part of it will be covered by the ramp-up of the Sino-Eastern Russian pipeline (from an expected 5 bcm in 2020 to 38 bcm in 2025). The reminder will have to be imported on the global LNG market. This means that LNG will still be the most important source of external supplies on the Chinese market. The global oversupply and low spot LNG prices provide a good opportunity for China to import more LNG during the 14th FYP period, favoring LNG imports over pipeline imports. According to the IEA, China is expected to become the leading LNG importer in 2023.⁴¹ China alone accounts for 22% of global LNG demand in 2025, contributing almost 40% of growth in total imports over the forecast period (2019-2025).

LNG offers many advantages to China. It is more flexible than pipeline gas in terms of volumes and pricing. By vigorously developing its LNG market and building an LNG future market, China will be able to establish its own pricing system and have more influence on global pricing. LNG enhances China's security as LNG supplies can be tapped from the global market. It may help China to optimize its supplies. China's major energy security strategy remains increased storage capacity, allowing it to buy when international LNG prices are low and guard against potential disruptions. As underground gas storage capacity is limited and takes a long time to be built, LNG terminals and their storage tanks can provide this hedging tool. In 2018, China implemented an ambitious expansion of

40. S. Weijun, "China Struggles with US Trade Deal", *Natural Gas World*, July 20, 2020, available at: www.naturalgasworld.com.

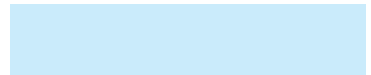
41. IEA, *Gas 2020: Analysing the Impact of the Covid-19 Pandemic on Global Natural Gas Markets*, *op. cit.*

its LNG import capacity. That capacity, after two years of construction, will enter operation from 2020. While China has around 78 Mt/y of import capacity at its current 22 LNG import terminals, another 60 Mt/y is under construction that should come into service by 2025.⁴² This would enable China to meet projected import needs and take advantage of lower spot and contract LNG prices.

42. Due to the COVID-19 and financial pressure, at least five new LNG regasification terminals and two terminal expansion projects that were expected to start operations in 2020 have been delayed to 2021. C. Liang, "Analysis: China's New LNG Regas Projects Delayed Amid COVID-19 Impact, Financial Strain", Platts, July 7, 2020, available at: www.spglobal.com.

Conclusion

During the epidemic, the natural gas industry has demonstrated its resilience. As a lower-carbon, efficient and secure source of energy, natural gas constitutes a strategic choice for Chinese policy makers to facilitate the move towards a decarbonized energy system by 2060. With the economic rebound in the post pandemic period, low imported gas prices, gas market liberalization, the window to a golden age of natural gas has opened up again in China.



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