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REFORM IS IN THE PIPELINES: PIPECHINA AND THE RESTRUCTURING OF CHINA'S NATURAL GAS MARKET

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Key Takeaways

Beijing launched the most ambitious reform of China's oil and natural gas industry in more than two decades with the establishment of the China Oil & Gas Piping Network Corporation (PipeChina) last December. The company is being developed from midstream assets—pipelines, liquified natural gas (LNG) import terminals, and storage facilities—and personnel transferred from China's national oil companies (NOCs).

Beijing expects that its goals of increasing China's domestic and imported natural gas supplies and consumption will be more effectively advanced by having China's midstream infrastructure owned and operated by a single company that provides fair and open access to its pipelines, LNG import terminals, and storage facilities instead of by three NOCs reluctant to grant third-party access to infrastructure.

The specific objectives Beijing intends for PipeChina to further include:

- Growing China's natural gas output by expanding the number of companies involved in the upstream (exploration and production)
- 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

If PipeChina delivers these outcomes—which depends, in part, on the enforcement of third-party access rules—there is likely to be an increasing number of new participants in China's natural gas markets, especially LNG importers, which in turn should create new opportunities for LNG exporters.

Introduction

On December 9, 2019, Beijing legally established a new player in China's oil and natural gas industry, the China Oil & Gas Piping Network Corporation (PipeChina). The company is in

the process of being formed through the transfer of assets and personnel from China's three major national oil companies (NOCs): China National Petroleum Corporation (CNPC), China Petroleum & Chemical Corporation (Sinopec), and China National Offshore Oil Corporation (CNOOC). PipeChina is scheduled to begin operation on September 30, 2020, but it will probably take several years for the company to be fully operational.[1]

The establishment of PipeChina is the most ambitious reform of China's oil and natural gas industry undertaken in more than 20 years. The last reform of this magnitude began in 1998, when Beijing orchestrated an asset swap between CNPC, then China's only onshore upstream company and Sinopec, then China's sole downstream company, to create two vertically-integrated oil companies. CNPC and Sinopec subsequently injected most of their best assets into two newly created subsidiaries—PetroChina and Sinopec Corp., respectively—and listed them on stock exchanges in Hong Kong and New York in 2000. CNOOC also listed a newly set up subsidiary, CNOOC Ltd., in Hong Kong and New York in 2001.

PipeChina's creation is part of China's ongoing reform of state-owned enterprises (SOEs). One element of Beijing's SOE reform agenda involves reallocating state-owned assets among SOEs owned by the central government to more effectively advance national interests. This asset reallocation involves both merging central SOEs and forming new conglomerates. The specific objectives of the restructurings vary by economic sector.

In the case of the oil and natural gas industry, Beijing determined that its goals of increasing China's domestic and imported natural gas supplies, developing a unified pipeline network, and creating a more competitive downstream market to lower end-user costs and increase consumption were not being advanced by having the ownership and operation of the country's major pipelines and other midstream infrastructure split between three NOCs that have used their control of that infrastructure and domestic and imported gas supplies to monopolize downstream markets. The unbundling of the NOCs' pipelines to create PipeChina reflects Beijing's view that a truly national pipeline network open to all and under the control of a single company will be more likely to expand China's natural gas supplies and reduce end-user costs by lowering the barriers to entry to China's upstream and downstream for companies other than the NOCs.

If this pipeline reform delivers the outcomes Beijing seeks, it probably will result in an increasing number of new participants in China's natural gas markets. These new participants likely will include new LNG importers. Their emergence, in turn, likely will create new opportunities for natural gas exporters to sell to China.

Whether PipeChina brings about the changes to China's natural gas market sought by Beijing likely will depend in part on three factors. The first is whether China's government develops enforceable rules for third-party access to China's midstream infrastructure. The second is whether the government entity tasked with enforcement, likely the National Energy Administration (NEA), has the power to do so. The third is the extent to which China's NOCs continue to dominate China's natural gas market.

This commentary examines China's largest reform of its oil and natural gas industry in nearly a quarter century in the context of China's restructuring of central SOEs. It explains why Beijing

viewed the ownership and operation of China's midstream infrastructure by China's NOCs as an impediment to the realization of its natural gas reform goals and why Beijing expects PipeChina will be able to deliver better outcomes. It also assesses key factors that likely will determine the extent to which PipeChina will help China's government transform the natural gas market it has into the natural gas market it wants.

A New Player in China's Oil and Gas Industry

PipeChina is one of 97 companies known as central SOEs administered by the State-owned Assets Supervision and Administration Commission (SASAC) of the State Council.[2] This group of firms also includes CNPC, Sinopec, and CNOOC.[3] PipeChina and the three NOCs rank among the 50 "core" central SOEs deemed strategically important to China's national security and economic development which hold vice-ministerial rank.[4]

The senior leadership of PipeChina is almost exclusively comprised of former NOC executives. Seven of the eight top executives at the new company are from CNPC, Sinopec, and CNOOC or their internationally-listed subsidiaries (See Table 1). The company's top two executives, Chairman Zhang Wei and General Manager Hou Qijun, were senior executives at CNPC and PetroChina. The only member of the leadership team not from the oil industry is Chen Pingping, the supervisor of the company's discipline and inspection team.[5] He transferred from the Central Commission for Discipline Inspection of the Communist Party of China, the Party's top anticorruption body.[6]

Table 1: Senior leadership of PipeChina

Name	Positions at PipeChina	Previous positions
Zhang Wei	Chairman	Director and General Manager, CNPC; Vice-Chairman, PetroChina
Hou Qijun	Director and General Manager	Deputy General Manager, CNPC; Executive Director and President, PetroChina
Li Hui	Spokesman	Deputy General Manager, CNOOC
Liu Zhongyun	Deputy General Manager	Chairman of the Board, Sinopec Oilfield Service Corporation
He Zhongwen	Deputy General Manager	Chairman and General Manager, CNOOC Refining and Chemical Company
Jiang Changliang	Deputy General Manager	General Manager, PetroChina Pipeline Company
Wang Dehua	Chief Accountant	Chief Financial Officer, Sinopec Corp.
Chen Pingping	Discipline Inspection and Supervision Team Leader	Deputy Director of the Letters and Calls Office, State Supervision Commission of the Central Commission for Discipline Inspection

Sources: See appendix.

PipeChina will be responsible for the operation of China's major oil and natural gas pipelines, some LNG import terminals and storage facilities and the construction of new midstream infrastructure. According to an unnamed interlocutor from the company who spoke with the Chinese media, PipeChina's responsibilities include:[7]

- Investment in and construction of new oil and natural gas trunk pipelines and some gas storage and peaking facilities
- Interconnection of trunk pipelines and "social pipelines" (i.e., those owned by local governments, industrial zones, regional gas distributors and private companies) to form a national pipeline network
- Pipeline transportation of crude oil, oil products, and natural gas
- Consolidation of transmission coordination of national oil and gas trunk line network dispatching and operations;
- Regular public disclosure of available pipeline transportation and storage capacity
- Provision of fair access to infrastructure to all qualified users

The majority of PipeChina's assets will include the NOCs' long-distance oil and natural gas pipelines and some of their LNG import terminals and storage facilities.[8] In 2019, PetroChina owned 76 percent of China's natural gas pipelines, while Sinopec and CNOOC controlled 15 percent and 9 percent, respectively.[9] The three NOCs also owned 17 of China's 22 LNG import terminals in 2019, with CNOOC accounting for 60 percent of the country's receiving capacity.[10]

As of this writing, China's NOCs are in the process of transferring assets to PipeChina. In April 2020, CNOOC reached an agreement with PipeChina on handing over management rights for oil and natural gas infrastructure projects.[11] The assets include oil and gas storage facilities, gas pipelines, and LNG import terminals from CNOOC's subsidiary CNOOC Gas and Power Group.[12] In July 2020, PetroChina and Sinopec Corp. agreed to sell midstream assets valued at $56 billion to PipeChina. Specifically, PetroChina will transfer its major oil and natural gas pipelines and some of its oil and gas storage facilities and LNG import terminals.[13] Sinopec Corp. will transfer its major crude oil, natural gas, and refined product pipelines and its Beihai LNG import terminal.[14] PetroChina and Sinopec will be paid in cash and equity in PipeChina.[15]

PetroChina will be the largest shareholder in PipeChina with a 29.9 percent stake. Sinopec Corp. will be the second-largest shareholder with a 14 percent stake (including the shares owned by its subsidiary, Sinopec Natural Gas Company), while CNOOC Gas and Power Group will own 2 percent. SASAC and funds owned by China's central government will be the remaining shareholders (see Table 2).

Table 2: PipeChina's shareholding structure

Shareholder	Shareholding (%)
PetroChina	29.90
China Chengtong Holdings Group, Ltd.	12.87
China Reform Holdings Corporation, Ltd.	12.87
National Council for Social Security Fund	10.00
Sinopec Corporation	9.42
China Insurance Investment Co., Ltd.	9.00
Sinopec Natural Gas Company	4.58
SASAC	4.46
CNOOC Gas and Power Group	2.90
CIC International Co., Ltd.	2.00
Silk Road Fund Co., Ltd.	2.00
Total	100.00

Source: PetroChina, "Major Transaction Disposal and External Investment Concerning the Pipeline Business and Assets," Hong Kong Exchanges, July 23, 2020, 16, https://www1.hkexnews.hk/listedco/listconews/sehk/2020/0723/2020072301300.pdf.

PetroChina and Sinopec Corp.'s shareholdings entitle them to seats on PipeChina's board of directors. The board has 11 seats. PetroChina will have two seats, and Sinopec Corp. will have one seat.[16]

The Broader Context: Reforming SOEs Through Restructuring

The creation of PipeChina illustrates one component of Beijing's SOE reform agenda: the restructuring of SOEs through the reallocation of state-owned assets among state-owned entities.[17] The goal is to enhance the ability of China's SOEs to advance central government policies.[18] Consequently, changes in Beijing's policy priorities periodically spur changes in the allocation of assets among SOEs. According to SASAC, 22 SOE restructurings involving 41 central SOEs occurred between November 2013—when China's leader Xi Jinping began to outline his vision for SOE reform—and December 2019.[19]

These central SOE restructurings involve not only mergers between central SOEs but also the creation of new conglomerates from assets split off from existing firms, examples of which are listed in tables 3 and 4. The objectives of central SOE restructurings vary by industry and the specific firms involved in each restructuring.[20] Broad goals include reducing overcapacity, utilizing state capital more efficiently, integrating the upstream and downstream of industrial chains, and creating larger, more competitive firms.

Table 3: Selected central SOE mergers completed since 2013

Date announced	Original SOEs	New SOE
2014	CNR Corporation CSR Corporation	China Railway Rolling Stock Corporation
2015	China Power Investment Corporation State Nuclear Power Technology Corporation	State Power Investment Corporation
2015	China Metallurgical Group Corporation China Minmetals Corporation	China Minmetals Corporation
2015	China Ocean Shipping Group Corporation China Shipping Group Company	China COSCO Shipping Corporation
2015	China Merchants Group Sinotrans &CSC Holdings Company	China Merchants Group
2016	China National Building Materials Group China National Materials Group Corporation	China Construction Materials Group
2016	Baosteel Iron and Steel Group Wuhan Iron and Steel Corporation	BaoWu Steel Group
2017	Shenhua Group China Guodian Group	China Energy Investment Corporation
2018	China National Nuclear Corporation China Nuclear Engineering & Construction Corporation	China National Nuclear Corporation
2019	China Shipbuilding Industry Corporation China State Shipbuilding Corporation	China Shipbuilding Corporation

Sources: See appendix.

Table 4: Selected new central SOEs created since 2013

Date announced	Original SOEs/assets	New SOE
2014	Telecommunications towers of: China Mobile, China Telecom, and China Unicom	China Tower Corp.*
2016	Aircraft engine businesses of: Aviation Industry Corporation of China and Commercial Aircraft Corporation of China	Aero Engine Corporation of China
2019	Midstream assets of: CNOOC, PetroChina and Sinopec Corp.	PipeChina
2020	Assets of the People's Liberation Army in 10 industries including real estate, agriculture, tourism, and hotels	China Rongtong Asset Management Group

**China Tower Corp. is not a central SOE, but more than 70 percent of its shares are owned by central SOEs, including China Mobile, China Telecom, and China Unicom.*
Sources: See appendix.

The decision to create PipeChina from the midstream assets of China's NOCs dates to the beginning of Xi's tenure as China's leader. Xi's blueprint for economic reform, unveiled in November 2013, laid the groundwork for the birth of the national pipeline company with its goal of separating "networks from operations" in natural monopolies controlled by SOEs.[21] The State Council's oil and natural gas industry reform plan, released in May 2017, underscored this objective with its call for separating oil and natural gas pipelines from the NOCs and providing third-party access.[22] On March 5, 2019, Premier Li Keqiang announced at the National People's Congress that operation and network ownership would be separated in natural monopoly industries.[23] On March 19, 2019, the Central Committee for Deepening Overall Reform, chaired by Xi, approved the establishment of a national pipeline company.[24]

Beijing's Problems with China's Pipeline Oligopoly

The impetus for the establishment of PipeChina was the central government's assessment that having the ownership of China's pipelines and other midstream infrastructure divided among CNPC, Sinopec, and CNOOC was undermining its objective of creating more competitive upstream and downstream natural gas markets joined by a national pipeline network.[25] Beijing wants to increase the number of companies involved in China's upstream to boost China's output of natural gas, especially unconventional gas. It also wants to create a more competitive downstream in a bid to reduce natural gas prices and boost natural gas consumption. Finally, Beijing also wants a truly national pipeline network to efficiently move natural gas from areas of surplus to areas of deficit.

However, the NOCs' use of their pipelines and LNG import terminals to gain and maintain customers for their natural gas supplies, including expensive pipeline and LNG imports, prevented Beijing from transforming its vision for China's natural gas markets into reality. The NOCs are reluctant to grant third parties access to their pipelines and LNG import terminals to avoid losing customers and revenues to companies with lower cost supplies.[26] They are also reluctant to forge interconnections between pipelines and LNG terminals that they operate with those operated by their domestic peers for the same reason.[27] As a result, from Beijing's perspective, China does not have enough participants in its upstream, enough competition in its downstream, or enough interconnections among the country's midstream infrastructure to increase China's natural gas supply and consumption.

Not Enough Participants in the Upstream

Beijing wants to expand the number of companies in China's upstream to slow the growth of China's dependence on natural gas imports, which is estimated to be 42–45 percent in 2019.[28] To this end, in July 2018, President Xi instructed China's oil companies to ramp up domestic oil and natural gas exploration and production to enhance China's supply security.[29] The following month, the State Council released its first document promoting the development of China's natural gas industry, which echoed Xi's call for more upstream spending.[30] Beijing intends for shale gas to play an increasingly important role in China's gas production because of the country's shale gas potential. Although China has the world's second-largest technically recoverable shale gas resources after the United States, its shale gas output was only 15.5 billion cubic meters (bcm) in 2019, nine percent of China's total output of 176 bcm.[31]

Beijing is unhappy with the dearth of companies other than the NOCs engaged in exploration and production. Indeed, PetroChina, Sinopec Corp. and CNOOC Ltd. accounted for 94 percent of the natural gas and oil produced in China in 2019.[32] The three companies also own 97 percent of the exploration rights for China's conventional oil and natural gas.[33]

Consequently, the central government's plan for the development of the natural gas industry during the 13th Five-Year Plan period (2016–2020) states that there is insufficient investment in China's upstream, especially in shale gas and other unconventional resources. The plan also notes that some Chinese companies that acquired technology and management experience overseas have been unable to them at home because of restrictions on upstream access.[34]

One of the reasons companies other than the NOCs have shied away from investing in China's upstream is because PetroChina, which operates most of China's long-distance pipelines, made it difficult for third parties to access them. PetroChina preferred to purchase gas from independent producers at 70–80 percent of the retail value of the gas and then sell it to consumers at the full retail price. This practice enabled PetroChina to earn a profit and prevent other companies from competing for customers.[35]

The experience of one independent producer of coalbed methane (CBM) in Shanxi Province further illustrates how CNPC's reluctance to allow independent producers access to its pipelines constrains investment by independent companies in China's upstream. The CBM producer sought access to CNPC's Shaanxi-Beijing natural gas pipeline to deliver CBM to industrial consumers in Beijing and Tianjin. CNPC rejected the request on the grounds of insufficient pipeline capacity. As a result, the producer had no choice but to convert the CBM to LNG for delivery by truck to local service stations due to the high cost of truck transport over long distances.[36]

That said, lack of third-party access to pipelines operated by China's NOCs is not the only reason China's upstream has failed to attract investment. China has challenging geology, including deep reservoirs, faults, and low permeability, all of which add to production costs.[37] In addition, China's NOCs probably have already developed most of the best assets onshore and offshore.[38]

Not Enough Competition in the Downstream

Beijing wants more competition among natural gas sellers in China to lower prices and boost consumption. The Chinese government's objective is to increase the share of natural gas in China's energy mix from around 8 percent in 2019 to 10 percent in 2020 and 15 percent in 2030 in a bid to improve air quality.[39] (For comparison, natural gas accounted for 25 percent of global energy consumption in 2019).[40]

China's NOCs have contributed to the lack of competition in the downstream by denying other companies use of their midstream infrastructure. This lack of access in turn limits the supply options available to gas distributors. The NOCs' objective is to prevent companies, especially those with cheaper supplies, from competing against them for customers.[41]

PetroChina is a case in point. The company controls the majority of China's natural gas supply

(domestic production plus imports) and China's natural gas pipelines.[42] PetroChina's import portfolio includes some expensive long-term contracts, including pipeline gas from Central Asia and LNG from Qatar, which probably ranks among the most expensive LNG ever contracted.[43] The company routinely loses money on these imports because the price it pays is often higher than the state-set city gate prices at which it can sell the gas in China (see text box). In 2019, PetroChina lost $4.3 billion on natural gas imports.[44] Consequently, PetroChina has been reluctant to allow companies with cheaper supplies, such as LNG purchased on the spot market in periods when Asian spot prices are well below China's city gate prices, to avoid making it more difficult to sell its expensive imported gas.

Natural Gas Prices in China

The National Development and Reform Commission (NDRC) sets benchmark city gate (city-level distribution) prices by province for domestic pipeline gas and imported pipeline gas that began delivery before 2015.[45] Buyers and sellers can negotiate prices as much as 20 percent above the benchmark with no floor.[46] (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.[47]) The NDRC's objective is to set prices low enough to encourage consumption but high enough to support domestic natural gas production and limit the NOCs' losses from expensive imports.

Prices for LNG offshore production, unconventional gas, direct sales to users, and pipeline imports that commenced after 2015 largely have been liberalized.[48] However, the price of LNG is influenced by the city gate price in areas where the markets for LNG and pipeline gas overlap.[49] As a result, China's NOCs generally are unable to sell imported LNG at a price higher than that of the city gate regardless of their import costs. This is also the case for pipeline imports.

The latest edition of the Central Government Pricing Catalogue, which took effect on May 1, 2020, indicates that Beijing intends to abolish city gate prices. The previous edition of the catalogue, which took effect on January 1, 2016, lists "natural gas" as an item subject to price controls.[50] In contrast, the 2020 edition replaces "natural gas" with "oil and natural gas transportation," a change in line with Beijing's plan to maintain control of the midstream while liberalizing the upstream and downstream. However, a footnote to the 2020 catalogue states that the government will temporarily continue to set city gate prices for domestic pipeline gas and imported pipeline gas deliveries that began before the end of 2014 and that prices for both will eventually be set by the market.[51]

The NOCs' behavior is not the only reason there is limited competition in the downstream. Another factor is that China's city gas companies monopolize markets across China. Three companies—China Gas, ENN and China Resources Gas (CR Gas) —account for 30 percent of the total available gas distribution market, according to Bernstein.[52]

Not Enough Infrastructure and Not Enough Interconnections

The ownership and operation of China's midstream infrastructure by the three NOCs has also slowed the development of the unified national pipeline network sought by Beijing not only to increase the volume of natural gas supplies available in China but also to efficiently move it around the country, especially during peak demand periods. Specifically, the division of China's midstream among the three NOCs has hampered the development of a national pipeline network in at least three ways:

First, China's NOCs have not built enough storage facilities and pipelines to keep pace with the growth in China's natural gas demand. Central government agencies, notably the NDRC and the NEA, have repeatedly stated that China's inadequate storage facilities are constraining the development of China's natural gas industry.[53] For example, according to the NDRC and NEA, as of April 2018, China's natural gas storage was equivalent to 3 percent of its consumption, compared to a global average of 12–15 percent.[54]

The NOCs' underinvestment in natural gas storage is primarily because it has not been profitable to do so.[55] According to the president of PetroChina's Planning and Engineering Institute, "without government policy support and market-driven pricing, no company would want to invest… as it's expensive to build and costly to operate."[56] Indeed, the cost of building storage exceeds the state-set residential gas prices in some locations. Beijing is a case in point. In January 2018, the city's residential gas price was RMB 2.28 per cubic meter, whereas the cost for building storage was RMB 3-6 per cubic meter.[57]

China's pipeline construction is also inadequate to support natural gas demand growth. Energy experts often make comparisons with the United States to underscore China's need for more natural gas pipelines because the two countries are of similar geographic size.[58] For example, in 2018, an official with China's NEA stated that although China's natural gas consumption is one-third of that of the United States, the length of its natural gas trunk pipelines was just one-seventh of that of the United States.[59]

The underinvestment in pipelines by China's NOCs is probably partly due to more attractive investment alternatives. The companies likely found it to be more profitable to develop LNG import terminals to supply natural gas to nearby industrial users, which pay a higher state-set price for natural gas than residential consumers. In addition, as it became increasingly clear that the central government was going to establish a national pipeline company, developing pipelines that ultimately would be transferred to the new company was probably a disincentive to invest in new pipelines.

Second, PetroChina and Sinopec were decidedly unenthusiastic about forging connections among their midstream infrastructure and between their midstream infrastructure and that of CNOOC. From the perspective of PetroChina and Sinopec (and some provincial governments which operate extensive pipeline networks), they had not invested large sums of money in the construction of pipelines across China to secure customers for their natural gas supplies only to risk losing those customers by allowing domestic rivals access to their networks. This maintenance of separate pipeline networks helped PetroChina and Sinopec gain and maintain customers but deprived the central government of the infrastructure interconnections

necessary to efficiently move natural gas supplies from areas of surplus to deficit, such as from southern to northern China during peak winter demand.

Third, the lack of midstream infrastructure interconnections gave rise to another problem, the construction of "repeat" infrastructure that wasted financial and land resources. In Guangdong, one of China's largest gas consuming provinces and the terminus of PetroChina's West-East II pipeline, PetroChina built its own pipeline distribution network to compete with the network being developed by Guangdong Natural Gas Pipeline Company (GNGPC) in the early 2010s. The two pipeline networks overlapped in multiple cities, including Guangzhou, Foshan, Qingyuan, Dongguan and Shenzhen. PetroChina similarly built duplicate pipeline networks in other provinces such as Hubei and Jiangsu to avoid sharing infrastructure and thus customers and revenue with other operators.[60]

The severe natural gas shortages that plagued northern China in the winter of 2017-2018 and left many communities literally out in the cold highlighted how the development and operation of China's midstream infrastructure by its NOCs failed to serve Beijing's interest in ensuring natural gas supply security during periods of peak demand. Indeed, in March 2018, Liu Bingjiang of the Ministry of Environmental Protection (now the Ministry of Ecology and Environment), stated that the twin culprits of the shortages were the lack of pipeline interconnections and the lack of natural gas storage.[61] (Other factors include the aggressive implementation of "coal-to-gas" switching to meet the air pollution reduction targets set by Beijing for the end of 2017, colder than normal winter temperatures, and cutbacks in pipeline gas deliveries from Turkmenistan.[62]) The crisis prompted Beijing to coordinate infrastructure interconnections, including between CNOOC's Shenzhen and Dapeng LNG import terminals, the GNGPC, and PetroChina's West-East Pipeline II, which required the reverse flow of the pipeline to deliver natural gas to points north.[63]

The Solution: A New Single Pipeline Operator

The establishment of PipeChina reflects Beijing's view that a pipeline monopoly will be more effective than a pipeline oligopoly in advancing the central government's natural gas goals. The logic is that the concentration of China's midstream assets in a single company that does not produce, import, or sell natural gas will lower the barriers to entry for other firms created by the ownership and operation of pipelines and LNG import terminals by three NOCs also involved in China's upstream and downstream. Specifically, Beijing intends for PipeChina to develop more infrastructure and infrastructure interconnections to create a truly national natural gas pipeline network. It also expects that fair and open access to this pipeline network will increase China's domestic and imported natural gas supplies. Finally, the central government also expects that PipeChina will foster the development of more competitive downstream, which in the longer term should lower prices and boost China's natural gas consumption.

More Infrastructure and More Interconnections: PipeChina has a mandate to develop the infrastructure required to improve the allocation of natural gas resources nationwide. This endeavor entails building some of the pipelines, LNG import terminals, and natural gas storage facilities that have constrained China's ability to meet demand during peak periods. It also entails forging connections between infrastructure previously operated by the NOCs and

provincial governments. In addition, Beijing expects that having a single central SOE in charge of the construction of pipelines will eradicate the development of "repeat pipelines" and the resulting waste of capital and land.[64]

Beijing is backing these goals with new policy support. For example, in April 2020, five central government agencies released measures to spur the development of natural gas storage facilities in response to what they called China's lagging gas storage construction plans. The measures offer a subsidy of up to 30 percent of the total investment. In addition, the measures call for preferential land, tax, and finance policies.[65]

More Players in the Upstream: PipeChina intends to attract more investment in exploration and production from a more diverse group of companies by ensuring fair and open access to China's pipelines. Beijing provided an additional incentive when it released new regulations, effective as of May 1, 2020, to spur the development of a more competitive upstream. First, the regulations abolish the requirement that foreign companies must partner with one of China's NOCs to engage in exploration and production. Foreign (and domestic) firms registered in China with net assets of $43 million are now allowed to obtain mining permits valid for five years. Second, the regulations have a "use it or lose it" provision that is likely to force the NOCs, which control most of China's oil and natural gas resources, to cede some of their acreage. Specifically, the regulations mandate that extensions in mining permits will be accompanied by a 25 percent reduction in the area covered by the original permit.[66]

More Competition in the Downstream: Beijing regards the creation of PipeChina as key to its efforts to develop a more competitive downstream and lower natural gas prices. In Beijing's view, unbundling pipelines and LNG import terminals from China's NOCs is a necessary step toward generating more competition and further price liberalization. Indeed, Liu Manping of the NDRC's Centre for Price Monitoring argued in a 2019 essay that if Beijing abolished price controls in the absence of midstream reforms to provide third-party access, there would not be enough suppliers to form prices through competition.[67]

The central government expects that by concentrating the NOCs' pipelines and some of their LNG import terminals in the hands of PipeChina and providing fair and open access to them, more companies will be able to sell domestic and imported natural gas to Chinese consumers. The increase in the number of sellers will expand the number of supply options available to distribution companies. The enhanced ability of the gas distributors to comparison shop will put pressure on natural gas suppliers to source the lowest cost supplies, which, over time, should result in lower prices for end users and increased consumption.[68]

There is also an expectation that PipeChina can help lower the cost burden for consumers by harmonizing and reducing pipeline transmission tariffs, building on tariff cuts implemented in 2017.[69] The NDRC has set transmission tariffs on a pipeline-by-pipeline basis with input from the pipeline operators.[70] This resulted in a wide range of tariffs, even for pipelines with identical routes.[71] In the first half of 2017, the NDRC reviewed the costs used by the operators in determining the tariffs for 13 interprovincial pipelines.[72] On September 1 of that year, the NDRC cut the tariffs for the 13 pipelines by an average of 15 percent and also implemented a reduction in city gate prices to pass the tariff reduction to end users.[73]

Will PipeChina be a Catalyst for Better Outcomes?

The extent to which PipeChina can help grow China's natural gas supplies and consumption by lowering the barriers to entry for firms other than the NOCs to participate in China's natural gas markets is likely to depend in large part on the answers to three questions:

- Will China develop enforceable rules for third-party access?
- Will the NEA have the authority to enforce it?
- How large a role will China's NOCs continue to play in China's natural gas markets?

Whither Third-Party Access?

The provision of third-party access to midstream infrastructure is key to Beijing's efforts to increase the number of participants in China's upstream and to create a more competitive downstream. To this end, China's government has been working to develop rules for third-party access to China's pipelines, LNG import terminals, and storage facilities. Central government agencies have issued a series of documents detailing China's evolving third-party access rules. Each new document seeks to address weaknesses in earlier ones.

The Chinese government has sought to expand third-party access to natural gas infrastructure since February 2014, when the NEA released the "Measures for Regulation of Fair and Open Access to Oil and Gas Pipeline Facilities (for Trial Implementation)" (Trial Measures) for a five-year period.[74] The Trial Measures called for pipeline and facility operators to grant third parties access to their pipelines, storage, and LNG import terminals if there was surplus capacity.[75] However, the Trial Measures did not clearly define "surplus capacity" or how it should be determined. Consequently, it was left up to the operators to determine whether their pipelines and LNG import terminals had surplus capacity, with the result that there was little improvement in the ability of third parties to access infrastructure controlled by the NOCs.[76] Indeed, the NOCs granted use of a handful of LNG import terminals on an ad hoc basis, which effectively prevented third parties from contracting LNG since they did not know if or when they would have access to infrastructure.[77]

On May 24, 2019, the NDRC, NEA, the Ministry of Housing and Urban Development, and the State Administration for Market Regulation published updated guidelines on third-party access, "Measures for Regulation of Fair and Open Access to Oil and Gas Pipeline Facilities" (Measures)," to replace the Trial Measures.[78] The Measures, which will remain in effect for five years, contain some new requirements aimed at broadening third-party access, such as requiring operators to publicly disclose monthly surplus capacity. However, the Measures do not define surplus capacity and appear to continue to let the operators of midstream infrastructure determine how to allocate it.[79] Moreover, the Measures do not stipulate any consequences for noncompliance by the NOCs or other operators and instead only state that the NEA may recommend penalties.[80]

On April 14, 2020, the NEA issued the "Notification on Doing a Good Job on Work Related to the Calculation of the Surplus Capacity of Oil and Gas Pipeline Network Facilities (Consultation Draft)." It explains how to calculate the spare capacity of pipelines, LNG import terminals, and

natural gas storage facilities.[81] The establishment of unified standards for the calculation of spare capacity to replace the independent calculations done by the NOCs and other pipeline operators is regarded as a precondition for third-party access.[82]

Whither Enforcement?

Beijing also needs an entity with the authority to enforce third-party access, penalize non-compliance, and resolve disputes to help PipeChina spur the development of more competitive upstream and downstream markets. The series of documents issued by the NEA and other government agencies indicate that the NEA is slated to play this role. For example, the Measures released in May 2019 state that the NEA is responsible for supervising fair and open access to China's midstream infrastructure and that users and operators may ask the NEA to "coordinate" disputes.[83]

One challenge the NEA may face as an enforcer of China's third-party access rules is that the NOCs may be tempted to influence the operations of PipeChina via the pipeline company's leaders or other personnel transferred from the NOCs.[84] These concerns about the NOCs' influence are probably most warranted in the case of PetroChina. The company is PipeChina's largest shareholder, holds two seats on PipeChina's board of directors and was the previous employer of PipeChina's top two executives. For example, one observer interviewed for this paper stated that one can imagine a scenario in which the NOCs collude with PipeChina to deny other companies access to the infrastructure that PipeChina operates.[85] Similarly, a manager at a city gas company interviewed by *Caixin*, a prominent business publication, said, "We are used to dealing with just CNPC, but now we have to talk to PipeChina, too—who knows whether the company would prioritize the needs of giant consumers like Sinopec and CNPC when supply is tight, and cut off our gas for safety reasons?"[86]

Local governments may also make it difficult for the NEA to enforce third-party access. Protectionism and the need to maintain employment have prompted some local governments to form joint ventures with the NOCs to operate pipelines. For example, PetroChina, CNOOC, and Sinopec collectively own 72 percent of the GNGPC.[87] Local subsidiaries of the NOCs may still be granted priority access to provincial pipeline networks in exchange for assurances of stable supplies of natural gas.

Whither the Role of the NOCs?

How large a role China's NOCs continue to play in China's gas markets likely will influence the extent to which Beijing's goals for increasing China's natural gas supply and consumption are realized because these goals require creating space for companies other than the NOCs. China's leaders have made clear that they want to see more participants in China's upstream, midstream, and downstream. On December 4, 2019, five days before the legal establishment of PipeChina, the Central Committee of the Communist Party of China and the State Council prepared their "Opinions Concerning Creating a Better Development Environment to Support Private Enterprise Reform and Development," which endorses the entrance of private companies into the upstream, midstream, and downstream of China's oil and natural gas industry.[88]

Liu Manping of the NDRC's Centre for Price Monitoring, who has written prolifically about China's midstream reforms, has indicated that if PipeChina delivers the outcomes Beijing seeks, the role of the NOCs in China's natural gas markets will have to shrink. For example, in April 2019, he said, "[W]hen the existing oil and gas companies are stripped of their pipeline networks, their monopoly power and voice in the market will be weakened to a certain extent. This objectively improves the ability of other market players to compete fairly, and market competition will become more intense."[89] In December 2019, he similarly stated that as the number of participants in China's oil and gas industry increases following the creation of PipeChina, "the market concentration of the three major oil and gas companies will be reduced and the market competition will be more adequate."[90]

However, there probably are limits to how much Beijing wants to see the role of China's NOCs reduced. China's leaders will likely want the NOCs to continue to be the dominant players in the upstream because of the importance of domestic oil and natural gas production to supply security. Indeed, Xi's instructions to China's NOCs in July 2018 to increase domestic output to enhance national energy security demonstrate the value to China's leaders of having most of China's oil and natural gas resources concentrated in the hands of its NOCs. Consequently, it seems highly unlikely that other companies would be able to obtain an asset also sought by one of China's NOCs. As a result, companies other than the NOCs that enter China's upstream are likely to be involved in filling in gaps left by the NOCs, such as developing assets that the NOCs have passed over because of their small size.

Meanwhile, China's NOCs are expanding their presence in the downstream. For example, in August 2019, Kunlun Energy, a subsidiary of PetroChina that controls 8 percent of China's gas distribution market, purchased 17 natural gas companies from Jinhong Holding.[91] One year later, in August 2020, Sinopec and Guangxi Guangtou Energy Group formed a joint venture, Guangxi Gas Group, in which Sinopec is the majority shareholder.[92]

The NOCs' acquisitions of city gas companies are motivated by the sale to PipeChina of their midstream businesses, which have been important sources of income and influence over consumers.[93] This is especially true for PetroChina. The company's natural gas pipeline operations have constituted a substantial portion of its income and helped cushion losses from imported pipeline gas and LNG in recent years. In 2019, for example, PetroChina earned a profit of $5.2 billion from its pipeline transmission business and lost $4.3 billion on imported gas.[94] Consequently, PetroChina is eyeing the downstream as a new source of profits.

While the growing presence of PetroChina and Sinopec in the retail business is consistent with Beijing's goal of creating a fully competitive downstream market, their expansion has raised concerns among city gas companies that the NOCs might become the dominant players in the downstream.[95] Specifically, city gas companies worry that the NOCs' control of the majority of domestic and imported gas supplies give them an unfair advantage in the competition for consumers, especially large industrial users. Indeed, PetroChina has bypassed city gas companies and increased its direct sales to end users.

A New Group of LNG Importers[96]

If PipeChina spurs the changes in China's natural gas markets that Beijing seeks, one result is

likely to be an expansion of China's so-called "second-tier" LNG importers. This group already includes gas distributor ENN, power plant operator Huadian, and energy groups such as Jovo. New LNG importers have continued to emerge since China's leaders approved the creation of PipeChina in March 2019. For example, in May 2019, Guangdong Energy, a utility, purchased its first spot cargoes from Malaysia's Petronas for delivery to the CNOOC-operated Dapeng LNG terminal, in which Guangdong Energy is a minority shareholder. The company bought all of its gas from CNOOC before it secured access to the Dapeng terminal.[97] In May 2020 Foran Energy Group made its first direct purchase from the international market.[98]

Meanwhile, incumbent second-tier firms are likely to increase their LNG imports if they can obtain reliable access China's midstream infrastructure.[99] In June 2019, for example, a source with China Gas, one of the country's largest city gas companies, said that once the country's LNG import terminals and pipelines are fully open to third parties, "we can purchase LNG directly from the international market by obtaining access to LNG terminals and send [it] to our city pipelines via access to national and provincial pipelines."[100] Similarly, In June 2020, the president of ENN, Zhang Yuying, said he expects PipeChina will begin operating LNG import terminals by the fourth quarter, which will provide ENN with more opportunities to bid on import slots and take advantage of cheap spot cargoes.[101] In June, spot prices in Asia (JKM) averaged $2.10 per MMBtu whereas the city gate price in Shanghai was $8.14 per MMBtu.[102]

The emergence of new LNG importers, in turn, should create new opportunities for LNG exporters to supply China. Here the rise of China's independent refiners (refineries not wholly-owned by the NOCs) as crude oil importers is instructive.[103] Beijing's decision in February 2015 to grant the independents the right to apply for licenses to purchase and process imported crudes created a new class of crude oil importers. In 2017 alone, the independents accounted for 80 percent of the growth in China's crude oil imports.[104] Their emergence as oil importers provided crude exporters with new ways to gain and maintain market share in China. Saudi Aramco, for example, expanded its customers from the NOCs to include independent refiners. Supply deals struck with two independents totaling 800,000 bpd helped Saudi Arabia reclaim its position as China's largest crude oil supplier on an annual basis in 2019.[105]

Conclusion

The establishment of PipeChina highlights a key element of Beijing's SOE reform agenda, the reallocation of assets among central SOEs to enhance their ability to advance the policy priorities of China's leaders. The creation of a new central SOE from the midstream assets of CNPC, Sinopec, and CNOOC reflects Beijing's view that the transformation of China's pipeline oligopoly into a pipeline monopoly will catalyze more investment in the upstream, more competition in the downstream, and a unified national pipeline network, all of which Beijing views as necessary to boost China's natural gas production and consumption. The key to achieving these goals, in the eyes of China's leaders, is to lower the barriers to entry to China's oil and gas industry for companies other than the NOCs. The extent to which PipeChina will deliver the outcomes Beijing seeks will almost certainly depend on several factors, including how China's rules for third-party access to midstream infrastructure evolve, whether the NEA is able to enforce them, and the extent to which Beijing is willing to reduce the role of China's NOCs to create more competitive gas markets.

This new round of reforms to China's oil and natural gas industry is likely to unfold gradually, if history is any guide.[106] For example, Beijing's moves to liberalize natural gas prices date back to 1982.[107] Similarly, rules for third-party access to midstream infrastructure, begun much more recently, are still a work in progress. Consequently, the central government's efforts to transform the natural gas market it has to the one it wants will almost certainly move forward incrementally.

The current situation in which Asian spot LNG prices are substantially lower than the city gate price in Shanghai has created a window of opportunity for China's government to further restructure China's natural gas market to bring regulated domestic gas prices more in line with international prices. Afterall, it is easier to implement reforms that result in lower prices than higher ones. That said, one issue Beijing and the NOCs will have to resolve as transmission contracts are separated from sales contracts is how to deal with the expensive long-term contracts for imported gas, notably pipeline gas from Turkmenistan and LNG from Qatar.[108]

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