中国天然ガス業界の現状と
中流分野における制度改革の行方

【要約】

中国の天然ガス消費量は、高い経済成長に加えて、政府によるクリーンエネルギー利用促進政策も後押しとなり、過去10年で急速に拡大。政府は、一次エネルギー消費量に占める天然ガスの割合を2020年には、2015年の6%から10%へ引上げる目標を掲げており、消費量は引き続き拡大基調を辿ろう。

天然ガス消費量が急増する中、中国では2006年以降、LNG及びパイプラインガスによる調達を積極化しており、天然ガスの輸入依存度は2016年には35%と過去最高を記録。今後も需要増加が見込まれる中、国内生産量と輸入量を一段と拡大させていく取り組みは必要不可欠。

こうしたなか、業界構造をみると、国有石油大手（NOC）3社がサプライチェーンの上流・中流分野をほぼ独占。新規参入事業者が、エンドユーザーに供給しようにもパイプラインへのアクセスが事実上困難となっており、参入企業の裾野拡大が阻まれていたのが実情。

また、NOC3社も、現在の価格決定メカニズムでは、輸入ガスの調達コストが上昇する局面では卸売価格に十分に転嫁ができないため、輸入量を増加させることが収益面でのリスクの高まりに繋がる状況にあった。

こうした課題に対応すべく、政府は、パイプラインへの第三者アクセスの促進や中流事業における価格透明性の向上、といった制度改革を2014年から矢継ぎ早に打ち出しており、今後は、第三者による天然ガス供給の増加や中流分野に対する投資拡大が見込まれている。

もっとも、一連の改革を経てもNOC3社の強固な事業基盤が揺らぐ事態は現時点では想定し難い。これは、安定した収益源である中流分野の主要インフラ設備をNOCが引き続き保有するとみられる上、上流分野においても輸入ガスに比してコスト競争力に勝る国内ガス資源をほぼ独占しているため。
China’s natural gas consumption has witnessed a rapid growth in the last decade attributed to the rapid economic growth and the government’s clean energy policies. The strong growth momentum is expected to continue given the government’s target to raise the natural gas share in the primary energy consumption mix from 6% in 2015 to 10% by 2020.

In order to secure gas supply, China has proactively increased import of liquefied natural gas and pipeline natural gas since 2006. Import dependency reached a record high of 35% in 2016. Still, new sources of gas supply - both domestic production and imports - are needed to meet the projected demand growth.

Along the natural gas supply chain, the 3 national oil companies ("NOCs") have traditionally dominated the upstream and midstream segments. New non-NOC gas suppliers are almost unable to access the downstream users and thereby posing a limitation in new gas resources development and diversification of gas supply in China.

Wholesale price of the majority of gas supply are regulated by the government. Yet, current pricing mechanism has resulted in inefficient cost pass-through of import gas to wholesale price. Therefore, a more effective price-setting mechanism is essential for sustainable industry development.

To address the aforementioned challenges, a number of reform policies have been launched since 2014. These policies are likely to improve transparency in pipeline tariff-setting and stimulate utilisation of midstream facilities under the third-party-access scheme, unlocking potential for non-NOC gas suppliers.

Nevertheless, NOCs’ strategic role in the natural gas supply chain is expected to remain unchanged because NOCs will continue to control the operation of key midstream infrastructures, and exert strong influence in the upstream segment through their ownership of low-cost, onshore conventional gas resources.
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I. Overview

1. Natural Gas Demand and Supply in China

(1) Demand Trends

◇ Natural gas consumption is likely to remain positive growth in the next few years

➢ Natural gas is a kind of fossil fuel that emits fewer air pollutants and hydrocarbons when burnt, thus is encouraged by Chinese government as a substitute fuel for coal and oil.

➢ Over the last decade, natural gas consumption in China has surged rapidly at a CAGR of 14.5% attributed to the rapid economic growth as well as the government’s clean energy policies, reaching 206 billion m³ in 2016 (Figure 1). Although the consumption growth decelerated in 2015 mainly due to declining price of the substitute fuels (e.g. oil & coal), consumption growth has rebounded in 2016 attributed to a natural gas price cut implemented by the government in Nov 2015.

➢ In a bid to reduce air pollution, the government has set a target to raise the natural gas share to above 10% in the primary energy consumption mix by 2020 (Figure 2). Natural gas consumption, therefore, is projected to maintain a solid growth and reach 315 billion m³ in 2020 (Note).

(Note) Based on the Current Policy Scenario projection compiled by the International Energy Agency (“IEA”), assuming China average real GDP growth rate at 6.4% throughout the period of 2013-2020.

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas Consumption (Billion m³)</th>
<th>YoY Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>2005-2016 CAGR: 14.5%</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>3.3%</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>6.5%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Natural Gas Consumption in China

<table>
<thead>
<tr>
<th>Year</th>
<th>IEA Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-2020F</td>
<td>315 billion m³</td>
</tr>
</tbody>
</table>

Figure 2: Chinese Government Target of Primary Energy Consumption Mix

(Note) “13th Five Year Plan for Energy” by National Energy Administration.
(Source) CEIC, National Development and Reform Commission (“NDRC”), Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
(2) Supply and Import Trends

◊ China is expected to become even more dependent on gas import in the next 5 years

➢ China had traditionally been self-sufficient for natural gas. However, attributed to the government’s policy encouragement of natural gas usage, domestic supply has become no longer able to meet the rapid demand growth of natural gas since 2006 (Figure 3).

➢ Aside from development of new gas basins, China has started to import natural gas by receiving the first liquefied natural gas (“LNG”) shipment from Australia in 2006 and the new pipeline natural gas (“PNG”) connection from Central Asia in 2010 (Figure 4).

➢ Since then, natural gas import has gradually expanded to compensate for the shortage of domestic gas output. Import dependency of natural gas in China has kept increasing and reached a record high of 35% in 2016.

➢ Looking ahead, IEA projects China natural gas import dependency will further increase as domestic supply-demand gap is expected to widen amid the rapid domestic gas demand growth.
2. Industry Structure

(1) Overview of Gas Supply Chain

◇ The gas supply chain in China is largely dominated by the 3 NOCs

➢ With respect to the gas supply chain in China, the upstream segment comprises the activities of domestic gas exploration and production (“E&P”) as well as securing sufficient natural gas supply through import of PNG and LNG from the international market (Figure 5).

➢ The midstream segment mainly covers the construction and operation of gas import and transmission infrastructure facilities, including national pipelines for cross-regional gas transmission, LNG receiving and regasification terminals, and provincial pipelines for intra-provincial gas transmission. The segment is also responsible for wholesale of natural gas.

➢ The upstream and midstream segments are almost dominated by the 3 National Oil Companies (“NOCs”), namely China National Petroleum Corporation (“CNPC”), China Petroleum & Chemical Corporation (“Sinopec”) and China National Offshore Oil Corporation (“CNOOC”).

➢ Natural gas end-users in downstream either procure gas directly from the midstream wholesalers or indirectly from the city gas distributors.

Figure 5: Natural Gas Supply Chain in China

(Source) CEIC, China Customs, company IR, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
(2) Geographical Demand and Supply

Midstream infrastructures are essential for supplying gas to the coastal demand centre

- In China, supported by robust economic activities and higher degree of urbanization, coastal provincial/municipal cities have collectively accounted for almost half of the nation’s gas consumption. On the other hand, major gas basins and gas producing regions are largely located in the distant inland provinces, resulting in gas demand and supply imbalance of the country.

- Attributed to the government’s effort to invest in development of large-scale gas transmission and import infrastructures over the past decades, most of the coastal cities are now able to access to one or more sources of natural gas (Figure 6).

![Figure 6: Illustrated Geographical Gas Supply in China](source)

(Source) International Group of Liquefied Natural Gas Importers (“GIIGNL”), information from various sources, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
(3) NOCs’ Monopoly in the Midstream Infrastructures

- NOCs’ dominance in midstream creates an entry barrier for new gas suppliers

- Owing to the capital intensive nature, NOCs play an important role in the construction and operation of national pipelines and key import infrastructure facilities (Figure 7).

- CNPC and Sinopec are the owners and operators of national pipelines in China (Figure 8). Some CNPC’s national pipelines are directly receiving PNG from the neighbouring countries.

- For LNG terminals, most of the facilities are owned and operated by CNOOC. The company operated more than 60% of the nation’s LNG regasification capacity in 2015.

- For provincial pipelines, apart from CNPC, operators owned by the local governments are also responsible for intra-provincial gas transmission in many provinces (Figure 9).

- NOCs’ dominance in the midstream segment has been the major barrier for non-NOC players to develop the upstream gas supply business since they are physically unable to access the downstream end-users without the connectivity.

**Figure 7: Midstream Infrastructures in China (2015)**

<table>
<thead>
<tr>
<th>NOCs</th>
<th>National Mileage (Km)</th>
<th>Provincial Mileage (Km)</th>
<th>LNG Terminals Regasification Capacity (Billion m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNPC</td>
<td>34,085</td>
<td>25,630</td>
<td>54.1</td>
</tr>
<tr>
<td>Sinopec</td>
<td>3,216</td>
<td>1,330</td>
<td>13.7</td>
</tr>
<tr>
<td>CNOOC</td>
<td>n.a.</td>
<td>4,300</td>
<td>36.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-NOCs</th>
<th>Mileage (Km)</th>
<th>Regasification Capacity (Billion m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n.a.</td>
<td>Over 10,000</td>
<td>1.6</td>
</tr>
</tbody>
</table>

(Note) Estimated based on disclosures of NOCs and major provincial pipeline companies.
(Source) Company IR, annual reports, GHIGNL, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)

**Figure 8: Key National Pipeline Operators**

**Figure 9: Key Provincial Pipeline Operators**

(Source) Company IR, news articles, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
3. Price Regulations

(1) City Gate Price (Wholesale Price)

◇ Wholesale price of majority of gas supply are regulated

➢ City gate price refers to the wholesale price of gas transmitted via national pipeline. The price is regulated by NDRC on provincial basis. It comprises the blended cost of onshore conventional gas and PNG import gas as well as transmission cost of gas via national pipelines. Sales volume under the city gate price roughly accounted for 71% of national gas volume in 2015 (Figure 10).

➢ With an aim to encourage natural gas consumption, city gate prices are set at a lower-price level compared to the alternative oil products.
  ▪ Residential: City gate price for residential usage is essentially the sum of government-approved wellhead price and national pipeline tariff. Price has been kept at low level and unadjusted since 2010.
  
  ▪ Non-residential: City gate price for non-residential usage is designed to benchmark the price of alternative oil products (Note 1) with 15% formula discount to encourage industrial usage of natural gas.

➢ The remaining 29% of natural gas, such as LNG and other domestic gases (Note 2) are traded at market-based price, which is determined freely through negotiation between sellers and buyers.

(Note) 1. Benchmarking the average import prices of fuel oil and LPG in Shanghai.
   2. Including offshore gas and unconventional gases such as shale gas, coalbed methane, coal-based synthetic gas.

Figure 10: Regulation on Procurement Cost and Wholesale Price (Illustration)

Gas Supply in 2015: 193 billion m³

- Onshore Conventional: 71%
- PNG: 29%
- LNG: 55%
- Other Domestic Gas: 45%

(Source) News articles, CEIC, NDRC, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
Price mechanism reform is needed for sustainable industry development

- Under the current price mechanism, the PNG import activities in China has been unprofitable attributed to inability of the importers to adequately pass-through the expensive import gas to wholesale price (Figure 11).

- Importers’ losses have been subsidized by the sales activities of low-cost, onshore conventional gas. Nevertheless, there is a growing concern about the sustainability of the import business as China’s import dependency of natural gas, and hence the blended cost of gas, is projected to rise in the upcoming years.

- In addition, non-residential city gate price has become less competitive since 2014 as the city gate price has not been timely adjusted in accordance with the movement of alternative oil price (Figure 12). This is said to be one of the major causes of slowdown in natural gas consumption growth in 2015. Therefore, a more effective price-setting mechanism of wholesale price is essential.

Figure 11: Profitability of Gas Wholesale Business in China (Note)

(Note) The figures above illustrated the “Natural Gas and Pipeline” segment of CNPC, which mainly comprises the transmission and wholesale activities of onshore conventional gas and import gas. Currently, PNG import business is almost dominated by CNPC, representing about 99% of the PNG import of the country.
(Source) Company IR, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)

Figure 12: Price of Alternative Oil Products v.s. Non-Residential City Gate Price

(Note) Marginal change in city gate price is due to change in exchange rate.
(Source) NDRC, Wind, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
(2) Pipeline Tariff

 بكلمة، ي 缺乏清晰的机制对管道收费的限制 新基金输入投资者

- 正
  - 端口和省天然气管道的收费标准由国家发展和改革 委员会和地区定价局审核和批准。收费标准根据每条管道的项目来计算，即每条管道的回报率不同（图13）。

- 反
  - 另外，由于管道运营通常与管道所有者（即国家石油公司和省天然气批发商）的批发业务捆绑在一起。因此，对外部投资者来说，很难评估管道业务的财务回报概况，从而限制了新资本基金对 新管道投资的输入。

Figure 13: Average Return Rate of Major Pipelines (2013-2015)

(Note) Returns on Assets (“ROA”) = Net profits/ Total Assets
(Source) Company IR, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
II. Outlook
1. Capacity Expansion Plan

♢ Massive infrastructure investment is needed to support transmission needs

- While China’s gas demand is expected to grow rapidly through 2020, existing infrastructures are insufficient to meet the anticipated demand. A number of construction projects including pipelines and LNG terminals are expected to be completed by 2020 (Figure 14). These projects are expected to increase connectivity in the domestic pipeline system and diversify supply sources for demand centers.

- In particular, the government has set a concrete target for pipelines in the 13th Five Year Plan for Natural Gas. Pipeline mileages will increase about 35,000 km to at least 104,000 km by 2020, which represents an acceleration compared with less than 27,000 km addition during 2010-2015. Enormous investment and funds would be needed to meet the target.

Figure 14: New Infrastructures to be Completed by 2020

<table>
<thead>
<tr>
<th>National Pipeline</th>
<th>Provincial Pipeline</th>
<th>LNG Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mileage (Km)</td>
<td>Share</td>
<td>Mileage (Km)</td>
</tr>
<tr>
<td>China Total</td>
<td>18,299 100%</td>
<td>Over 16,700</td>
</tr>
<tr>
<td>NOCs</td>
<td>18,299 100%</td>
<td></td>
</tr>
<tr>
<td>CNPC</td>
<td>9,899 54%</td>
<td></td>
</tr>
<tr>
<td>Sinopec</td>
<td>8,400 46%</td>
<td></td>
</tr>
<tr>
<td>CNOOC</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Non-NOCs</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

(Source) Company IR, news articles, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
2. Sector Reform

(1) Reform Direction

- Unbundling infrastructures, price marketization, TPA are three key reform directions

- To address the aforementioned challenges, a number of measures have been implemented since 2014 (Figure 15). Key reform directions include:
  ① Unbundle the “natural monopoly business” (自然壟斷業務) and “competitive business” (競爭性業務). Encourage third-party access (“TPA”) to natural monopoly infrastructures.
  ② Achieve marketization of prices in “competitive business” and promote direct trade between upstream suppliers and downstream distributors/large-scale users.
  ③ Standardize returns and improve cost supervision of “natural monopoly business” with an aim to attract third-party investments for pipeline expansion.

- Once fully implemented, these policies are expected to significantly increase the transparency in the midstream segment and introduce more market factors in gas price. However, details on tariffs and TPA implementation are still lacking and the reform progress is expected to be slow.

Table 15: Reform Directions and Related Policies

<table>
<thead>
<tr>
<th>Date</th>
<th>Policies/ Events</th>
<th>Reform Directions</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>“The Management Measures of Natural Gas Infrastructure Construction &amp; Operation”</td>
<td>①</td>
<td>Provided a set of guidelines for approval process and new infrastructure construction and operation management of gas-related infrastructures</td>
</tr>
<tr>
<td></td>
<td>《天然气基础设施建设与运营管理办法》</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Measures for the Supervision of the Fair Access to the Oil &amp; Gas Pipeline Facilities (Proposal)”</td>
<td>①</td>
<td>Obligated the infrastructure owners to open spare capacity of their facilities to third parties</td>
</tr>
<tr>
<td></td>
<td>《油气管网设施公平开放监管办法（试行）》</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>Establishment of the Shanghai Petroleum and Natural Gas Exchange Centre (“SHPGX”)</td>
<td>②</td>
<td>A new platform for physical spot trade of natural gas products, including both LNG and pipeline gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The exchange is expected to give the buyers and sellers more insight on market price of natural gas i.e. price discovery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>“Natural Gas Pipeline Transmission Tariff Administration Policy (Proposal)”</td>
<td>③</td>
<td>Proposed a fixed investment return of cross-provincial (national) pipelines at 8%</td>
</tr>
<tr>
<td></td>
<td>《天然气管道运输价格管理办法（试行）》</td>
<td></td>
<td>Cost of pipelines and approved tariffs will be publicized to improve transparency</td>
</tr>
<tr>
<td></td>
<td>“Notice on Information Disclosure of Access to the Oil &amp; Gas Pipeline Facilities”</td>
<td>①</td>
<td>Stipulated a set of procedures and requirements of information disclosures (e.g. tariff, capacity, etc.) by the infrastructure owners</td>
</tr>
<tr>
<td></td>
<td>《关于做好油气管网设施开放相关信息公开工作的通知》</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source) NDRC, news articles, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
(2) Recent Development

◇ New investors and gas suppliers have quickly emerged along the reform plans

- Following the reform announcement, NOCs have begun restructuring and sales of their pipeline assets to the third-party investors (Figure 16). While NOCs will still be holding the controlling stake in the pipeline companies, the participation of third-party investors will pressure NOCs to improve utilisation of the pipeline assets through TPA.

- With respect to LNG import activities, downstream non-NOC players such as city gas distributors and power generating companies have also proactively seek for new gas supply from the international market by utilisation of TPA to LNG terminals owned by NOCs. LNG import by non-NOC is expected to gradually increase in the foreseeable future, yet the volume will still be marginal compared to overall gas supply in China (Figure 17).

Figure 16: Pipeline Sales (Unbundling) by NOCs

<table>
<thead>
<tr>
<th>Pipeline Owner</th>
<th>Year</th>
<th>Pipeline Details</th>
</tr>
</thead>
</table>
| CNPC          | 2015 | West-East (Pipeline I, II & III)  
  • Consolidated all of the major pipeline assets into a company which is jointed held by third party investor  
  • Third-party investors: A group of investors (27.7%)  
  | Trans Asia Pipeline (a cross-border pipeline for PNG import)  
  • Sales of 50% stake in the pipeline company  
  • Third-party investors: China Reform Holdings (50.0%)  
| Sinopec       | 2016 | Sichuan-East China  
  • Sales of 50% stake in the pipeline company  
  • Third party investors: China Life Insurance (43.9%)  
  SDIC Communications (6.1%) |

(Source) Company IR, news articles, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)

Figure 17: New Non-NOC LNG Importers

<table>
<thead>
<tr>
<th>Owner</th>
<th>Background</th>
<th>Core Business</th>
<th>Contract Signed</th>
<th>Import Year</th>
<th>Annual Import Volume</th>
<th>Import Facility (Owner of Facility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jovo Group</td>
<td>Private</td>
<td>City Gas</td>
<td>2014</td>
<td>2014</td>
<td>0.4 billion m³</td>
<td>Self-owned facility TPA of CNPC’s facility</td>
</tr>
<tr>
<td>China Huadian</td>
<td>Central SOE</td>
<td>Power Generation</td>
<td>2014</td>
<td>2018</td>
<td>0.8 billion m³</td>
<td>TPA of CNPC’s facility</td>
</tr>
<tr>
<td>Guangzhou Gas</td>
<td>Local SOE</td>
<td>City Gas</td>
<td>2014</td>
<td>2020</td>
<td>1.4 billion m³</td>
<td>TPA of CNPC’s facility</td>
</tr>
<tr>
<td>Beijing Enterprises</td>
<td>Local SOE</td>
<td>City Gas</td>
<td>2015</td>
<td>(undisclosed)</td>
<td></td>
<td>TPA of CNPC’s facility</td>
</tr>
<tr>
<td>Guanghui Energy</td>
<td>Private</td>
<td>City Gas</td>
<td>2015</td>
<td>(undisclosed)</td>
<td></td>
<td>TPA of CNPC’s facility (Self-owned facility is still under construction)</td>
</tr>
<tr>
<td>ENN Energy</td>
<td>Private</td>
<td>City Gas</td>
<td>2016</td>
<td>2019</td>
<td>0.7 billion m³</td>
<td>TPA of CNPC’s facility (Self-owned facility is still under construction)</td>
</tr>
</tbody>
</table>

(Source) News articles, company IR, Bank of Tokyo-Mitsubishi UFJ Strategic Research Division (HK)
3. Implication of the Reform

◇ NOCs’ strategic role in the gas supply chain should remain unchanged despite anticipated growth in non-NOC players

➢ A more transparent tariff-setting mechanism with mandated return rate should help NOCs to raise new capital by selling minority stakes of pipeline companies to new investors and continue investing in related business, including pipeline expansions. This is likely to further reinforce NOC’s dominance in the midstream operations.

➢ The new policies are likely to facilitate utilisation of NOC’s midstream facilities by TPA, unlocking the potential for new upstream gas suppliers. As a result, it is expected that more and more non-NOC players will become the suppliers of natural gas in the future.

➢ Nevertheless, NOCs’ strategic role in the natural gas supply chain is expected to remain unchanged because NOCs will continue to control the operation of key midstream infrastructures, and exert strong influence in the upstream segment through their ownership of low-cost, onshore conventional gas resources.

- End -