

China's Energy Cooperation with Japan and the Koreas: Opportunities and Prospects¹

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Introduction

Northeast Asia is strategically significant, both in geographic and economic terms. The region has a history of strife including the Russian occupation of the northern Japanese islands, the separation of the Koreas as a result of the Korean War, and the Japanese invasion of China in the 1930s-40s. Economic connections and political cooperation in this region were minimal during the Cold War, but have been intensifying since then.

Energy is among the issues covered by regional dialogues. Japan is the largest petroleum consumer in Northeast Asia and the second largest one in the world, with an annual demand of 255 million tons (Mt) for oil and of 69.5 billion cubic meters (Bcm) for gas. In this country, over 97% of oil requirements are satisfied by sources outside the region, located mainly in the Persian Gulf.

The Republic of Korea (South Korea) is also dependent on external supplies to run its economy. Notably, South Korean petroleum demand in the last decade has been growing rapidly from 35.6 Mt to 93.3 Mt. In 1996, the country's oil demand reportedly exceeded 100 Mt, including 95% imported from outside the region. This great thirst for oil constitutes a major challenge for energy security of these two economies.

Mongolia and the Democratic People's Republic of Korea (North Korea) fall, to some extent, into the same category as Japan and South Korea, with few hydrocarbon reserves and with both countries being either landlocked or isolated politically and economically. Mongolia has been dependent on oil supplies from Russia, while North Korea is dependent largely on China. Considering its security interests and traditional relationship with North Korea, China continues to export about half a million tons of oil annually to its neighbor.

By comparison, Russia is among the leading non-OPEC oil producers endowed with huge resources of oil and natural gas. In 2000, Russian oil production increased to 346 Mt, while gas output reached 590 Bcm. About 78% of oil and 87% of gas produced in Russia are from Western Siberia. However, future strategic reserves of hydrocarbons may become available from such remote areas as the Yamal peninsula in Northwest Siberia, Eastern Siberia and the Far Eastern region. Based on these resources, Russia is likely to continue to be well positioned as a major oil and gas producer and exporter.

On the other hand, China became a major oil producer and its oil output reached 100 Mt in 1978. In 2000, Chinese oil production peaked to 162 Mt and natural gas production increased to 27 Bcm. From 1993, however, China became a

net oil importer and although its natural gas and oil production is projected to expand, domestic supplies will no longer be sufficient to meet growing demand. China therefore is seeking access to new sources of energy from both remote domestic sources such as the Tarim Basin and from other countries, including Russia and Central Asia.

Overall, none of the other economies mentioned above, except Russia, can bridge the gap between demand and supply without closely linking themselves to oil and natural gas exporters, Persian Gulf oil producing states in particular. In 1999, for example, the combined Japanese, South Korean and Chinese oil imports from the Middle East reached 370 Mt, meeting 94%, 77% and 62% of their domestic demands respectively.

At the same time, large underdeveloped oil and gas resources are available in Eastern Siberia and the Far Eastern region in Russia, and Xinjiang province in China. Potentially, these remote hydrocarbon provinces could be strategically important for the whole of East Asia. After the end of the Cold War, these regions have become accessible for development. Russia firmly intends to develop oil and gas resources in Eastern Siberia and the Far Eastern provinces. At the same time, Japan, South Korea and China have their own plans for developing new energy resources in Russia, while continuing to maintain imports from the Middle East and other regions.

Since the early 1990s, efforts aimed at developing oil and gas producing areas in Northeast Asia intensified, including plans for natural gas and oil pipelines between China and Russia, and other possible energy links between Russia and Japan, and Russia and South Korea. It is believed that these new connections will play a critical role in diversifying and securing regional energy supplies.

In order to examine some of these prospects and surmount the challenges associated with the realization of energy mega-projects in Northeast Asia, this paper, first of all, provides an overview of the changing energy landscape in Northeast Asia, particularly growing imbalances between demand and supply.

Our second goal is to elaborate on prospects for cooperative approaches in developing new energy sources by all energy-importing economies in the region, and their rationales for considering such approaches. China-Russia natural gas and oil connections are paid special attention, taking into account the importance of the two neighboring countries and their key role in balancing Northeast Asian energy markets.

The paper also briefly reviews prospects for regional cooperation in natural gas and oil exploration and

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production, cross-border transportation infrastructure, and governmental coordination in project financing and risk management. In conclusion, prospects for strategic gas connections between China and Russia are analyzed in the context of changing regional political and economic settings.

The Changing Energy Picture in Northeast Asia

A number of political and economic changes are taking place in Northeast Asia, affecting and reshaping global energy configurations. The Persian Gulf region continues to serve as the world's key energy warehouse with its oil output traditionally sought after by several leading consumers, including the United States, Japan and European economies. The collapse of the Soviet Union also opened up Central Asian energy resources. Furthermore, Russia, in the process of pursuing a policy of economic openness and cooperation, is encouraging foreign investment in the development of its new oil and gas fields, including those in Eastern Siberia and the Far Eastern region. At the same time, the Northeast Asian energy landscape is undergoing a dramatic transformation with China and South Korea expanding their oil and gas demand. These trends, coupled with large-scale energy consumption and imports by Japan, position Northeast Asia as a strategic region in the world of energy.

1. Energy demand

Japan saw strong economic growth from the 1960s-1970s and has been the biggest oil consumer in Asia since 1965, accounting for about two-thirds of energy demand in the whole of the Asia-Pacific region until the 1990s. Apart from coal, Japan lacks any significant domestic sources of energy and imports almost all crude oil, natural gas, and other energy resources, including uranium. Currently, oil provides Japan with 56% of its total energy needs. In 2000,

75%-80% of oil imports originated from OPEC, particularly the Persian Gulf countries, including the United Arab Emirates, Saudi Arabia, Kuwait, and Iran. With the advancement of energy-saving technologies, its energy consumption has grown slowly and Japan's share of regional demand has shrunk since the late 1980s, compared with growing energy consumption in China and South Korea. When, in 1996, Chinese consumption of crude oil visibly outstripped domestic supplies, it was a turning point in the changing oil demand picture in Asia (Table 1).

Because Japan's domestic natural gas production is minimal, about 97% of its gas is imported, all in the form of liquefied natural gas (LNG) from Southeast Asia, including 40% from Indonesia. Demand on the part of Japan, South Korea and Taiwan accounts for about three-quarters of world LNG trade (Table 2).

Only about 5% of Japan's urban areas are equipped with a gas distribution system thus far, although there are plans to increase the natural gas share in the primary energy supply to 14% and above by 2010. Meanwhile, Japan also has an opportunity to import gas via a pipeline from Sakhalin or via China. Many analysts have cited the absence of an effective gas distribution system as the key reason for Japan's high retail energy prices (Table 3).

South Korea, on the other hand, used to be a relatively small consumer in the 1970s, while China was self-sufficient. Dramatic shifts have been taking place since the end of the Cold War. In the 1990s, South Korean oil and gas consumption accounted for around 70% of its primary energy consumption. From 1988-1998, consumption and imports grew by 10% annually, largely from the Middle East.

To enhance oil security by exploring overseas opportunities, the Petroleum Exploration and Development Company (PEDCO) was established in 1979. In 1999, it was renamed as the Korean Petroleum Development

Table 1. Asian Oil Consumption, 1990-1999
(Mt)

	1991	1992	1993	1994	1995	1996	1997	1998	1999
China	117.9	129	140.5	149.5	160.7	174.4	185.6	190.3	200
Japan	252.1	258.5	252.7	268.4	268.6	269.9	266.3	255	258
South Korea	59.9	72.3	79.3	87	94.8	101.4	110.3	93.3	99.9

Source: BP-Amoco World Energy Statistical Review, June 2000.

Table 2. LNG Imports by Japan and South Korea, 1999
(Bcm)

	U.S.A.	Qatar	UAE	Australia	Brunei	Indonesia	Malaysia	Total
South Korea	–	–	0.1	–	0.8	9.5	3.9	14.3
Japan	1.8	3.7	6.2	9.7	7.3	24.2	13.2	66.1

Source: BP-Amoco World Energy Statistical Review, June 1999.

Table 3. Gas Demand in China, Japan and South Korea, 1991-1998
(Mtoe)

Countries	1991	1992	1993	1994	1995	1996	1997	1998
China	13.4	13.6	14.6	14.9	15.9	15.9	17.4	17.4
Japan	49.2	50.4	50.7	54.3	55	59.5	58.6	62.5
South Korea	3.5	4.6	5.7	7.6	9.2	12.2	15	14.1

Source: BP-Amoco World Energy Statistical Review, June 2000.

Corporation (KPDC). Between 1981 and 1993, KPDC invested \$1 billion in 43 overseas projects in 26 countries including Indonesia, Yemen, Egypt, Argentina and Venezuela. Since 1993, it has expanded its investment in the Middle East. So far, the company has 18 overseas exploration and development projects in 12 countries (4 production oil fields, 2 development fields and 12 exploration projects).

Moreover, South Korean gas demand has increased rapidly. The share of natural gas accounted for 8.6% of the primary energy consumption in 1997, an increase of 84% from the 1990 level. The gas share in South Korea's primary energy mix is expected to reach 12% in 2010 and 13.5% in 2020 (Table 4).

By 2010, natural gas will be widely used across the entire country except for Cheju Island, where there are fewer than 150,000 residents. LNG imports are being expanded gradually due to growing demand for natural gas and exclusive dependence on LNG. To import LNG from Qatar (Ras Laffan), Kogas was promoting construction of the new receiving terminal and expansion of the existing terminals in Pyongtaek and Incheon. In 2000, South Korea imported 16 Mt of LNG largely from Indonesia and Malaysia, but also from Brunei and Australia, accounting for about 14% of the LNG volumes traded worldwide.

North Korea, on the other hand, relies on two domestic energy sources - coal and hydropower. Its industrial activities are routinely affected by energy shortages. Coal accounts for more than 80% of primary energy consumption, while the share of hydropower is more than 10%. North Korea has few oil reserves other than a handful of areas (Hamhung and Sinpo) under exploration, and imports about 2.85 Mt of oil, including about 0.5 Mt from China and another 0.5 Mt provided by the United States and other countries under the 1994

KEDO agreement. Oil accounts for about 6% of North Korea's primary energy consumption and is largely limited to gasoline, diesel and jet fuel production.

Coal is also the primary energy source for Mongolia and it is used at coal-fired power stations to produce electricity and provide heat to urban areas. Annual coal consumption is estimated at 4.67 Mt. Mongolia generates 2.425 billion kWh of electric power with a 0.23 billion kWh shortage. Its annual oil imports (about 0.6 Mt) and fuel supplies (0.4 Mt) originate mainly from Russia. Since the second half of 1999, Mongolia has had to reduce its imports from Russia due to rising prices. Imports from China have been planned for years and are expected to ease supply constraints.

Reportedly, some petroleum exploration activities are under way in Tamsag and the East Gobi basins. Mongolia has no substantial natural gas reserves and no experience of utilizing natural gas or LPG. It has been confirmed that its national energy company has made an attempt to market a small amount of LPG balloons imported from Russia and China.

China is the fifth largest oil producer and the twentieth largest natural gas producer in the world. Currently, the oil and gas share in China's primary energy mix accounts for 23% and 2%, respectively. China's gas usage is lower than that of most industrialized and developing countries. Low natural gas utilization (Table 5), shortage of gas supply and regional imbalances in terms of the distribution of the reserves and location of the markets constitute major vulnerabilities in China's energy security policy.

Chinese oil production grew rapidly from 0.12 Mt in 1949 to 100 Mt in 1978 and 161 Mt in 1999. The reserves to production (R/P) ratio peaked in 1961 and declined thereafter. The R/P rate has decreased substantially to about 15 years as newly added reserves from the early 1980s

Table 4. Energy Consumption Mix in South Korea, 1997-2020
(%)

	1997	2001	2006	2010	2020
Oil	58.8	54.7	51.7	50.5	49.0
Coal	19.5	19.7	21.0	18.8	17.7
Nuclear	10.7	12.3	13.5	16.2	16.8
Gas	9.5	11.7	11.5	12.1	13.5
Hydro	0.8	0.7	0.7	0.6	0.5
Renewable	0.8	1.1	1.6	1.8	2.4

Source: *A Study on the National Long-term Energy Plan, December 1996, Ministry of Trade, Industry and Energy, Korean Energy Economics Institute*

Table 5. Oil/Gas Consumption Ratio
(%)

	1988	1990	1992	1994	1996	1998
China	8.68	8.36	9.49	10.03	10.97	10.94
Japan	5.58	5.37	5.13	4.94	4.54	4.08
South Korea	13.19	16.5	15.72	11.44	8.31	6.60
U.S.A.	1.70	1.61	1.54	1.51	1.47	1.55
Australia	2.09	1.92	2.03	1.94	2.01	2.04
United Kingdom	1.72	1.75	1.64	1.38	1.10	1.01
India	7.80	5.17	4.34	4.29	4.29	4.12
Brazil	17.85	17.18	17.25	16.02	14.82	14.34

Source: *BP-Amoco, 1999; EIA Outlook, 1996.*

failed to keep pace with increased output.

However, the development of natural gas reserves in Sichuan, the Tarim, Changqing and Yingehai basins helped China to expand gas production. The natural gas R/P ratio is estimated to be around 40-57 years. The oil/gas ratio in terms of production (Table 5) has shown a downward trend in the past decade in all countries surveyed, except China, which demonstrates an increasingly high dependence on oil compared with some industrialized and developing countries. Moreover, there remains a deficit in natural gas supplies compared to demand, promoted by high pace of economic development and environmental pressure (Table 6). In 2010, estimated gas deficit could be over 40 Bcm (low case scenario).

More notably, gas reserves are located in Southwest and Western China (Sichuan, Changqing, Qinghai and the Tarim) and offshore. Currently, Sichuan gas accounts for about 32% of the total output. Changqing will be a growing supplier of gas in the next five years. Natural gas consumption is mainly centered in Northeast China, the Bohai Bay region, the Yangtze River Delta and central-southern China. Currently, central-southern China is the biggest gas consuming area. However, the Yangtze River Delta, Northeast China and the Bohai Bay region will become major gas consuming centers, making regional patterns of Chinese natural gas supply and demand very unbalanced (Table 7).

These imbalances are forcing the government to construct a national gas trunk line network to move large quantities of natural gas from gas fields in Southwest and Western China to markets in Northern and Eastern China. In 2000, China's oil and gas pipelines extended to 11,552 km and 13,148 km in length, respectively. Currently, over 70% of crude oil is shipped through the pipelines and the rest is transported by rail and river. The current level of

pipeline infrastructure development constitutes a serious bottleneck in developing the market and promoting natural gas.

In summary, this brief overview of the current and anticipated demands for energy in Northeast Asia leads to the following conclusions:

Growing energy demand on the part of China, South Korea and other economies of Northeast Asia, together with large traditional demand on the part of Japan, justifies plans for a substantial reliance on external natural gas resources;

A downturn in Japanese demand has resulted in the shrinking of its market share in the region, while demand from other countries is growing;

The growth of energy demand in a regional context, rather than that in the case of any single country, deserves greater consideration. The economies of Northeast Asia will continue to search for multiple, cleaner and more reliable sources of energy supplies, including the Persian Gulf and emerging strategic energy regions such as Eastern Russia.

2. New Hydrocarbon Sources

In geophysical terms, Eastern Siberia in Russia is a plateau with rich natural resources, including about 8,600 Mt of oil and 31,000 Bcm of gas resources. Thus far, proven oil reserves are estimated at 1,250 Mt to 1,750 Mt and proven gas reserves at 2,000 Bcm (Table 8).

The whole of Eastern Russia's oil and natural gas resources, including those in the Far Eastern region show great potential (Table 9).

At the same time, early exploration activities in Eastern Siberia have encountered unexpected geophysical challenges and development difficulties. There are a number of giant natural gas fields in Eastern Siberia and at

Table 6. Gas Production and Demand in China

(Bcm)

	1998	2000	2005	2010
Production	22	24	60.6	70.7
Consumption	17.4	27.67	60.6	134.4
Gas gap	4.6	- 3.67	-	- 63.7

Source: Wan; 1997 and SDPC Energy Institute. *Chinese Gas Demand Projection to 2010, 1996*

Table 7. Natural Gas Production and Consumption Forecast

(Bcm)

	1998	2000	2005	2010
Production	23.2	25.0		70.7
Sichuan	7.53	7.70	11.8	-
Changqing	1.80	2.31	8.04	-
Qinghai	0.64	0.66	1.81	-
Tarim	0.55	0.55	0.92	-
Offshore	1.92	-	-	-
Consumption	17.4	27.4	60.6	134.7
Northeastern China	3.82	3.83	7.27	30.98
Bohai Bay	2.08	6.30	13.93	28.28
Yangtze Delta	0.87	1.92	14.54	32.32
Central-Southern China	8.17	10.41	12.12	18.85
Rest of China	2.43	4.93	12.72	24.24

Various sources

least eight big gas fields in the Far Eastern region, as well as smaller ones, not to mention underdeveloped oil fields. Nonetheless, oil production in Eastern Siberia reportedly could reach 45 Mt in 2015 and eventually peak at 60-70 Mt for oil and 100-120 Bcm for natural gas.

This potentially makes Eastern Russia a huge hydrocarbon resource area and a strategic warehouse of hydrocarbon fuels for Asia. Moscow did not pay adequate attention to the strategic importance of these energy riches during the Cold War because of security and political tensions in Northeast Asia. From the 1960s, the majority of Russian exploration and production activities were concentrated in Western Siberia and Central Asia. Ironically, the oil needs of Eastern Siberia and the Far Eastern region are still satisfied by shipments from Western Siberia.

Russia launched geological surveys and exploration activities in its Far East, offshore from Sakhalin, in cooperation with Japan under the Sakhalin-1 project. In the early 1980s, the necessity of development in Eastern Siberia and the Far East region increased and Moscow adopted a development plan for the eastern areas. In 1986, Mikhail Gorbachev stated Russian policy in the Far East with the clear intention of accelerating the economic development of the eastern provinces. In 1990, Moscow decided to develop its energy resources in Eastern Siberia and the Far Eastern region, with the intention of strengthening its political and economic ties with Northeast Asian countries. However, these plans have not gained momentum as expected. The fall of the Soviet regime

brought radical political and economic changes, including the separation of Central Asia and decreasing oil production in Western Siberia.

In 1996, a research team from the Siberia Energy Institute estimated the production and supply potential in a presentation at the First International World Energy System Conference in Toronto (Table 10).

On the other hand, oil output from Western Siberia has declined steadily and this trend is likely to continue in the next decade, while oil and gas production in Eastern Siberia and the Far East are expected to display an upward trend. Once again, exporting oil and gas to the Asian market is a major step forward in Russia's involvement in Asia-Pacific affairs. The Siberia Energy Institute made the following projection concerning natural gas exports. In the coming decades, Northeast Asian natural gas markets will be increasingly dependent on imports from Russia and cooperation with the Russian Government and energy producing companies is needed (Table 11).

Quests for New Sources of Supply

Japanese crude oil imports depend heavily on the Middle East. In LNG imports, Japan relies mostly on Southeast Asia, including Indonesia, Malaysia, Australia and Brunei, which provide most of its LNG. Japan's LNG imports have increased gradually from the outset in 1969 and, by 1995, the LNG share in total natural gas supply was 97%. In recent years, the Japanese energy industry has seen big changes in terms of deregulation, restructuring and construction. Taking these factors into account, the High

Table 8. Eastern Siberia and Yakutia: Oil and Gas Prospects

Region	Proven Reserves		Possible Annual Production	
	Oil, Mt	Gas, Bcm	Oil, Mt	Gas, Bcm
Yakutia	263	1,340	5	15
Irkutsk	261	1,100	10	35
Krasnoyarsk	779	1,200	20	25
Total	1,303	3,640	35	75

Source: Saneev, 2001

Table 9. Oil and Gas Resources and Reserves in Eastern Siberia and the Far East

Region	Oil Reserve, Mt		Gas, Bcm	
	Resources	Proven Reserves	Resources	Proven Reserves
Eastern Siberia, incl.	8,920	1,040	33,360	2,300
Krasnoyarsk	6,850	779	24,940	1,200
Irkutsk	2,070	261	8,420	1,100
Far East, incl.	3,845	696	13,790	2,284
Yakutia	2,910	263	10,430	1,340
Sakhalin	935	433	3,360	944
Total	12,765	1,736	47,150	4,584

Source: *Ibid.*

Table 10. Natural Gas Production and Supply for Eastern Siberia and the Far Eastern Region (Bcm)

Regions	2005	2010	2020
Western Siberia	70	75	80
Eastern Siberia	25	30	40
Far East	10	15	20
Total	105	120	140

Source: M. Merenkov, 1996.

Case and the Base Case for its gas demand are estimated as follows (Table 12).

Over-dependence on remote hydrocarbon sources and long-distance transportation routes remains a source of concern for Japan. Therefore, there is an interest in seeking new strategic energy sources (especially cleaner sources) in the neighboring Far Eastern provinces of Russia and Eastern Siberia. Transporting Russian gas to Japan via a pipeline from sources 2,000 to 4,000 km away could be economical. Government, business and academics in Japan are nearing a consensus that it is necessary to capture this supply opportunity.

In June 1994, the Japanese Ministry of Trade and Industry's Comprehensive Energy Research Board prepared a long-term energy demand forecast for Japan and its neighboring economies (the Chinese mainland, Taiwan, Korea and six ASEAN nations) into 2010. This forecast mentioned that Asia-Pacific regional oil imports will increase from 50% to 69% of the regional demand from 1980 through 2010, while gas imports from external regions will increase from 8.7% to about 27% by 2010. The authors of the forecast indicated that besides the Middle East, additional strategic sources of energy supply are sorely needed. It seems that this official report gave the oil business a clear signal to pursue new potential sources of supplies. The outcomes of the Japanese policy of diversification, however, proved mixed.

Japanese oil companies have been active overseas since 1967, when the government established the state-owned Japan National Oil Company (JNOC) to finance overseas ventures. The Tokyo-based Arabian Oil Company (AOC), for instance, operated the offshore portion of the Saudi Arabia-Kuwait Neutral Zone in the 1960s. As part of the negotiations for renewal of the agreement, Saudi Arabia has been pushing Japan to buy more Saudi oil and to increase its non-oil investments in Saudi Arabia. AOC's concession with Saudi Arabia expired in 2000 and its concession with Kuwait will expire in 2003. In parallel, according to a report prepared by the Mitsubishi Research Institute, Inc., oil businesses have explored and reviewed other E&P activities and also prospects for gas pipelines

from Russia.

Numerous foreign sources of energy are also indispensable for South Korea. Besides the Middle East, South Korea has been searching for additional import sources in Far Eastern Russia and the western region of China since the 1980s. Compared with remote Chinese oil and gas provinces, Korean energy companies have paid much attention to Eastern Siberia and the Far Eastern region. Hyundai Group was the first of the Korean corporations to negotiate with their Russian counterparts regarding plans for oil and gas developments in the Far East. In 1990, Hyundai signed an agreement regarding oil and gas development in Yakutia. The Korean Ministry of Energy started to explore prospects for the development of the Lunkoye gas field offshore from Sakhalin after Mikhail Gorbachev visited Cheju Island in April 1991. Since the collapse of the Soviet Union, the Daewoo Group has taken over Hyundai and joined the Yakutia gas development project. After Boris Yeltsin visited Seoul in November 1992, a Korean consortium evaluated the prospects for joining Sakhalin-2 and reassessed the investment prospects for Yakutia. In 1995, before the South Korean President visited Moscow, South Korea was seriously considering importing Russian oil, gas and power. In November 2000, Kogas finally joined the China-Russia pipeline feasibility study and may decide to invest in the Eastern Siberia and Sakhalin projects.

Both North Korea and Mongolia are located in a critically important landmass in the region. The two countries' strategic position cannot be ignored, considering the routes for energy transportation from Russia. In theory, North Korea needs Russian gas but has not explicitly expressed its position on a gas pipeline through its territory. However, few experts and officers from that country have been in communication with their counterparts in neighboring countries regarding energy cooperation issues and the North Korean attitude towards these projects and potential cooperation is uncertain.

In comparison, Mongolia is watching with great interest the progress of the cross-border gas pipeline to be constructed from Russia to China and the efforts by South

Table 11. Russia's Export Capacity to Asia-Pacific, 2005-2020
(Bcm)

Destination	2005	2010	2020
China	10-15	16-23	30-45
South Korea	8-10	10-23	12-14
North Korea	2- 4	3- 5	5- 6
Japan	5- 8	18-10	10-15
Taiwan	2- 3	3- 4	4- 5
Mongolia	0- 2	1- 3	2- 3
Total	27-42	41-58	63-88

Source: *Merenkov, 1996.*

Table 12. Japanese Natural Gas Demand Forecast
(Mt)

	1995	2000	2010
Base Case	45	53	58
High Case	45	63-71	83-95

Source: *Asakura, Natural Gas Demand Outlook of Japan, 1998*

Korea, Japan, Russia and China to lay the foundation of the Northeast Asian natural gas pipeline network. Mongolian government agencies have been actively approaching neighboring countries concerning cross-border gas transportation. Its energy companies are seeking first hand, adequate and accurate information on the projects by attending the annual Northeast Asian Natural Gas and Pipeline Forum conferences.

During the Cold War, China did not expect Moscow to develop energy resources in the Far Eastern region. Also, China had no intention of searching for Russian energy resources because of security reasons. Chinese policy toward East Asia in the 1980s mainly focused on its relations with Japan, aiming at the introduction of Japanese capital and technology. With rising domestic demand, the Chinese hydrocarbon gap between demand and supply has been expanding, forcing China to review its policy toward neighboring countries, especially neighboring energy-producing countries (Table 13).

Firstly, Northeastern China, consisting of Heilongjiang, Jilin and Liaoning provinces with a population of 120 million, represents an old industrial region with per capita GDP of US\$727 and a GDP growth rate of 10%. Coal is the primary energy source in this part of China. Gas consumption (around 3.8 Bcm annually) is concentrated in the region around Daqing and Liaohe.

Environmental concerns and a switch to much larger gas utilization in winter require a bulk gas supply and an infrastructure. It was estimated that natural gas demand in the region would approach 7 Bcm in 2005 and 18 Bcm in 2010, but the local gas producers could only supply up to 6 Bcm. Considering the future development of domestic supplies, the deficit for natural gas in this region can be estimated at 13 Bcm.

Secondly, the Bohai Bay region consists of Beijing, Tianjing, Hebei and Shangdong with a population of 175 million and per capita GDP of \$960 in 1997. Coal consumption accounts for 75% of the regional energy mix. Gas demand in the region, including gas supply during winter, will grow by 14%, reaching 14 Bcm in 2005 and 28 Bcm in 2010. Taking domestic supplies of 13 Bcm into account, the gas deficit would be 15 Bcm. Currently, the Shanjing gas pipeline can only supply up to 3.3 Bcm.

Thirdly, the Yangtze Delta includes greater Shanghai, Jiangsu and Zhejiang provinces with a population of 130 million and per capita GDP of \$1760. Regional demand for cleaner energy will grow from the current 2 Bcm to 14.5 Bcm in 2005 and 32 Bcm in 2010, although there are no significant winter gas requirements in this region. The

eastbound supplies from Sichuan, Changqing, Qinghai and Tarim combined are estimated at 19 Bcm in 2010.

The Chinese quest for Russian gas can be traced back to the late 1980s and early 1990s, when the Russian Sidanco and local officials expressed an interest in cooperation with China to export gas. In 1992, when Li Guoyu, a senior geologist from CNPC, brought back Russian messages to China, a debate on whether or not to import Russian gas unfolded, with some advocating an opportunity for China to move into mammoth energy projects. Others argued, however, that China might encounter serious supply risks considering the domestic political uncertainties in Russia. Even so, both Russian and Chinese planners agreed to conduct separate feasibility studies. The Chinese experts believe that new gas sources from the eastern provinces of Russia would greatly contribute to bridging the domestic gas deficit in China. Russia, on the other hand, is in the process of opening Eastern Siberia and the Far East to foreign investors. Their mutual interests create a solid foundation for China-Russia energy cooperation.

Searching For Cooperation

In general, as mentioned above, Eastern Russia is rich in natural resources, but its capacity to provide investment resources is limited. Japan and South Korea, on the other hand, are major economies and capital exporters for energy projects overseas. Compared with these countries, China is emerging as a large and growing energy market, but it is short of both capital and natural resources. Both Mongolia and North Korea are seriously short of both natural resources and capital, but geographically located at important strategic crossroads in Northeast Asia. These differences could result in positive dialogue aimed at multilateral energy cooperation based on shared interests. All Russia's neighbors could import energy directly across the border; however, among possible links, a China-Russia natural gas connection is going to be particularly important in geo-economic and geo-political terms.

1. Potential cooperation in cross-border infrastructure

The potential annual capacity of Russian natural gas exports to Asia-Pacific countries is estimated at 40-60 Bcm. There are several options for energy links, including multiple transportation routes and delivery options. Among them are four pipelines, linking Irkutsk-Beijing, Yakutia-Shengyang, Sakhalin-Beijing and Novosibirsk-Shanghai (Table 14).

It has been estimated that there are gas reserves of

Table 13. China Regional Gas Demands and Gaps, 2010
(Bcm)

Regions	Demand	Supply sources						Gap
		East	Ordos	Sichuan	Qinghai	Xinjiang	Star	
Northeastern	18.9	4					2	12.9
Bohai Bay	26.6	3	3	1	2		4	13.6
Yangtze Delta	31.0		5	2		10	2	12.0
Central-Southern	14.5						2	10.5
Total	91.0	7	8	3	2	10	10	49.0

Various sources

Table 14. **Russia-China Natural Gas Pipeline Options**

Pipeline	Length, km	Throughput, Bcm	Investment, US\$ billion
Irkutsk- Rizhao	3,300	10-15	7
Sakhalin- Shenyang	2,400	10	3
Novosibirsk- Shanghai	6,800	20-30	10

Source: *CNPC*

about 3,000 Bcm in the Irkutsk, Yakutia and Krasnoyarsk regions, including 1,100 Bcm of reserves in Kovyktinskoye field in Irkutsk region. The production capacity of Kovykta is estimated at about 30 Bcm. In addition, there is another source of natural gas with production volumes estimated at 15 Bcm a year in the Chayandinskoye gas field in Yakutia. Considering that local consumption could be about 10-15 Bcm, China could import about 20 Bcm of gas to its northeastern provinces and the Bohai Bay region, transmitting an additional 10 Bcm to South Korea. Furthermore, the area offshore from Sakhalin holds huge natural gas resources, estimated at more than 3,000 Bcm, and proven reserves of almost 1,000 Bcm. It is expected that Sakhalin-1 will produce about 11-12 Bcm and Exxon is planning to export 10 Bcm to China's northeast provinces. Khabarovsk officials reportedly support this project.

Moreover, in February 1997, Russian Gazprom proposed a project to transport about 20 Bcm from the Bolshekhetskaya Cavity region in Western Siberia to Shanghai. This proposal should be competitive with pipeline projects from sources in Central Asia, including those in Turkmenistan, Uzbekstan and Kazakhstan. At this point, however, the priority is to develop sources of natural gas in Western China and transport these to Central China and the Yangtze Delta region, the leading and growing market for gas in China.

To promote cross-border pipeline projects from Russia, further review of technical data by both the Chinese and Russian experts is required. It has been estimated that more than US\$20 billion of investment will be needed to build pipelines between Eastern Russia and China. The timeframe for natural gas imports via a pipeline is an additional concern, given that the synergic combination of governmental schedules is difficult to achieve. Chinese gas imports from Russia have generally been planned for 2010. In its turn, China has to address its gas import policy and relations with Russia and other neighboring countries to cope with demand uncertainties and prices for natural gas.

The proposed routes for natural gas transportation from Russia to China, Korea and Japan are giant cross-border projects that require huge investment, long construction time and transit agreements. However, the proposed routes via Mongolia seem to make political rather than economic sense. Natural gas exports via a pipeline to the Korean peninsula will also have both political and economic impacts on the Koreans and the region as a whole. Nothing would be possible without close and comprehensive cooperation among the countries involved in these complex cross-border projects.

2. Cooperation in other fields

Japanese, Korean and Chinese energy companies are searching for major energy opportunities in Eastern Siberia and the Far Eastern region of Russia. Joint exploration and production (E&P) ventures are among the essential instruments for expanding future imports, considering that some degree of control over the origin of supplies and transportation routes creates more confidence on the part of importers.

In this context, the role of the CNPC-the Chinese oil and gas industry flagship-has to be properly assessed. CNPC has developed significant potential in geological surveying, as well as in the exploration and development sectors. In the past few years, CNPC has strengthened its monopolistic position in developing the natural gas sector in China. To meet growing demand in the Northeastern region of China, the Bohai Bay and the Yangtze Delta areas, China participates in E&P activities through CNPC and it seems that the core of these activities could also include Eastern Russia.

Japanese and Korean energy companies are also well positioned to accelerate energy cooperation in Northeast Asia, considering their investment potential and technological advantages. These companies are already involved in numerous overseas energy projects and traditionally demonstrated strong interest in Russian and Central Asian energy resources, including those located at the Kysyl-Syr, Tas-Tumus, Kovykta, Yakutia and the Sakhalin offshore area. It could be useful for these large companies to look for practical development and transportation solutions in a cooperative format, searching for opportunities to make gas cooperation economically feasible and competitive vis-a-vis LNG.

The central governments could help these companies to develop bilateral and multilateral linkages with their counterparts in the neighboring countries. For example, in February 2001, when Vladimir Putin visited Seoul to meet with South Korean President Kim Dae-jung, Russia and South Korea expressed an interest in developing natural gas reserves in Kovykta and promote investment cooperation in projects related to Sakhalin oil and gas development.

In addition to gas and oil cooperation, electric power development and transmission projects are also of interest to all parties. As South Korea suggested, hydropower development projects and gas-fired electric power generation are important in meeting Chinese and Korean energy needs. Possible cooperation in electricity transmission in Northeast Asia could include Russian exports of about 20 billion kWh from the Irkutsk region to either Shenyang (Liaoning province) in Northeastern China or Beijing-Tianjin region. Investment requirements for these projects are estimated at approximately US\$1.5 billion and above. The China National Electricity

Corporation (CNEC) has been encouraged to assess the economic feasibility of such projects, including their potential impact on equipment supplies, related businesses and technical services.

Proper financial arrangements are definitely a key element in all these giant E&P, pipeline and electric power transmission projects. By 2006, investment only on the Chinese sections of the proposed pipelines from Sakhalin and Western Siberia would near \$10 billion, while by 2010, the Chinese section of a pipeline from Irkutsk to Rizhao is estimated at US\$3 billion. By 2010, the pipeline projects on the first two routes could require about US\$1.4 billion per annum, reaching a peak of US\$2 billion to be spent annually in 2006 and 2007. The third pipeline from Kovykta is likely to be completed beyond 2010, with investment exceeding US\$1 billion annually. These estimates demonstrate that no single company or even country will be in a position to provide these huge investments or to bear all the investment risks. However, several oil companies backed by the governments of the countries involved in these projects could find solutions through joint investment arrangements.

Environmental protection also requires intergovernmental cooperation. There is a variety of areas for such cooperation, including the mitigation of CO₂ emissions, oil and gas spills prevention and other types of land, air and water pollution management. Japan, South Korea and China, along with Mongolia and even North Korea, are currently searching for cleaner alternative energy sources from Eastern Russia. There are also reasons to believe that Russia, China, Japan and South Korea are demonstrating an increasingly strong interest in and commitments to developing energy cooperation.

Intergovernmental coordination is indispensable to support industry-to-industry and private-sector cooperation in Northeast Asia and promote giant cross-border projects. Legislation and governmental regulation are needed to oversee and facilitate pipeline construction and operation. Russia is already working on production-sharing schemes and allows deregulation in the oil and gas sectors, including E&P and transmission infrastructure. China is currently creating a new gas pricing policy, while Japan and South Korea are in the middle of deregulating their power sectors.

In addition, technical and academic cooperation are also serving as tools in implementing governmental policies through exchanging ideas and discussing differences on longer-term strategic issues. "Track two" dialogue on energy and environmental issues and the value of these exchanges for energy-development-environment cooperation in Northeast Asia have yet to be emphasized and promoted.

3. Sources of uncertainty and risk

Uncertainties related to resource supply stability are important factors in decisions over large-scale energy projects. Notwithstanding the solid confidence in proven gas resources in Sakhalin and Eastern Siberia, no one can guarantee the stable and reliable flow of natural gas supplies during the current decade except for Western Siberia. Further exploration in Eastern Siberia and the Far Eastern region of Russia is required to make these major

gas fields more attractive to further development steps.

The technological risks, however, could be less problematic compared with the financial risks. Comparatively, the financial requirements for pipeline construction and E&P activities are even bigger. For example, it has been estimated that about US\$36 billion is required for de-bottlenecking and balancing the Chinese gas market. Risks also exist in Northeastern and Northern China, considering the inadequate level of development of the local distribution systems, and pricing and taxation distortions that affect the competitiveness of natural gas.

Political risks in Northeast Asia must be factored in as well. Some bilateral relations in this area are particularly problematic. The prospects for Korean peace dialogue are among the uncertainties and this is a time-consuming issue. A dangerous economic collapse may occur in North Korea. However, there remain some leverages that will enable China, Japan and the United States to put the country back on track. Social stability in Russia is a matter of concern as well. It seems that the federal government remains weak vis-a-vis the local authorities in the provinces of Far Eastern Russia and Eastern Siberia. It remains to be seen whether the political influence of the central government will be strengthened, counterbalancing the country's geographical remoteness.

Also, market risk management should also be among the factors, considering that the Asian economy remains in the middle of a 'zigzag' recovery. The Asian financial crisis resulted in major industrial reorganization across the region. Both exporters and importers in the economies affected by the crisis have experienced the impact of an unexpected economic downturn. On the other hand, the gas market is under development in China, while the Koreans and Japan have a greater need for cleaner energy than in the past.

Conclusions

Russia is the largest natural gas producer with 33% of world's gas reserves and 24% of the world gas production. China's growing energy demand and its quest for external sources of supply could fuel both cooperation and competition in the region. Cooperation would greatly cement the China-Russia strategic partnership and contribute to stability in Northeast Asia as a whole. Also, China-Russia energy cooperation could counterbalance the strength of the Western/American hegemony in the region. As a result of the changing energy world, China-Russia energy linkages will be crucial not only for China, but also for Japan, the Koreas, Mongolia and other economies to ease their energy insecurity, mitigate air pollution and promote regional cooperation.

At the same time, oil and gas ventures have traditionally been time-consuming projects due to uncertain political, legal and investment environments. Some western joint ventures in the energy sector in Russia have encountered serious hardships. Without question, China-Russia gas cooperation is in progress and the author holds an optimistic view on the prospects for such cooperation because both China and Russia demonstrated solid economic and political intentions to promote and even prioritize cooperation in the energy sector at the fifth

meeting of the respective prime ministers in the first half of 2000.

First, they agreed that the natural gas transportation route from Irkutsk and Yakutia to China is to be confirmed if Russia coordinates its local intergovernmental affairs in the eastern region, and will be supported by South Korea and Japan. Second, the Prime Ministers agreed to look for enhanced gas E&P and transportation infrastructure investment in the form of a consortium that will include China, Japan and South Korea. Both of these proposals could have significant economic and geopolitical impacts. China, Russia, Japan, South Korea and other countries involved have to make strategic choices to cope with the uncertainties.

It is in the strategic interests of both China and Russia to maintain and enhance the strategic partnership with more economic incentives and political support. The summits and prime ministers' meetings are key channels for promoting strategic coordination. Kogas's involvement in the Kovyktinskoe gas field feasibility study makes an important contribution to cooperation. Energy companies and local governments in the Northeast Asian area should be encouraged to work closely together.

China has to be ready to improve its all-round relationships with its neighbors in general and in particular with Russia, Japan and South Korea, in order to achieve effective cooperation and dialogue in the energy field.

Major gas infrastructure construction will not only greatly contribute to an improved energy mix for China, but will facilitate environmental improvements and sustainable development in the next decades. These will also facilitate comprehensive energy cooperation in Northeast Asia.

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