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Energy Cooperation in Northeast Asia: Prospects and Challenges

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INTRODUCTION

By all accounts, Northeast Asia[1)] is expected to show the most dynamic economic growth of any country in the world, for at least the next two decades. At the center of this expectation lies the prospect that China will rise as the most promising economy in the coming years. At the same time, the economic growth of South Korea, which will continue to surpass the world average, and the status of Japan as a global economic leader also account for the rosy views on a thriving Northeast Asia. In addition, the signs of economic revitalization and active reforms implemented to attract

1) There are different classifications for Northeast Asia in terms of the countries that constitute each region, depending on the issues being discussed. In a broad sense, Taiwan and Hong Kong are often included in the classification of the Northeast Asian countries. For the purpose of the energy-related discussion here, the Northeast Asian countries are South and North Korea, China, Japan, Mongolia and the Russian Far East (i.e. the eastern part of Siberia bounded by the Ural Mountains) as they are more relevant to this discussion.

foreign investment in Russia and Mongolia, along with some recent moves toward a market economy in North Korea indicate that an even greater wave of economic prosperity may await the Northeast Asian region.

Such events have yet to unfold, and difficulties abound which could hinder those events, as well as any potential economic progress. Focusing on energy-related issues, the first and foremost challenge is to secure an adequate level of energy necessary for fueling the economies. While high economic growth will inevitably result in a surge of energy demand in the region, the energy security of Northeast Asia is vulnerable and the problem is expected to aggravate over time. With energy demand increasing rapidly and energy imports growing, the gap between the region's energy demands and its indigenous supply is widening. Moreover, as energy imports are largely dependent on Middle East suppliers, any regional conflicts or marine transportation route crises could seriously impact the stability of energy supplies to Northeast Asia.

Second, heavy dependency on coal and oil in the region points to its vulnerability to environmental issues. Growing concerns for environmental deterioration and climate change have caused the world to focus on environmentally sound economic development. Intensified international efforts for environmental preservation are likely to limit the use of fossil fuels in one way or another. This means that the countries in Northeast Asia could experience a serious setback in their efforts toward economic prosperity due to high environmental externality costs of energy, unless they convert to more environmentally-friendly energy systems.

Third, in light of recent drastic changes around the globe resulting from deregulation and market reforms, the energy industries in Northeast Asia are relatively immature and inefficient, making them less adaptable to the current heightened market volatility. Furthermore, while other regions of the world such as Western Europe and North America are seeking to improve energy market efficiency and secure cost-effective energy supply through

energy market integration and system interconnection, the countries in the Northeast Asian region are deprived of such opportunities due to their isolated and, in some cases, fragmented energy systems.

Fourth, from a political aspect, the legacy of the Cold War that still persists on the Korean peninsula could be a stumbling block to the economic development of the region. Foreign investment and international trade are indispensable for any future takeoff to economic prosperity, especially for the infrastructure-sparse areas of Northeast Asia. Nevertheless, prolonged political instability, such as escalating tensions surrounding North Korean nuclear weapons, could deter much-needed investments in energy and social infrastructure in the region.

To put it simply, countries in Northeast Asia, especially heavy energy-consuming countries like China, Japan and South Korea, are exposed to energy security threats in the broad sense,[2] when we interpret the energy security concern as securing a stable, cost-effective, and environment-friendly energy supplies.

Considering the critical role of energy in every area of modern society and the grave consequences of a disruption, it is imperative to ensure energy security for the wellbeing of the people and the economy. Yet countries are severely limited in what they can do alone to strengthen energy security, and the few options they have often entail excessive costs or limited effectiveness.[3] In this respect,

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2) The notion of energy security has evolved over time. In the 1970's, with the experiences of two oil crises and a preoccupation with resource depletion, energy security focused mainly on securing adequate physical supply of energy. Later, around the mid-1980's and onward, more emphasis was placed on securing 'affordable' energy supply, recognizing that energy security problem involves a price risk in addition to quantity risk and that a short-term supply shortage often translates into a price hike. We can expand the notion to reflect the environmental factor, which could significantly influence the physical or economic aspects of energy supply stability.

3) Examples include R&D on alternative energy sources, emergency stock building, and demand-side management.

energy cooperation among the countries in Northeast Asia takes on particular significance, as it offers an effective and mutually beneficial solution to all participating countries.

THE ENERGY SCENE IN NORTHEAST ASIA

Northeast Asia is a diverse group of countries in many respects. Interestingly, they vary widely in terms of economic system and level of economic development. While Japan and South Korea are open capitalist economies, Russia, China and Mongolia[4] represent emerging transition economies. On the other hand, North Korea is one of the few remaining communist economies and very much isolated from the rest of the world. The six countries can also be similarly distinguished in terms of their economic development stage, with Japan and North Korea occupying an extreme position on each end of the spectrum.

Natural Resources Endowments and Complementary Pattern of Factors

The Northeast Asian region is endowed with abundant energy resources, especially natural gas, coal and hydropower. Roughly a third of the world's natural gas and coal deposits lay in the region. More than a quarter of the world hydropower capability is contained there as well. Yet the geographical distribution of the resources endowment exhibits extreme disparity across the six countries. As seen in Table 1, most reserves are found in Russia and China, while the two Koreas and Japan are endowed with few indigenous

4) Mongolia was also a closed country until 1991, heavily dependent on the former Soviet Union and other COMECON (Council for Mutual Economic Assistance) countries. COMECON was an organization for economic cooperation among the Eastern European communist countries, established in 1949 and disbanded in 1991 with the dissolution of the Soviet Union.

Table 1. Energy Reserves of the Northeast Asian countries

	Coal	Oil	Natural Gas	Hydropower
	Proven Reserves (Mton)	Proven Reserves (Mton)	Proven Reserves (Bil.m^3)	Technically Exploitable Capability (TWh / yr)
S. Korea	82	-	6	55
N. Korea	600	-	-	N / A
Japan	785	7	32	134
China	95,900	5,272	1,171	1,923
Mongolia	10,000	-	-	6
Russia (RFE & E. Siberia)[1)]	200,580* (169,300)*	6,654 (1,570)*	47,700 (3,204)*	1,670 (1,008)**
NE Asia Total (a) (share a / b)	253,927 (39.1%)	11,933 (8.2%)	48,909 (33.2%)	3,788 (26.5%)
World Total (b)	788,511	146,102	147,265	14,284

1) The Russian Far East and East Siberia. The probable reserves for oil and natural gas are estimated to be 12.4-14.4 billion tons and 32-36 trillion m^3, respectively. Hence only 10-12 percent of probable oil reserves and 9-10 percent of gas reserves are proven. Readers should note that the criteria for classifying reserves differ slightly from one country to another. See Bang Ki-yual, *The Analysis of Potential Energy Supply and Overseas Development Strategies in East Siberia* (in Korean), (Euiwang-si: Korea Energy Economics Institute, 2003), pp. 34-35.

Source: *Bang, *ibid.*, pp. 40-62; **Lee Sang-gon, "Vision and Strategies for Energy Cooperation in Northeast Asia (in Korean)," *Mimeo*, 2002, p. 3; Other figures cited from Lee Sang-gon, "Energy Security and Cooperation in Northeast Asia," paper presented at the symposium on Pacific Energy Cooperation in Japan, February 19-20, 2002, p. 5.

resources.

China is rather richly endowed with energy resources, but due to the rise in energy demand driven by economic growth, it became a net energy importer in the early 1990s. Russia is the only net energy exporter in Northeast Asia. The International Energy Agency

projects that Russia will play an increasingly important role in world oil and gas markets for the next three decades.[5] The country is already the world's largest gas exporter and the second largest exporter of oil and oil products, after Saudi Arabia, and its exports are set to grow stronger in the next few years. Although they are thus far unproven, Mongolia is believed to have substantial reserves of coal and oil.[6]

Paradoxically, the countries with rich energy reserves are relatively less developed, while those with a more developed economic system have little energy reserves. When we consider the endowment of natural resources in combination with other production factors such as labor, capital, technology and managerial expertise, the uneven distribution of resource endowment becomes even more conspicuous (see Table 2).

Since each country possesses a comparative advantage in some of the factors, the Northeast Asian region can benefit greatly from energy trade and cooperation. Better energy utilization and cost reduction through regional cooperation will prove a win-win solution for all.

For countries like Japan and South Korea, geographical proximity and supply source diversification will lead to more efficient and stable procurement of energy supply. For the resource-rich transition countries, joint resource development will encourage infrastructure investment, capital influx and technological transfer. Moreover, by taking advantage of the geographical connectedness, interconnection of energy infrastructure could raise the efficiency, flexibility and stability of the energy supply system. It could also

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5) International Energy Agency, World Energy Outlook 2002 (Paris: OECD/IEA, 2002), pp. 269-284.

6) See Luvsanvandan Bold, "Mongolian Energy Profile, Outlook and Perspectives on Regional Cooperation," paper presented at the International Symposium on Energy Cooperation in Northeast Asia, June 7-8, 2001, Korea, p. 2; and Lee Sang-gon, "Vision and Strategies for Energy Cooperation in Northeast Asia (in Korean)," *Mimeo*, 2002, p. 3.

Table 2. Comparison of Resource Endowments

	Oil & Gas	Coal Minerals	Labor	Capital	Technology	Managerial Expertise
China	B	A	A	D	C	C
Japan	D	C	C	A	A	A
S. Korea	-	C	C	B	B	B
N. Korea	-	B	B	D	D	D
Russia	A	A	D	D	C	C
Mongolia	C/B	B	C	D	D	C

Key: A = very plentiful; B = plentiful; C = scarce; D = very scarce; - = none
Source: Adapted from Keun-wook Paik, *Gas and Oil in Northeast Asia: Policies, Projects and Prospects* (London: The Royal Institute of International Affairs, 1995).

offer an effective means to cope with environmental concerns by enabling utilization of environment-friendly energy sources such as natural gas and hydropower.

Energy Demand of Major Energy Consumers in Northeast Asia

Northeast Asia includes three of the top-10 energy-consuming countries, namely, China, Japan and South Korea. China is ranked 2nd in primary energy consumption, accounting for 9.2 percent of the world's total. Japan is 4th and South Korea is 10th, accounting for 5.6, and 2.1 percent, respectively.[7] The three countries total around 17 percent of the world energy consumption[8] and about 18 percent of the global gross domestic product (GDP).

7) In 2001, primary energy consumption for China was 839.7 million tons of oil equivalent (toe), for Japan 514.5 million toe, and for South Korea 195.9 million toe. The US is the largest energy consumer in the world, with primary energy consumption in 2001 accounted for 24.5 percent of the world total at 2,237 million toe. This is more than double that of China, the 2nd largest energy consumer. Korea Energy Economics Institute, *Energy Info Korea* (Euiwang-si: KEEI, October 2002).

8) The GDP share of the three countries of the global GDP was 17.9 percent in 2000.

Table 3. Total Energy Consumption Projection

(Unit: Quadrillion Btu)

	2001	2005	2010	2015	2020	2025	Annual Growth (2001-2025)
S. Korea	8.1	9.0	10.6	12.0	13.0	13.9	2.3
Japan	21.9	22.4	23.8	25.2	26.0	27.1	0.9
China	39.7	43.2	54.4	65.5	77.6	90.8	3.5
World	403.9	433.0	481.0	532.0	583.0	640.0	1.9

Source: Energy Information Administration (EIA), U.S. Department of Energy, *International Energy Outlook 2003* (May 2003).

In the next two or three decades, the energy demands of China and Korea are expected to grow much faster than the world average (see Table 3), while that of Japan is projected to show a modest growth.[9)]

The leading source of primary energy in Northeast Asia is oil. In 1999, oil overtook coal as the leading source of primary energy in the region, due to the continuous decline in the share of China's coal consumption since 1996.[10)] In terms of the oil consumption share of world total in 2001, Japan is the second-largest oil consuming country in the world following the U.S., accounting for 7 percent of the world total. China follows Japan with a share of 6.6 percent, making it the 3rd-largest oil consuming country in the world, and South Korea ranks 6th largest with a share of 2.9 percent. Japan, China and South Korea together accounted for 16.5 percent of world oil consumption in 2001.[11)]

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9) According to the APERC, the annual growth rate of final energy demand between 1999 and 2020 for China was projected to be 2.7 percent, for South Korea 3.3 percent, and for Japan 0.9 percent. Asia Pacific Energy Research Centre, *APEC Energy Demand and Supply Outlook 2002* (Tokyo: APERC, 2002).

10) See Vladimir Ivanov and Eleanor Oguma, Energy Security and Sustainable Development in Northeast Asia: *Prospects for Cooperative Policies* (Niigata: Economic Research Institute for Northeast Asia, 2001), p. 19.

11) British Petroleum, *BP Statistical Review of World Energy 2002* (London: BP

According to the EIA,[12] over the next 25 years, China's oil demand is projected to grow from 5 million barrels per day in 2001 to 10.9 million barrels per day in 2025, with an annual growth of 3.3 percent. In fact, China's oil consumption will soon surpass that of Japan. The projected increases of Japan average a modest 0.8 percent per year, from 5.4 million barrels per day in 2001 to 6.5 million barrels per day in 2025. South Korea consumed 2.1 million barrels of oil per day in 2001, with oil demand projected to grow by 1.8 percent per year, reaching 3.3 million barrels per day in 2025.

Northeast Asia is a major oil importer. China became a net oil importer in 1993, and Japan and South Korea import all their crude oil. These major energy consuming countries are greatly dependent on the Middle East as their supply source. In 2002, Korea's oil import dependency on the Middle East was 73.4 percent.[13] For Japan, it was 88.4 percent in 2001.[14] China's oil import dependency on the Middle East is projected to increase from 46 percent in 1999 to 67 percent in 2025.[15] The increased imports of China from the Middle East, which

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Corporate Communication Services, 2002).

12) Energy Information Administration, U.S. Department of Energy, *International Energy Outlook 2003* (Washington, D.C.: EIA, May 2003), pp. 31-35.

13) In 2001, the Middle East Oil dependency was 76.0 percent.

14) Petroleum Communications, *Petroleum Data* (in Japanese), (Tokyo: Petroleum Communications, 2002).

15) EIA, *op. cit.*, pp. 41-42. While there is no doubt that a large proportion of China's future oil supplies will have to come from the Middle East, the possibility of Russia becoming an important supplier to China and other Northeast Asian countries in the future cannot be dismissed. Talks are ongoing between the Chinese National Petroleum Corporation (CNPC) and Russia's Yukos to construct an oil pipeline from Angarsk in E. Siberia to Daqing in Northeast China in order to supply Russian oil for a total of 700 million tons for 25 years from 2006. But the final decision regarding the oil pipeline route is unclear at the moment, since Japan is competing with China for the same Angarsk oil. Japan would like to see an oil pipeline constructed from Angarsk to Nakhodka, and it has reportedly offered up to 10 billion dollars for development of the Siberian oil field, in addition to 5 billion dollars for construction of the pipeline.

will account for about 80 percent of future incremental imports of the Northeast Asian region, will necessarily raise the region's dependency on the Middle East in the future. This outlook clearly indicates that a future oil crisis, especially originating in the Middle East, could seriously disrupt the supply stability of Northeast Asia.

Although natural gas demand has grown fast in Northeast Asia, it still accounts for less than 10 percent of the region's total energy consumption and is still under-utilized compared to other regions of the world. Natural gas currently accounts for a small share of China's total energy mix, only about 3 percent in 2001. In Japan, while the past decade saw a relatively strong growth of the natural gas consumption at an average of 4 percent per year, it is projected to slow down and grow by a modest average of 1.0 percent from 2001 to 2025.[16] In Korea, natural gas consumption has grown rapidly for the past 15 years since its introduction to the country, at an average growth of about 18 percent per year. Its share in the country's total energy mix was 11.3 percent in 2002. The growth of natural gas consumption, however, is expected to slow down to 4.8 percent per year for the next two decades.

Even though the share of coal consumption in China has been declining, it still takes up a significant share (64 percent) of total primary energy consumption in China. Due to the high coal dependency of China and the high oil dependency of South Korea and Japan,[17] the region is extremely vulnerable to energy-environmental issues. As seen in Table 4, the annual average growth rate for carbon dioxide emissions of China will far surpass the world average. In fact, by 2010 the carbon emissions of China alone are expected to outstrip those of Western European countries combined.[18] Also, the carbon dioxide emissions of Korea will grow

16) EIA, *op. cit.*, pp. 61-64.

17) They are about 50 percent for both countries.

18) Included in the Western European countries are the United Kingdom, France, Germany, Italy, the Netherlands, Austria, Belgium, Denmark, Finland, Greece,

Table 4. Carbon Dioxide Emissions Forecast

(Unit: Million TC)

	2001	2005	2010	2015	2020	2025	Annual Growth (2001~2025)
S. Korea	121	131	156	178	193	206	2.2
Japan	316	319	334	353	365	382	0.8
China	832	888	1,109	1,319	1,574	1,844	3.4
World	6,522	6,908	7,685	8,512	9,375	10,361	1.9

Source: EIA, *International Energy Outlook 2003*.

faster than the world average. Northeast Asia is expected to overtake North America and Europe in terms of carbon dioxide emissions from energy consumption in the future and is likely to become the focus of interest in future environmental negotiations.

SCHEMES FOR ENERGY COOPERATION IN NORTHEAST ASIA

To overcome the energy security challenges of meeting fast-growing energy needs and lessening the import dependency on the politically unstable Gulf region, while at the same time, addressing energy-related environmental issues, the concept of strengthening energy cooperation among the Northeast Asian countries is particularly important. As stated earlier, workable measures by individual countries on their own are severely limited. Individually, each country is striving to improve energy efficiency and promote new and renewable energy sources, but these measures can achieve only limited results in the foreseeable future. Hence countries in Northeast Asia are exploring workable energy cooperation schemes, in order to mitigate energy security risks and, at the same time, to

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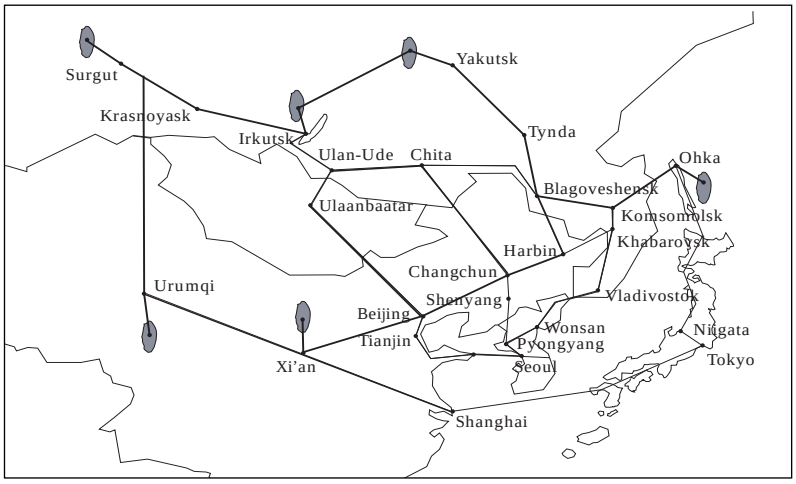
Iceland, Ireland, Luxembourg, Norway, Portugal, Spain, Sweden, and Switzerland. EIA, *op. cit.*, p. 191.

Figure 1. Proposed Pipelines in Northeast Asia



Source: Lee Bok-jae, Lee Won-woo, and Park Chang-won, *Energy Cooperation in Northeast Asia: Schemes of Energy Cooperation in Northeast Asia* (in Korean), (Euiwang-si: KEEI, May 2002), p. 216.

secure cost-effective energy supply. In this section, we will examine possible energy cooperation schemes in Northeast Asia in the natural gas, oil and electricity sectors.

Natural Gas Cooperation

One potentially effective cooperative scheme is the utilization of natural gas in East Siberia and the Russian Far East. As all three of the major energy consuming countries in the region, China, Japan and South Korea, expect their natural gas demands to increase substantially, perhaps the natural gas sector is the forerunner in discussion of the Northeast Asian energy cooperation that has the highest possibility of implementation. Besides, natural gas provides a way to lessen oil dependency as well as to address environmental concerns.

Most of the current discussion on natural gas cooperation in Northeast Asia involves development of gas fields in Irkutsk, Yakutsk or Ohka on Sakhalin Island, and construction of pipelines to transport gas to final consumption sites. In all these prospective pipeline natural gas (PNG) projects, several different routes for pipeline construction are possible. Three alternative routes for the Irkutsk project and two different routes for the Yakutsk and the Sakhalin projects have been suggested.

For the Irkutsk project, some progress has been made. China, Russia and South Korea have already agreed upon joint development of the Irkutsk gas field, which involves over 4 thousand kilometers of pipeline (see Table 5), and a feasibility study is soon to be completed.

According to the preliminary feasibility study completed in 1997, the Route I pipeline would extend from Irkutsk to Seoul, passing through Ulaanbaatar, Beijing, and Tianjin. According to the preliminary study, it holds an advantage as the shortest among the three routes. While it would have to pay transit fees to Mongolia, that country's demand for natural gas is thus far insignificant. The disadvantage is that the route would incur additional construction costs for a pipeline under the Yellow Sea to reach South Korea.

Route II would pass through Shenyang, which would supply natural gas to neighboring areas and lower pipeline construction costs. It would also preclude building a pipeline under the Yellow Sea, by passing through North Korea instead. Route II would hence pay a transit fee to North Korea in addition to Mongolia.

Route III would not pass through Mongolia, thus enabling the extension of pipelines into other areas and of interconnection with other pipeline projects in the future. This route would also enable connection to the Sakhalin reservoirs, which could increase the profitability of the Irkutsk projects and secure a sufficient gas supply.[19)]

19) With the completion of the proposed joint development of Irkutsk and Sakhalin

Table 5. Irkutsk Pipeline Project

	Country	City	Supply (mcm*)	Cumulative Distance (km)
Route I	Russia	Angarsk	10,000	727
	Mongolia	Ulaanbaatar	500	1,439
	China	Beijing, Tianjin, Rizhao	10,000	3,450
	S. Korea	Seoul	10,000	4,115
Route II	Russia	Angarsk	10,000	727
	Mongolia	Ulaanbaatar	500	1,439
	China	Beijing, Shenyang	10,000	3,491
	N. Korea	Pyongyang	500	4,008
	S. Korea	Seoul	10,000	4,252
Route III	Russia	Irkutsk, Ulan-Ude, Chita	10,000	1,610
	China	Changchun, Shenyang	10,000	3,390
	N. Korea	Pyongyang	500	3,907
	S. Korea	Seoul	10,000	4,151

*million cubic meters

Source: Lee, Lee, and Park, *op. cit.*, p. 216.

Reportedly, the pipeline route from Russia to China has already been determined to bypass Mongolia, while the route from China to South Korea, whether to take the land or undersea route, is still open to debate.[20] The comprehensive international feasibility study jointly conducted by Russia, China, and South Korea is expected to be completed in October 2003.

The Sakhalin project and the Yakutsk project are to develop gas reservoirs in the far northeastern region. Regarding the Sakhalin project, one of the routes runs from Sakhalin through Russia, China and North Korea to South Korea,[21] spanning 2,766 km. The estimated

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reservoirs the annual gas supply is expected to amount to 40 to 50 bcm (billion cubic meters).

20) Energy Intelligence Group, "China, Korea play up problems for Kovykta," *World Gas Intelligence*, Vol. XIV, No. 36 (August 27, 2003).

21) In Russia, it passes through Komsomolsk and Khabarovsk. Other than these

annual gas supply is 21.5 billion cubic meters (bcm), of which 0.5 bcm would be supplied free of charge, in lieu of a transit fee, to North Korea. The other route does not go through China.[22] The overall distance from Sakhalin to Seoul is shorter than that from Irkutsk, incurring lower pipeline construction costs. For the Yakutsk projects, two different routes have been examined, and as in the Sakhalin project, one of the routes runs through China while the other doesn't.[23]

According to the results of a cost analysis, the size of pipeline investments in the region ranges from 3.9 billion dollars to 7.4 billion dollars.[24] The Irkutsk pipeline project is most expensive of the three, while the Sakhalin pipeline project costs the least.

The cooperative construction of pipelines in Northeast Asia could generate the following positive outcomes. First, while there are many types of risks associated with the projects, such as the size of the reservoirs and institutional, political and financial risks, cooperation among the countries would significantly reduce project risks. Second, regional cooperation would lead to net economic benefits. One source of the economic benefit is based on economy of scale, while another arises from the efficient utilization of heterogeneous production factors discussed earlier.

Russian cities enroute, the others in China, North Korea and South Korea are the same as in route III of the Irkutsk project.

22) The route runs from Ohka, passes through Komsomolsk, Khabarovsk, and Vladivostok in Russia, and Pyongyang in North Korea, before reaching Seoul. The total distance is 2,649 km.

23) One of the routes is Yakutsk-Tynda-Blagoveshchenk-Changchun-Shenyang-Pyongyang-Seoul, with a total distance of 3,656 km, and the other is Yakutsk-Tynda-Blagoveshchenk-Khabarovsk-Vladivostok-Pyongyang-Seoul with a distance of 4,159 km.

24) For more detailed discussion of the cost estimation, see Lee Bok-jae, Lee Won-woo, and Park Chang-won, *Energy Cooperation in Northeast Asia: Schemes of Energy Cooperation in Northeast Asia* (in Korean), (Euiwang-si: KEEI, May 2002), pp. 217-225.

Electricity Cooperation

Another possible scheme is that of interconnecting electricity systems. Northeast Asia possesses much potential for enhancing the efficiency of its power industry through exchanges of electric power, utilizing the differences in electricity demand structure among countries. A number of proposals for interconnecting the electricity grids of South Korea, North Korea, China, and, in some cases, Japan with the grid of the Russian Far East have been developed. In most of these proposals, electricity generated by hydropower, nuclear power, or natural gas in Russia would be transmitted to consumers in China, South Korea and Japan.

Around 68 percent of hydropower resources in the Russia Far East can be developed to produce electricity[25] with highly economical hydropower. About 29.4 billion KWh could be generated, yet only 1 percent of that potential has been developed. Also, the Russian Far East has abundant tidal power resources, for example, the Okhotsk coast, which is known for its tidal power.

The proposed electricity network plans fall into three categories. One is the East Siberia-Northern China project, which would construct a transmission corridor between one of the major hydropower plants of Irkutsk system, for example the Bratsk plant and Tangshan in China—a hundred fifty kilometers northeast of Beijing, via Mongolia. Another type of project would transmit electricity generated from East Siberia to Korea and Japan. In one of these plans, it is proposed to construct a nuclear power plant in Primorye Krai of Russian Far East and transfer the nuclear power to Korea or to Japan through cross-border interconnected systems. Another scheme would involve Yakutian hydropower plants along the Uchur and Timpton Rivers, or gas-and-coal-fired power plants on Sakhalin Island, which could be connected to the systems of Japan and

25) This and for more details of ensued discussion of electricity cooperation. *ibid*, pp. 252-259.

Korea. A third type involves connecting the Korean peninsula with the surrounding countries. First, East Siberia would be connected with Mongolia and China, and secondly, China, the Korean peninsula, and Japan would be connected. Lastly, after East Siberia and Japan are connected, the electricity network would form a ring connecting the Korean peninsula with China, Japan, and East Siberia.

These proposed projects to interconnect multiple power systems would provide an environmentally-friendly power supply from natural gas and hydro resources in eastern Russia to China, Korea and Japan. Also, these regional electricity cooperation projects could provide a way for Japan and South Korea to sidestep strong public resistance to nuclear power, which is considered one of the major measures for mitigating carbon dioxide emissions. Furthermore, such systems would enable the efficient utilization of power by taking advantage of the differences in load curves. In Japan and South Korea, the peak load occurs in summer while in eastern Russia it occurs in winter. Additionally, through the interconnection of an electricity grid, countries would have access to backup electricity from other countries in case of emergency. Finally, power interconnection in this region would provide a firm foundation not only for economic prosperity but also for mutual trust among the nations based on cooperative interdependency.

Oil Cooperation

Another area for cooperation deals with oil. A common stockpile can enhance the leverage for crude oil prices and allow a safer balance of supply and demand. To this end, Japan is proposing an immediate alternative of utilizing Okinawa as an oil reserve center for Northeast Asia. South Korea is expected to have a surplus storage capacity of 43 million barrels in 2006. In contrast, China has just started an emergency oil stockpile program, and is in need of storage capacity. China could use the surplus storage capacity of Japan and Korea to build its emergency oil stock. It would make sense in the

long run for interested countries to jointly invest and construct a common reserve.

Another direction for cooperation is strengthening the bargaining power of the Northeast Asian oil-consuming countries. The countries in the Northeast Asia region, including Japan, China and Korea are importing large quantities of crude oil and petroleum products from outside the region, which are anticipated to rise continuously. In spite of the large oil trade in Northeast Asia, however, it is often pointed out that the crude oil and petroleum product prices destined for this region have not been set rationally. This is the so-called "Asian Premium," meaning that the price of the Middle East crude oil imports for Asia is set higher than the oil destined for North America or Western Europe. Lee and Moon have calculated the difference in price, and found that the oil price destined for Asia is higher by about one dollar per barrel (see Table 6).

The factors that allow the Asian Premium persistent are said to be the heavy dependence on the Middle East and the lack of liquidity in Dubai, the marker oil used for Asia. Heavy oil-consuming countries must make concerted efforts to address such price discrimination.[26)]

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26) Some measures that can be taken follow: First, negotiate with suppliers to change the marker crude oil for Asia from Dubai to another oil. The price of Dubai is relatively easy to manipulate because of the small quantity produced and the lack of liquidity. Second, fill a common stockpile with non-Middle East oil, in order to bring in oil suppliers of other region. Third, raise the quantity share of spot purchase. On the other hand, since the Middle East oil producers will be increasingly dependent on East Asia for their volume growth as much as the East Asian oil importing countries need access to supply, one can think of persuading suppliers to correct discrimination. There is already action to correct the Asian Premium being taken by Japan and South Korea in this direction, and Middle East suppliers now seem more prepared to correct the problem.

Table 6. Comparison of Price Difference by Destination

(Unit: $/barrel)

	Price by Destination			Price Difference		
	Europe-Bound (A)	US-Bound (B)	Asia-Bound (C)	C – A	C – B	B – A
1995	15.73	15.79	16.75	1.02	0.96	0.06
1996	19.17	19.28	19.37	0.20	0.09	0.11
1997	17.13	17.35	18.71	1.58	1.36	0.22
1998	10.78	11.14	12.20	1.42	1.06	0.36
1999	16.19	16.09	17.29	1.10	1.20	-0.10
2000	26.02	26.17	26.75	0.73	0.58	0.15
Average	17.50	17.64	18.51	1.01	0.87	0.13

Source: Lee Dal-sok and Moon Yeong-seok, *Energy Cooperation in Northeast Asia: Efficiency Measures for Crude Oil Logistics in Northeast Asia* (in Korean), (Euiwang-si: KEEI, May 2002), p. 66.

IMPEDIMENTS AND REQUISITES FOR ENERGY COOPERATION

Despite the numerous advantages that energy cooperation can bring to all countries in the region, actual implementation will be a considerable challenge. While many energy cooperation schemes, such as natural gas development projects and interconnection of electricity grids, involve enormous investment, the risks of investment are also high, due to the political tensions in the region as well as institutional impediments. In addition, heterogeneous political and economic systems and market behavior set the countries apart. That is, some rely on free-market function while others are more inclined to central planning. Furthermore, energy markets in many countries of the region are relatively immature, with strict import barriers and tight regulations on returns. Cross-subsidies in energy price and entangled energy tax systems can also deter creation of a competitive energy market and an influx of

foreign investment capital. Fortunately, as deregulation of energy industries and introduction of competition are taking place in many countries in the region, irrational market structures that stand in the way of energy cooperation will improve in the future. The question is whether the speed of the improvement will be fast enough.

According to Cho and Katz,[27] required net foreign capital inflow to Northeast Asia for infrastructure development is estimated to reach at 7.5 billion dollars a year for the next 15 or 20 years. This estimated amount is beyond the region's means, and existing tools like international financial institutions (notably, IBRD, ADB and EBRD[28]), private direct investment in commercially viable infrastructure projects, and bilateral, government-to-government assistance cannot adequately cover those needs. Under optimistic assumptions, the region's financing shortfall would amount to 5.0 billion dollars a year, taking into account possible supply through the existing tools at 2.5 billion dollars a year.

To even begin filling the region's projected financing gap, Cho and Katz proposes creation of a new institutional arrangement dedicated to meeting Northeast Asia's future capital transfer and infrastructure investment requirements. A new, sub-regional development bank, the so-called Northeast Asian Development Bank (NEADB), could be an effective institutional option for helping to meet Northeast Asia's projected infrastructure financing gap. It should be noted that while this financing gap is one of the toughest challenges to advancing the regional cooperative scheme, it could also offer a great opportunity to participants in capital markets around the world.

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27) Lee-Jay Cho and S. Stanley Katz, "A Northeast Asian Development Bank?" *NIRA Review* (Winter 2001), pp. 41-47.

28) International Bank for Reconstruction and Development (IBRD), Asian Development Bank (ADB), and European Bank for Reconstruction and Development (EBRD).

CREATING AN INSTITUTIONAL FRAMEWORK FOR ENERGY COOPERATION IN NORTHEAST ASIA

The energy cooperation schemes in Northeast Asia require multilateral cooperation with many countries. Such cooperation tends to be difficult since involved countries' interests and development priorities differ, and hence, the desirable forms and conditions of specific cooperation outcomes may also vary. Yet, the comforting side of Northeast Asian energy cooperation is that the possibilities for benefits are so great that in various possible cooperation outcomes all involved countries can emerge as winners. Since practical interests will eventually drive each country to resolve the many obstacles to energy cooperation through dialogue and negotiations, it is important to set a clear vision for energy cooperation and to provide an institutional framework conducive to implementation.

For successful implementation, a roadmap is necessary to ensure broad energy cooperation that addresses various aspects and steps of cooperation, from formulating a consensus of all interested countries to the financing mechanism.

First of all, a comprehensive assessment of various options for cooperation and specific projects must be undertaken. Then, priorities among various cooperation projects must be set based on the assessment. In the process, information-sharing and dialogues among relevant experts and business sectors across the countries should be encouraged to facilitate consensus formulation and confidence building. This can lead to development of joint policy coordination agenda as well as optimal financing alternatives. Eventually, institutional frameworks for multilateral regional energy cooperation such as treaties, charters and regional energy communities in Northeast Asia can be created for future stable cooperation.

For this purpose, an intergovernmental institutional vehicle

should be established, such as a meeting of high-level officials from countries in the region, since clear governmental initiatives to reduce high political and institutional risks of energy projects are critical for the successful implementation of energy cooperation.

Moreover, it is important to form a public and private partnership so that the opinions of the private sector can be reflected at government-level talks. Hence it is further recommended that an intergovernmental institutional vehicle be supported by energy experts and business sectors to facilitate cooperation-perhaps through working parties or expert/business forums.

In a sense the groundwork for regional energy cooperation in Northeast Asia has already been initiated. As the first step towards the cooperation, an intergovernmental meeting, held in Khabarovsk, Russia in October 2001, was attended by 57 participants of government officials and experts from six countries of the Northeast Asian region—China, Japan, Mongolia, Russia, North Korea and South Korea.[29] At the meeting, a declaration, the Khabarovsk Communiqué was adopted, including the objectives and basic principles of energy cooperation in Northeast Asia. The agreed objectives for the energy cooperation are (i) to increase the supply of energy from the NEA region, (ii) to optimize the efficiency of supply and use of energy, and (iii) to minimize the environmental impact of energy projects through improved energy mix. The basic principles manifested in the Communiqué include (i) the recognition of sovereign rights over energy resources, (ii) development of free and fair trade, and (iii) investment promotion and protection and environmental protection.

The Khabarovsk Communiqué also recommended institutional

29) The creation of a working committee to promote multilateral energy cooperation at the government-level in Northeast Asia was first proposed by the Minister of Commerce, Industry and Energy of South Korea in June 2001 at the First International Conference for Energy Cooperation in Northeast Asia hosted by KEEI.

arrangements for a "senior officials meeting" attended by the six countries, a secretariat, and "working groups" in the following areas: (i) energy planning, programming and restructuring, (ii) emerging energy technology and scientific cooperation, (iii) electric power interconnection, (iv) interstate transit of fossil fuels, and (v) development of the Northeast Asian Energy Charter.

Subsequently, a preparatory meeting aimed at creating a working committee for Northeast Asian energy cooperation was held in Seoul, Korea in November 2001, and attended by participants from the governments of Japan, Russia, and Korea and from organizations of UN ESCAP,[30] ASEAN Center for Energy, and KEEI. At the meeting, a consensus was reached to create a working committee for energy cooperation in Northeast Asian and the UN ESCAP is to serve as an interim secretariat.

Following all the developments, a meeting of senior officials was held on April 2003 in Vladivostok on the initiative of South Korea. It was intended that this meeting would serve as an intergovernmental institutional vehicle necessary to establish the much sought-after energy cooperation in Northeast Asia. This meeting was not officially titled the "First Senior Officials Meeting," however, since China and Japan did not attend.

Despite non-attendance by certain countries, the participation of international organizations was enthusiastic, with the participation of the UN ESCAP, ADB, IEA, UNECE[31] and APERC, and some progress was made.[32] They also agreed to a regular meeting, to be held between senior officials from Russia, Mongolia, North and South Korea. There was also consensus that more cooperation would be made through the establishment of "working groups" in the areas

30) The United Nations Economic and Social Commission for Asia and the Pacific

31) The United Nations Economic Commission for Europe

32) UN ESCAP, "Vladivostok Statement of Senior Officials on Energy Cooperation in North-East Asia", UN ESCAP Senior Officials Meeting on Energy Cooperation in North-East Asia, Vladivostok, Russia, April 10, 2003.

of electric power interconnection, interstate transit of fossil fuels and prospective energy planning and programming.

CONCLUSION

Economic prosperity for Northeast Asia cannot be achieved or maintained unless energy security is assured. The key to energy security and environmental concerns, indeed the basis for sustainable development, lies within the Northeast Asian region for it is endowed with rich environment-friendly energy resources. We only need to implement workable cooperative schemes, since the motivation will be well-driven by the need for sustainable development and economic benefits, which can be summarized as follows:

First of all, the abundant energy reserves of East Siberia and the Russian Far East could become the key source of alternative energy supply source for the countries in the Northeast Asian region, and would lessen the region's heavy dependence on the Middle East. Moreover, the abundant environment-friendly natural gas and hydropower reserves can be effectively utilized to deal with environmental issues.

Second, it would also be a cost-effective alternative because of its proximity to consuming markets. The regional energy cooperation schemes such as joint development of energy resources and construction of oil and gas pipelines will permit land routes for energy supply to countries that have depended almost entirely on marine transport for imports. The interconnection of energy supply systems will further promote efficient energy trade and improve facility utilization.

Third, efforts pertaining to implementation of energy cooperation projects tend to promote market efficiency and accelerate liberalization process in the region. Often multilateral energy projects entail coordination of energy policies and induce

various changes such as streamlining unnecessary procedures and removing of ad hoc subsidies. In the course of implementing cooperative projects, each country's energy system and policies are likely to converge with international standards and improve energy market transparency. This will in turn lower the risks associated with multilateral energy projects and attract more investments to the region.

Fourth, energy cooperation in Northeast Asia could serve as an opportunity to improve the North Korean energy situation, thereby easing political tensions on the Korean peninsula, and contribute to the security of Northeast Asia. For Japan and South Korea, North Korea is situated on the threshold of the Northeast Asian continent where abundant resources are deposited. Therefore, many Northeast Asian energy cooperation proposals involving infrastructure for gas and electricity from the resource-rich Russian Far East to China, South Korea, and Japan would need to traverse North Korea. Involving North Korea through multilateral energy cooperation would provide the country with an incentive to open its institutions and stabilize its political circumstances to attracts more investment for the rehabilitation of its energy industry. Borrowing from Hippel and Hayes' expression,[33] regional cooperation on energy facilities provides an important "hook" for the substantive engagement of North Korea in constructive, peaceful, and mutually beneficial activities with the countries of the region and beyond.

We have seen that there are tremendous win-win opportunities among the countries in the Northeast Asia region from energy cooperation. Furthermore, considering current spread of regionalism throughout every region of the world, regional energy cooperation in Northeast Asia within the framework of broader economic

33) David Von Hippel and Peter Hayes, "Regional Energy Infrastructure Proposals and the DPRK Energy Sector: Opportunities and Constraints," paper presented at the KEI-KIEP Policy Forum on "Northeast Asian Energy Cooperation" Washington, D.C., January 7, 2003.

cooperation among Northeast Asia is all the more necessary for countries in the region to guard their own economic interests.

When we reflect on the recent U.S.-Iraq War and the current North Korean nuclear crisis, energy has played a major factor in both incidents. Energy is one of the handful of issues that countries will go to war over. Some say that if World War III were to break out, it would be either due to food or energy. Thus, we cannot ignore the possibility that energy could become the source of international conflicts. On the other hand, however, energy can also become a cooperative catalyst for all countries to harmoniously coexist, as in the case of Europe. The formation of the European Coal and Steel Community in 1951 eventually paved the way for the strong ties of the European Union today. Similarly in Northeast Asia, energy can, and should act to encourage a positive cooperative spirit; that is, a catalyst for strong regional ties, peaceful coexistence and prosperity in Northeast Asia.