ENERGY SECURITY AND SUSTAINABLE DEVELOPMENT IN NORTHEAST ASIA: PROSPECTS FOR U.S.-JAPAN COORDINATION

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As the Cold War era recedes into history, the position of Northeast Asia on the list of U.S.-Japan common priorities is moving upward. Main concerns now include managing subtle risks originating from North Korea, encouraging China's responsible participation in the international system, avoiding conflict in China-Taiwan relations, and counting Russia as a partner in the Asia-Pacific region. Moreover, the meaning of security is increasingly being perceived in broader, more comprehensive terms to include protection not only from traditional military threats, but also a variety of non-conventional challenges. New worries are emerging with regard to energy use, energy security, and the sustainability of economic growth. The question is whether the scope of the U.S.-Japan partnership expands to include new issues such as coordination on energy use and environmental preservation in Northeast Asia and globally.

There are many challenges that call for close U.S.-Japan policy coordination focused on energy security and environmental protection in the Northeast Asian subregion. The Asia-Pacific Economic Cooperation (APEC) forum has already raised the issue of reconciling energy-environmental policies in the area. It is doubtful, however, that this international body alone can facilitate a shift to cleaner fuels and "clean technologies," including those that reduce emissions that cause acid rain and climate change. Together with APEC, the United States and Japan should jointly promote a wider use of natural gas as an alternative to other types of more polluting fuels, particularly in Northeast Asia, first and foremost in China.

Future institutional options aimed at enhanced energy security and sustainable development in Northeast Asia depend on larger political issues. A cooperative regime in energy resource development, transportation and efficient use will depend on the type of relationship formed within the U.S.-Japan-Russia-China "quadrangle", provided that U.S. policies favor closer cooperation in the energy sector among the countries of Northeast Asia.

The Problem

Northeast Asia as a region comprises China, Japan, the Koreas, Mongolia, and Far Eastern Russia. The strong interests and presence of the United States also characterize the region's security, political, and economic relations. Northeast Asia is emerging as one of the leading regions in the world in terms of energy imports. This area is also vital for maintaining both global and regional energy-environment balances. China, Japan, the Koreas, Mongolia, and Russia together representing a quarter of the world's population and one fifth of the global economy, the region is likely to account for more than half of the growth in world energy demand by 2020. Growing energy consumption complicates existing problems and creates new ones. Import dependency on distant sources of fossil fuels has increased. This factor, coupled with reliability of supplies and the cost of transportation, necessitate a diversification both in geography and fuel mix.

Environmental concerns are also rising. By the year 2020, the combined share of Asia's carbon dioxide emissions is expected to reach 57 percent of the world total. China alone will

double its CO_2 emissions by 2010 and triple them by 2020.[1] China, one of the world's largest users of coal, discharges about 14 percent of world carbon dioxide emissions, including more than 85 percent of CO_2 (0.6 billion tons in 1996) from coal. Rising coal consumption leads to increased emissions of CO_2, acid rain-related nitrogen oxides (NO_X) and sulfur dioxides (SO_X), and numerous toxic metals, with far-reaching environmental and health consequences. In the United States, for example, coal used for heating and electric power generation is reportedly causing 15,000 premature deaths annually.

For Northeast Asia, the point of special importance is how fast China moves towards sustainable use of energy and away from predominant reliance on coal in its current form. This alone will strongly influence the environmental future of Northeast Asia. There is a growing concern that Northeast Asia, including Japan, is already experiencing various damaging environmental effects of expanding energy use, such as acid rain, including trans-boundary acid pollution. This subregion is also an increasingly important factor in the context of global climate change. More broadly, Northeast Asian economies without exception are looking for economically rational, diversified, and reliable options to support their energy needs and are well aware about the need to protect the environment. In this context, the energy resources of Eastern Russia are attracting attention from both the governments and the end users in such countries as China, Japan, and the Republic of Korea.

A Solution at Hand

The states of the subregion share a strong interest in enhancing their energy security and an opportunity to cooperate in promoting a region-wide shift towards more responsible energy-environment postures. Part of the solution is to involve Russia with its large proven reserves of natural gas in this subregional "energy security-development-environment" equation. In many cases natural gas could be an alternative to coal and oil in power generation. As a fuel, natural gas is cleaner than oil and coal. Gas burning produces no sulfuric discharges and much less CO_2 emissions compared to coal and oil.[2] It is estimated that the replacement of coal-burning facilities with those using natural gas in combined cycle gas turbines would reduce CO_2 emissions by between one-third and two-thirds.

On the other hand, for Russia, it could be very difficult to justify the development of large oil and gas fields in Siberia and the Far East without linking the feasibility assessment with larger neighboring markets. Access to these markets and their magnitude condition investment mobilization. This is particularly relevant to long-distance natural gas pipelines and liquefied natural gas (LNG) projects. Close cooperation with Japan, China, and South Korea on gas projects is perhaps the only realistic approach for defining their timing, shape, and scale. For example, the Sakhalin projects are unlikely to reach the stage of a gas pipeline to meet domestic energy needs without linking such a pipeline with China or the Koreas.

Improvements in Northeast Asian regional affairs in the 1990s allow these problems to be approached in a comprehensive and cooperative manner. Improvements in Russia's relations with Japan and China are partially associated with export-oriented energy ventures in Siberia and Far Eastern Russia. Private-sector energy giants reacted to this change rather swiftly, contributing to positive dynamics with their investment and feasibility studies. U.S. and European multinational corporations (MNCs), as well as leading Japanese companies are the primary actors in the first two internationally financed Sakhalin offshore oil and gas projects worth about US$25 billion. China, on the other hand, seems to be interested in the Kovykta gas

field near Irkutsk in which British Petroleum is involved. The estimated cost of this project, including long-distance pipelines, is around US$10 billion. There are expectations that in the next 10 to 20 years, other prospective ventures in Sakhalin, Eastern Siberia, and Yakutia will double and triple these already massive investment plans. These plans position Russia as a new factor in the context of subregional energy needs. It remains to be seen, however, to what extent and how fast the demand for these new energy sources will grow.

Interests—Primacy of Energy Security

Multiple interests embodied in national energy strategies and international environmental protection plans may favor international cooperation, but it is misleading to overlook the fact that, unlike in Europe, energy security interests in Northeast Asia remain predominantly national, leaving little room for multilateralism. If properly accounted for, these interests can facilitate cross-border energy projects, but in many cases the reality is the opposite—related domestic factors and regional political complexities have so far resisted the idea of developing cross-border fixed infrastructure.

There are also trends that can eventually change current perceptions. For "island" economies such as Japan, South Korea and Taiwan, energy security is a major and long-standing problem. For China, cultivating dependable and economical import sources of oil and gas is an emerging policy issue. These interests are unlikely to be sufficiently coordinated. China's economy is rising, generating huge and growing demand for energy. This alone could lead towards less competitive markets overcrowded by consumers. As China grows stronger and becomes an energy importer of world significance, the risk of competition for energy increases. The introduction of new large hydrocarbon supplies from Eastern Russia could mitigate potential rivalry.

At the same time, some contending standpoints do not rule out cooperation. Major challenges stem not only from rapid growth in energy demands but also increasing environmental pressures. Obviously, cooperation with China is key to region-wide sustainable use of energy and reduction of carbon dioxide emissions and acid deposition. The magnitude of the Chinese economy and population and its predominant reliance on coal pose serious environmental threats to China itself, as well as to its neighbors. Partly as a reaction to this challenge, Japan is promoting cleaner energy and energy efficiency—in China in particular. In this context, both China and Russia are emerging as Japan's natural partners with complementary needs.

As energy utilization expands, there is an increasing need for energy security. Measures to promote energy security include diversity of fuels, sources, and suppliers. The strategy of energy importers incorporates such elements as measures against disruption in supplies and actions aimed at the expansion of choices. These choices incorporate geographical diversification, technological innovation, and cleaner sources of energy such as natural gas, hydroelectric power (HEP), and nuclear power. In this context, Eastern Russia expands these "geography-fuels" choices. It could be a natural contender for markets in Japan, South Korea, and China, as well as a partner of these economies in securing energy needs through diversification and competition promotion.

More generally, all the economies of Northeast Asia can be seen as intrinsically linked by a number of factors underneath their energy needs and environmental concerns. Their most significant worries with regard to energy insecurity are "structural" with the solutions depending

on delivery infrastructure for diversification of imports, competition promotion, improvements in fuel mix, and shifts towards cleaner fuels. In all these segments opportunities for cooperation exist and the energy security enhancement can be closely coordinated with economic cooperation and environmental protection.

1. Growing Demand

The potential for competition among importers is significant, considering that in 1993, the total GDP of the Asian region (including China and other countries of Asia) was 23 percent of the world total, but by 2010, this share could reach 36 percent. Asia as a whole is likely to experience a 50 percent increase in energy use, with the bulk of the increase to be met through imports that could cause stiff competition.[3] In particular, the transportation sector generates a steep increase in demand for oil, aggravating dependence on overseas sources. China's reliance on oil from the Persian Gulf has risen to 60 percent of its total oil imports. Two decades from now, China's energy imports could be as high as its current production, equaling the imports of Japan and South Korea combined. Significantly, China is already the world's second largest consumer of energy. Although its per capita energy use is less than a quarter of Japan's level, the increase in energy consumption from 2000 to 2020 is projected to equal that of the OECD countries combined.[4]

Demand for oil in Asia is expected to increase sharply, fueled by motorization, rural electrification, rising living standards, and the ongoing shift from non-commercial to commercial energy in China. Moreover, the demand-supply gap in oil will rise, with China and Indonesia becoming oil importers. All these developments are likely to influence energy markets. In the 1990's, China became a major oil producer but also began to import oil. In 1997, the production of oil in China increased to 3.2 million barrels per day (Mbd), compared with 6 Mbd in Russia. By 2005, China's demand for oil is likely to reach 7 Mbd, compared with only 3.5 Mbd in 1997. Predictably after 2010, the growth in Chinese local production will slow down, with the output dropping to about 2 Mbd in 2020. The gap between domestic production and demand will widen, particularly after 2010, increasing imports to about 8 Mbd by 2020. By comparison, Japan's oil import in 2020 is also estimated at 8 Mbd, a significant increase from 5.7 Mbd in 1997. The United States imported 8 Mbd of oil that year.[5]

2. Diversification of Suppliers

In recent years Japan's diversification of oil supplies has decreased as it has imported less oil from Asia. As a result, Middle Eastern producers currently account for 86 percent of Japan's oil imports, providing more than 50 percent of its primary energy. Overseas fields developed with the participation of Japanese companies provide 15 percent of Japan's oil imports. A semi-governmental organization--the Japan National Oil Corporation (JNOC)--is involved in production and is developing four sites in China, sixteen in the North Sea, ten fields in Africa, twelve fields in the Middle East, forty-one fields in Southeast Asia and Oceania, seven fields in Central and South America and only one in Russia. In exploration activities JNOC is involved in four sites in Russia and nine in China.[6]

In addition, Japan and South Korea are major importers of LNG. If gas prices in Europe can provide a benchmark, LNG consumers pay about 30 percent more for LNG, relative to gas delivered through a pipeline. In Northeast Asia this difference could be larger. Cheaper pipeline gas could be a factor in investment decisions on gas imports from Russia. However, the debate

in Japan on the pipeline options is moving rather slowly and energy multinationals involved in the Sakhalin projects consider the option of LNG infrastructure first.

As far as new sources of oil are concerned, Sakhalin perhaps is the most realistic addition to the pool of choices for Northeast Asian importers. In general, the economic crisis in Russia caused a serious shortage of investment in the exploration and prospecting of new reserves--a key precondition for long-term planning and investment decision-making.

3. Diversity of Fuels

The 1973 and 1979 oil crises forced Japan, South Korea, and Taiwan to reduce their reliance on oil and speed up diversification to alternatives, including nuclear power, coal, and LNG. Japan has made an effort to reduce its dependence in power generation on oil, promoting nuclear energy. The diversification of fuel mix has led to an increased role of nuclear and LNG thermo-power plants in power generation. There are currently 52 reactors with a capacity of 42 GW. These reactors provide almost 35 percent of the power output compared with 79 percent in France and 20 percent in the United States--the two extremes among G7 countries in terms of reliance on nuclear power.

The path that Japan takes in choosing fuels for power generation will significantly influence the size of the natural gas market. Many Japanese experts propose that gas imports must be further promoted through a pipeline not only for fuel diversification, but also for competitive pricing. Natural gas utilization in the transportation sector and power generation, residential and commercial sectors also promises the reduction in the level of dependence on oil. Oil, however, remains important in Japan's power sector and it is still the leading fuel in electricity generation for South Korea and Taiwan. The imports of oil by these two economies are expected to increase from 90 million tons (Mt) and 33 Mt in 1995 respectively, to approximately 200 Mt and 80 Mt in 2020.

4. Infrastructure

Expansion of natural gas use requires an expensive delivery infrastructure. Huge investments are needed for providing large-scale and efficient systems, including long-distance pipelines, for delivering natural gas both within the countries and across borders. Currently, many of the envisioned energy ventures are yet to be confirmed, while others need clarification in terms of size, time frame, mode of delivery, and routing.

Moreover, current discussions on Northeast Asian cooperation in natural gas pipelines must be supplemented with a "bigger picture" of export-oriented energy projects, in order not to miss viable and cost-efficient options and alternatives. In Eastern Russia, for example, a large number of ongoing and proposed coal-fired power projects, hydroelectric power stations, gas-fired plants, as well as various cross-border delivery systems, such as pipelines for natural gas (PNG) and electric power lines, are not interconnected in terms of funding, capacity, environmental impact or timing.[7] Obviously, there are simply too many proposals related to Eastern Russia. There are also proposals to link China with resources of natural gas in Central Asia.

Another point that needs to be made is that Russia's eastern provinces have more than three-quarters of the country's economically viable resources of hydropower. Currently, about 20 billion kilowatt-hours (kWh) of excess power are available for exports from the Irkutsk and Krasnoyarsk regions. Together with the under-utilized electric power output in Chitinskaya

Oblast, after completion of the Kharanorskiy power plant, the power surplus could reach 25-30 billion kWh. It is estimated that this pool of energy, particularly cleaner and cheaper hydroelectric power, will continue to exceed domestic needs until at least 2010. The export capacity will be even greater after the Bureiskaya hydroelectric power station, a key project for solving energy problems in the Far Eastern region, begins operation.

In theory, cross-border high-voltage transmission lines (HVTL) between Eastern Siberia, the Far Eastern region (including Sakhalin), and neighboring Northeast Asian countries would allow integration of electric power systems, creating conditions for a subregional electric power grid. The problem, however, is that in some regions in China, the capacity of already installed power generation equipment is also larger than actual consumption. This means that a cross-border gas pipeline network in Northeast Asia must be carefully designed, taking into consideration economically feasible alternatives and integrating them into a larger regional picture of energy production, consumption, transmission, and rational use.

5. Unforeseen Risks

Unlike "structural factors" of energy insecurity unforeseen risks are beyond the reach of national governments. According to the Japanese Institute of Energy Economics, among the sources of "contingent risks" are the factors of political and military instability in and around the areas from which imports originate. Also, possible accidents and threats to oil transportation routes, especially sea-lines of communication (SLOCs), may cause disruptions of supply.

For decades these factors were a major concern for the United States. However, the United States' dependence on Middle Eastern oil decreased, as new sources of oil in neighboring regions became available. Some analysts ask whether the United States will continue to secure oil supplies from the Persian Gulf without proper burden sharing with the European Union and Japan.[8] According to these authors, by 2010, Asia will import more than 90 percent of its oil from the Persian Gulf, while the United States is likely to get only 5 percent of its oil imports from this area. This changing situation also constitutes a ground for significant geo-strategic shifts, considering China's future role as a large oil importer.

Uncertain Prospects for Natural Gas Pipelines

A combination of huge energy markets in Northeast Asia and the natural gas reserves in Eastern Russia makes large-scale pipeline projects for gas transmission quite attractive. In general, Russia wants to develop these large reserves of gas for exports to Northeast Asia. This provides an opportunity for Japan, China, and the Koreas to better manage energy supplies and diversify them geographically and in terms of energy mix, promoting competition and protecting the environment.

In addition, some unforeseen domestic factors also increase chances for Russian gas exports. Until recently, there were plans in Japan to construct about twenty new nuclear reactors, considerably expanding total nuclear power generation capacity and boosting its share of the total power output to 45 percent. These plans are now being questioned due to growing public opposition to new nuclear power projects.[9] If the share of nuclear power plants in the electricity output remains at the current level and the share of coal and oil respectively fall as planned, the role of natural gas in power generation could reach 30 percent. The share of natural gas in primary energy supply could reach 18 percent to 20 percent—much higher than the current level of about 12 percent of primary energy. Japan currently imports about 54 million

tons per annum (Mtpa) of LNG and under the old scenario the demand was projected to grow to about 70 Mtpa by 2010.

New emphasis on natural gas may require, as some experts argue, the development of national trunk pipelines and regional networks. Japan's regional pipeline network is only 2,100 kilometers compared with 13,300 kilometers in Britain. Japan has no national pipelines, while the British national system is 4,700 kilometers long. In absolute terms, gas consumption in the household and commercial sectors in Japan, at 22 billion cubic meters (Bcm), is less than one-third of that in the United Kingdom at 73 Bcm.

In comparison, the share of natural gas in South Korea's primary energy sector is only 8 percent, but the length of domestic trunk pipelines is almost 2,000 kilometers. Korea's current plans call for a total length of 2,450 kilometers by 2003. It is expected that South Korea will further increase the share of natural gas in electric power generation to the same level as in Japan today. China plans to diversify energy supplies and has designated various sources of gas for different regions. As it is currently planned, central China will be supplied from domestic sources, coastal areas will rely on LNG imports, and cross-border pipelines will be routed to the northeastern region, possibly including Beijing and Tianjin. Obviously, changes in the energy policy and domestic gas resource availability in these countries will affect the volume of imported gas.

In China, which will continue for quite some time to rely mostly on coal, hydropower plants, and nuclear energy, forecasts for the share of natural gas in primary energy supply range from 5 percent to 10 percent by 2020. Currently, natural gas accounts for only 2 percent of total energy use. Some analysts suggest that gas demand will rise faster, from the current level of 16 Bcm to around 50 Bcm in 2005, 100 Bcm in 2010, and possibly 200 Bcm in 2020, creating a huge demand for imports. In absolute terms China's natural gas imports in 2005-2010 could be in the range of 25 Bcm to 60 Bcm, further increasing to 160 Bcm by 2020.[10]

Conservative estimates suggest that in South Korea the demand for natural gas is likely to reach 21 Mtpa by 2010. However, this approach does not envision expansion of power generation through the use of natural gas.[11] Alternative projections indicate that the gas power plants in South Korea will consume additional 5-7 Mtpa, if operated at about 70 percent of their capacity, and by 2020, the demand could reach 35-40 Mtpa. In that case, in absolute terms, the combined imports of gas by Japan, South Korea, and Taiwan in 2020 might expand to about 120 million tons even without counting possible additional demand for gas from the power sector in Japan. By 2020, the combined demand for imported natural gas in China (including Taiwan), Japan, South Korea, and Eastern Russia could expand to 320 Bcm (240 Mtpa) or more, depending on policies adopted by China and Japan.

There are numerous factors, however, that could affect the feasibility of cross-border gas pipelines. The first factor, in the case of Japan, South Korea, and China, is competition from LNG. The second factor, in the case Japan, is competition from alternative modes of energy transmission and, in the case of China, alternative fuels, particularly the promotion of clean coal technologies. The third factor, in the case of Japan and South Korea, is the future of their nuclear power programs.

1. LNG

Japan is the world's largest importer of LNG. Three-quarters of LNG are consumed in the power sector. Without the support of the regional electric power companies the gas industry

alone cannot undertake capital-intensive pipeline projects. Gas delivered by a pipeline could be significantly cheaper but this implies almost permanent commitment on both sides of the project. LNG is traded in "closed" markets on the basis of long-term and rigid ("take or pay" type) contracts, also involving the construction of very expensive infrastructure on each side of the project. The advantage is that this delivery mode does not involve the massive compensation payments for use of land that long-distance trunk pipelines require. Besides, the LNG technology is well known in Japan. Sources of LNG supplies are ample. However, despite an anticipated increase in the real LNG price by 2020, the demand is projected to exceed supply from existing sources.[12]

2. Oil and Coal

In the late 1990s, oil accounted for about 34 percent of the world's primary energy supply (coal--34 percent) and 10 percent of the global electric power production (coal--39 percent). In Japan, in 1995, oil accounted for about 23 percent of electricity generation, second only to nuclear power. According to official projections, the share of oil in power generation is expected to decline to 8 percent by 2010. However, there is strong pressure to introduce new oil-fired plants and oil-fired generation could resist losing its share.

In China, the share of oil-fired power plants in electricity production is expected to be at 6-7 percent in the next ten years, representing a four-fold growth over the 1995 level. Some recent publications by Chinese experts indicate that only by switching to oil and natural gas and relying on foreign supplies will China be able to achieve the 55-60 percent energy efficiency level that is common among the developed countries.[13] This requires China's power sector to reduce its dependence on coal, but the employment concerns may significantly delay this process. Besides, oil is less attractive for power generation because of its price volatility. This is driving up the shares of coal and natural gas in the energy mix, particularly in power generation, with coal retaining its predominant position.

Similarly, coal and natural gas consumption grew at comparable rates in South Korea and Japan. Favorably for consumers, international coal prices have declined at a steady rate over the last two decades. The proven reserves of coal in Northeast Asia are more than sufficient to meet anticipated increases in demand. These resources are widely distributed and available for imports. On the other hand, if gas is widely available, it has strong advantages in terms of final use flexibility and environmental impact.

Gas-fired power plants are faster and cheaper to build and easier to operate. The question is whether technical innovation and dynamics of prices (costs per caloric value) of coal and natural gas (both LNG and piped gas) will affect these competitive advantages. Independent power producers (IPP) in South Korea prefer natural gas, but those in China lean toward coal. Fuel prices and availability will influence these preferences in the future. These factors will be working in combination with such policy directions as privatization, liberalization of domestic energy markets, and environmental precautions, possibly including obligations under the Kyoto Protocol.

3. Nuclear Power

There is no doubt that nuclear power-based electricity generation reduces dependence on imports and enhances energy security. In Japan and South Korea the development of the nuclear power industry was a rational response to the oil crises of the 1970s. More recently, this option

became important in reducing emissions—carbon dioxide (CO_2) discharges in particular. Nuclear scientists strongly emphasize that nuclear power is environmentally safe, practical and affordable, and should be assigned a central place in the energy economy of the 21st century. They argue that fuel cell technology using natural gas could significantly reduce air pollution in the interim, but in the long term the transportation sector should be based on fuel cells with hydrogen generated by electricity produced by nuclear power plants.[14]

Nuclear power generation and LNG thermo-power plants remain the priority for major electricity companies such as Tokyo Electric Power Company (TEPCO) and Kansai Electric Power Company (KEPCO). These two power producers account for 30 percent and 25 percent of the total power generation in Japan, respectively, and are much less oriented towards gas pipelines than are gas utilities. Moreover, all nine electricity companies in Japan are regional monopolies, with TEPCO covering an area with more than 30 percent of the nation's population and supporting 35 percent of Japan's industrial production. Its choice with regard to gas pipeline projects could be the major determining factor.

Obviously, economic factors will play a role in determining the future of nuclear power. Nuclear electricity in the United States costs 1.9 cents per kWh, while power produced from gas costs 3-4 cents per kWh. Also, being the most technically advanced, the nuclear power industry has an edge in promoting its technology further, enhancing its cost-effectiveness, reducing environmental impacts, and improving public perceptions. On the other hand, recent estimates made in Japan show that if the disposal and decommissioning costs are included, nuclear electricity will be priced at 9-10 cents per kWh, while power produced from oil costs about 9.5 cents per kWh.

4. Downstream Infrastructure

Some studies indicate that the convergence between natural gas and power industries could tilt the competition between coal and natural gas, as well as piped gas and LNG, in favor of piped gas. Indeed, cross-border pipelines are market-driven projects, making financing possible only if there is a well-prepared market and downstream infrastructure that allows long-distance transportation and the use of large quantities of gas. Sizeable volumes of natural gas can reach customers in power generation and/or household and commercial sectors, but both directions require public-private sector partnership.

On a practical level, options for gas deliveries that are currently under study for the Sakhalin projects (LNG and a pipeline) depend exactly on the size of the market and downstream use. Also, progress in the Kovykta gas fields near Irkutsk, to be developed for exports to China as the main market, depends on the quantity of gas that Chinese end users can absorb. There were also proposals for high-voltage electric power transmission between Sakhalin and Honshu via Hokkaido. Again, the viability of these schemes depends on markets access conditioned by the Japanese perceptions of reliability of such linkage with Russia. Resolution of all these issues requires political attention and support.

Policies—Governments and Their Roles

Perhaps only through intensive government-level dialogues will the economies of Northeast Asia be able to adopt long-term energy policies coordinated with environmental protection goals. The choice of policy instruments by the governments of China, Japan, and South Korea to promote energy security and the strength of political backing are the factors that

will determine the viability of the specific projects. Transmission infrastructure options, diversity of competitive supply options, and the ability of the region's economies to cooperate will eventually define the prospects of a pipeline network in Northeast Asia and, consequently, determine the prospects for developing an "energy community" aimed at energy security and sustainable development in this area.

Obviously, the competing interests of energy producers, national regulations, and also contending energy projects present numerous challenges to the concept of a regional energy community. Competition among the industries, fuels, modes of utilization, and transmission options is natural, considering the interplay of various social, political, and regional factors and industrial interests in a variety of combinations.[15]

On the other hand, mega-projects in the energy sector will obviously create a sizable market for equipment, construction services, materials and labor. It is worth noting that the participants in the envisioned large-scale infrastructure undertakings, both exporters and importers, are not immune to a "project drawing" anticipation. In China, Russia, and Japan, industries, provinces, local authorities, and economic planners lobby for those projects that benefit their constituent domains, promising economic, social, political and other benefits. Naturally, the ongoing discussions, research, and inter-state dialogues create fertile ground for policy guesswork, competing aspirations, and occasionally excitement.

This mosaic of interests and competition should not be left to market forces and vested interests alone. Subregional coordination can play a crucial role in stimulating cooperative and environmentally responsible energy policies in Northeast Asia. Some ongoing shifts deserve international support and encouragement. For example, China plans to build by 2007 a long-distance West-East pipeline for natural gas delivery, linking Tarim Basin with central China. Potentially, this infrastructure could also transport natural gas from the Nadym-Purtazovskiy region in Western Siberia or from Central Asia.[16] Moreover, the Kovykta gas fields near Irkutsk can be connected through a pipeline with China's northeastern provinces that are geographically close to Russia.

Numerous uncertainties described above require governments to play a role in promoting energy projects, which ensure reliable supplies, competitive pricing, and reduced pollution. Government leadership will be indispensable, particularly in attracting and facilitating private sector participation. The Japanese government, for example, possesses powerful economic instruments to promote a cooperative and region-wide approach to energy security by supporting new oil and gas projects. Its involvement was indispensable for the success of LNG projects in Australia, Brunei, Indonesia, Malaysia, Qatar, and the United Arab Emirates. The government also supported the key role of the Mitsubishi and Mitsui groups in energy exploration and development in these countries.

In the context of building a cooperative energy framework in Northeast Asia, institutional instruments should perhaps include channels of official development assistance (ODA), ensuring active support of the energy projects in Eastern Russia and northeastern China by specialized development agencies. Japan's Overseas Economic Cooperation Fund (OFCF), for example, already designates some projects as "environmental" to deal with climate change, acid rain, and other types of pollution. In 1998, ODA loan commitments were made to support 32 such environmental projects. Almost half of the ODA loans to China were directed towards eleven environmental projects. Also, there are "special environmental projects" with favorable loan conditions. In 1998, there were 27 projects of this kind.

Additionally, the government of Japan could exercise stronger authority and leadership in the energy projects located in eastern Japan. For example, the government already maintains half of all emergency oil storage facilities in the north of Honshu and Hokkaido.[17] In addition to this system, an idea of regional buffer oil stock might be explored. The two systems could be operated in parallel, reducing the maintenance costs of the emergency stockpiling facilities and smoothing the effects of price instability. Moreover, such an initiative could become multilateral, involving China and South Korea.

National governments play a very important role in advancing policy dialogue on energy issues and these activities send signals both to the private sector and bureaucracies. Currently, there are several bilateral policy dialogues on energy issues, including Japan-Russia and China-Russia consultations, and similar contacts exist between South Korea and Russia, as well as between the United States and Russia, although only at the subregional level--Far Eastern Russia-West Coast of the United States consultations. Also, the Japan-Russia Intergovernmental Commission has named six "priority projects" for future joint efforts between Japan and the Far Eastern provinces. Seven of these projects are in the energy sector.

Regional groupings also provide a venue for discussion and practical exchanges on this subject. Foremost are the Asia-Pacific Economic Cooperation (APEC) forum and its Energy Working Group. APEC energy ministers at their third meeting in Okinawa on October 9, 1998 endorsed "Recommendations concerning Accelerating Investment in Natural Gas Supplies, Infrastructure, and Trading Networks in the APEC Region" as a special initiative. Northeast Asia, with its relatively unfavorable conditions for private investment and inadequate infrastructure, would benefit from the implementation of these recommendations.

Multinational corporations already demonstrate how investment risks and other problems can be managed in large-scale export-oriented oil and gas projects. Private sector groups also contribute to the multilateral contacts on energy issues as well, albeit informally. A Northeast Asian Gas and Pipeline Forum has grown out of a conference on trans-Asian gas pipeline network held in Tokyo in 1995.

Domestic measures aimed at liberalization and investment promotion are vital. In Russia, steps were taken to permit private, domestic and foreign ownership of natural gas facilities. The production-sharing agreement (PSA) mechanism protects the property rights of private investors and operators. The PSA approval processes are complex, but already well established, transparent, and non-discriminatory. This approach permits capital transfers and does not restrict repatriation of earnings. It provides equal treatment for foreign companies, ensures recovery of and return on investment, and sets out environmental standards.

Energy and the Environment

One of the most striking features of Northeast Asia is the wide diversity among the countries of the region in terms of geography, resource endowments, and the level of economic development. This means that there are substantial differences in the important environmental issues facing each country. For example, Japan has long experienced industrial pollution, deterioration of the quality of urban environment, and environmental and health problems caused by harmful chemicals and other substances. In China, fast economic growth in recent decades is creating serious industrial pollution, and there are also clear signs of deteriorating urban-living environment.

Since about 1990, the international community has recognized global environmental problems, such as acid rain and climate change, as important issues. The effect of global environmental changes on human health and economic development is being felt throughout world. It is equally recognized that no country can solve these issues by itself. International cooperation is clearly in order.

A major challenge ahead for Northeast Asian countries individually and for the subregion as a whole is the adoption and implementation of an energy policy that includes environmental protection as an *integral* part. International pressures, especially since the adoption of the Kyoto Protocol, as well as domestic pressures--concerns over the health effects of air pollution and the economic costs associated with pollution--are combining to influence the development of energy policy in Northeast Asian countries. Basic elements of an energy policy for Northeast Asia, inclusive of environmental protection, should attempt to:

- correct market and policy failures;[18]
- accelerate fuel substitution to cleaner and renewable sources;
- improve energy conservation and efficiency and lower barriers to technology transfer;
- invest in R&D of renewable and cleaner energy and environmental technologies;
- protect and increase natural carbon sinks/forests;
- strengthen the Kyoto Agreement and implementation mechanisms; and,
- promote coordination with China.

Japan and the United States share the goal of promoting energy production and use in ways that reduce environmental burdens. The development of a subregional infrastructure for energy transportation should be related to the issues of climate change and sub-regional environmental degradation. These issues could represent the pillars for U.S.-Japan cooperation in promoting sustainable and efficient energy use in the subregion.

1. Acid Deposition

There has been a steady progress in monitoring acid deposition in East Asia, including Northeast Asia, since 1990 and a framework for international cooperation has been gradually assembled. East Asian countries have been holding intergovernmental meetings since 1993, and they are preparing for a meeting on the Acid Deposition Monitoring Network in Niigata, Japan later this year. This network will become operational by 2001 and will puruse two main objectives. One objective is to provide a common understanding of the state of acid deposition in East Asia. The second objective is to provide information for policy making in the region or order to mitigate and prevent harmful influences of acid deposition on health and the environment. South Korea, China, Russia, and Mongolia will join Japan in the activities supported by this network.

2. Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC), aimed at mitigating global warming, was adopted in 1992. All the Northeast Asian countries are parties to this convention. The Kyoto Protocol to the UNFCCC states that by 2010 developed countries are responsible for reducing greenhouse gases by 5 percent compared to the levels of 1990. This target was adopted at the Third Conference of Parties (COP3) held in Kyoto in December 1997. The Sixth Conference of Parties (COP6) will be held in The Hague in November 2000. This

event is likely to attract significant attention because it is there that the controversial issues of Kyoto Protocol implementation mechanisms--emissions trading, joint implementation, clean development mechanism, etc.--will be discussed.

Although the developing economies are likely to be at the center of coordination efforts regarding energy use and environmental preservation, currently it is the advanced OECD countries, including the United States and Japan, that are among the largest carbon dioxide (CO_2) emitters. By 2010, under the Kyoto Protocol, Japan and the United States will be responsible for reducing their greenhouses by 6 percent and 7 percent, respectively, compared with the 1990 levels. Currently, emissions by both countries far exceed the target levels.

Also, to achieve the Kyoto Protocol targets and reduce greenhouse gas emissions under the Kyoto framework, both the United States and Japan need to utilize such mechanisms as emission trading, clean development, and joint implementation. It is only natural that Japan and the United States cooperate and strengthen relations with China and Russia in joint energy-environment efforts aimed at stabilizing climate change. In terms of emission trading and joint implementation, both China and Russia are attractive partners. For the utilization of a clean development mechanism, China has special significance, because it is expected to drastically increase carbon dioxide emissions in the next two decades.

3. Venues for Multilateral Dialogue

As far as environmental issues in Northeast Asia are concerned, the Group of Eight (G8) framework is the most prominent body that involves participation of Japan, the United States, and Russia. The G8 Okinawa Summit's Communiqué referred to the issues of climate change, preservation of forests, renewable energy use, and export credit policies that incorporate environmental considerations. At the summit a decision was made to establish a Task Force to prepare recommendations on measures to support developing countries in promoting renewable energy use and reconciling development and environmental protection. Regarding export credit policy, it was decided to prepare agreed environment guidelines by the next meeting of the G8 leaders.

There are several other international frameworks that provide an opportunity for the United States and Japan to discuss energy-environment issues. One such forum is *the Northeast Asia Conference on Environmental Cooperation*. This conference focuses on methods of environmental cooperation of Northeast Asia, development of the policy dialogue, and information exchange. This conference has been convened every year since 1992 involving Japan, China, South Korea, Russia, and Mongolia.

The Tripartite Environment Ministers Meeting (TEMM), including Japan, China, and South Korea also aims at the promotion of information exchange on environmental issues in Northeast Asia and global environmental issues. The first TEMM meeting was held in South Korea in 1999, and the second in China in 2000. At the second meeting it was decided to form and promote a TEMM project regarding raising environmental consciousness on such issues as fresh water pollution prevention, land-based marine pollution prevention, and cooperation in environmental industry.

Another forum of relevance here is the *Ministerial Conference on Environment and Development in Asia and the Pacific*, which is held to follow up the discussion in the United Nations Conference on Environment and Development (UNCED) held in 1992 but focused on Northeast Asia. Meeting almost about every year since 1993, the participating countries have

discussed such issues as the development of an environmental cooperation framework in Northeast Asia, reduction of air pollution from coal-fired power plants, and strengthening of environmental monitoring. This year's conference is to review the state of implementation of the "Agenda 21" in the Asia-Pacific region and to discuss prospects for reconciliation between environment and development in the region.

The Environment Congress for Asia and the Pacific (ECOASIA) was set up in 1991 to promote discussion of environmental issues in the region at the ministerial level. Representatives from Japan, South Korea, China, and Mongolia meet annually and discuss problems of sustainable development in Northeast Asia and climate change.

The Asia-Pacific Seminar on Climate Change also aims at information exchange and discussion on climate change in the context of the Asia-Pacific region. This seminar has been held annually since 1991 with participation from Japan, China and Mongolia. This seminar is linked with the Environment Congress for Asia and the Pacific and the Ministerial Conference on Environment and Development in Asia and the Pacific.

Vital Japan-U.S. Coordination

In the field of energy use and sustainable development many problems need to be addressed at the governmental level, including review of national energy policies, building of political confidence, establishment of an institutional framework for cooperation, and launching of intergovernmental coordination. An important issue also will be how to balance public and private sector interests. Japan-U.S. coordination is vital for the successful resolution of these and other problems that currently prevent a balanced development of energy and environment policies in Northeast Asia. Unfortunately, however, the potentially very important role of bilateral government-level dialogue on energy issues in Northeast Asia has been somewhat overlooked in the current discussion of the energy and environmental situation in the region.

Japan and the United States share common as well as complementary needs and capabilities, which should encourage bilateral coordination in this area. First, coordination is needed for the promotion of their own energy security. Together, Japan and the United States use 32 percent of the world's primary energy. Japan's dependence on imported energy is 82 percent, while the United States' dependence is 50 percent. World competition for energy will intensify, affecting their interests as the world's leading consumers and importers of energy. The two countries' policies are aimed at diversification of energy supplies, and large-scale energy projects in Northeast Asia will serve Japanese and American interests, providing additional reserves of oil and gas imports and enhancing competition among the exporters.

Secondly, Japan-U.S. coordination in the field of energy resource development in Northeast Asia enhances regional stability, providing, at the same time, greater opportunities for China, the Koreas, Mongolia, and Russia to cooperate on economic development, energy security, and cross-border environmental issues. It will benefit South Korea, a major energy importer, an ally of the United States, and also a major economic partner of Japan.

Thirdly, the long-term strategies of Japan and the United States call for an environmentally less damaging energy usage. To meet the challenges of coordinating and reconciling energy-environmental policies in Northeast Asia, the business community, international organizations, public interest groups, and other players must be involved. In the Northeast Asian context, the primary emphasis should be on developing an optimal mechanism

for linking global, regional, national, and sub-national actors in the development of cooperative policies for promoting cleaner energy production and use.

Finally, it is widely believed that Japan and the United States will play the role of "strategic investors." Major U.S. companies already participate in the Sakhalin projects mentioned above and in feasibility studies for pipeline construction between Sakhalin and Japan and China. Japan and the United States share strong interests in supporting their private companies' participation in large-scale energy projects. Russia, in particular, offers many potentials for American and Japanese companies in terms of sales of equipment and investment. Energy projects in Russia will also expand markets for energy resources, equipment, and machinery in China.

There are, however, some considerable differences between Japan and the United States. First, the energy strategy of the United States and its international posture are reinforced by large U.S.-based energy corporations that play a key role in projects all over the world, where the international role of Japanese energy companies is quite limited. Secondly, the United States provides political leadership in the prevention of energy supply disruptions. The United States' regional military presence and global security role dwarfs Japan's limited hardware capabilities and policy tasks. Thirdly, unlike the United States, Japan has no significant domestic sources of oil and gas. Although Japan is geographically close to energy resources in eastern Russia, U.S. private companies play the leading role in projects such as those in Sakhalin.

Japan-U.S. government-level cooperation (or coordination) on energy issues is currently limited to only a few areas, including the following:

- Japan-U.S. Science and Technology Agreement (signed in 1988);
- Common Agenda for Cooperation in Global Perspective (since 1993);
- Environmental and energy-efficient technologies;
- Climate change; and,
- Research and development

Japan and the United States cooperate in multilateral bodies and policy forums, including the G7/G8 Summits, G8 Energy Ministerial Meeting, the World Bank, the Asian Development Bank, OECD, and APEC and APEC Energy Ministers meetings. The two countries also participate in security and safety frameworks in the field of nuclear energy such as the International Atomic Energy Agency (IAEA), and the Korean Peninsula Energy Development Organization (KEDO). They both belong to climate change stabilization mechanisms, including the UN Framework Convention on Climate Change, the Kyoto Protocol, and the Intergovernmental Panel on Climate Change. The problem here is that multilateral forums provide opportunities to discuss energy issues in broad terms only. More specific and concrete energy issues in the context of Northeast Asia attract greater attention in Japan than they do in the United States.

Conclusion--Towards an "Energy Community" in Northeast Asia

The countries of Northeast Asia clearly have an opportunity to create a subregional policy framework on energy issues. A region-wide energy initiative should assist other policies and must be driven by a competent regional body to keep the focus on long-range issues and promote common interests. This subregional body should sponsor a subregional pipeline network in combination with other complementary projects. A region-wide energy infrastructure

should be seen as something more than simply a cross-border and trans-regional transportation facility. It should be viewed rather as a foundation of coordinated interests and cooperative efforts. Such an infrastructure is to serve the public good in Northeast Asia, encouraging cleaner energy policies within the entire area.

A consultative mechanism on energy issues should also facilitate the formation of legal and regulatory frameworks and fiscal regimes that can reduce investment risks. Pricing mechanisms must be efficient and free from government intervention and tax distortion. In order to deal with these impediments, the Northeast Asian countries must establish stable and transparent regulatory regimes. In the longer term, all countries of the subregion should support the free flow of natural gas and natural gas-related products and services such as electric power. This means that policies governing the electricity sector should not be designed to inhibit the ability of natural gas to compete with coal and nuclear power.

The question is how to promote such a multifaceted concept of energy cooperation. Obviously, broad cooperation on energy issues, not only specific projects, requires a conceptual framework. Japan's basic energy policy goal is the simultaneous attainment of the 3Es--energy security, economic growth, and environmental sustainability. This approach is fully compatible with the OECD principles and closely mirrors the policy of the United States. A similar concept can be promoted and adopted by the economies of Northeast Asia. Future institutional options will be much easier to consider with such a concept in place. It is desirable that the states of the subregion approach the problem of energy resources development and utilization in a joint, coordinated manner, including long-term effort for an assessment of their national energy policies. The central challenge is how to connect financial, technical, and organizational capabilities of the private sector in the pursuit of sustainable development.

Inter-governmental cooperation is vital for encouraging private participation in building a cross-border energy infrastructure. Also, extensive multilateral collaboration is indispensable for improving energy efficiency and promoting environmental protection. Japan and the United States possess economic, political, and intellectual capabilities to facilitate the introduction of such a framework and house institutions committed to environmental protection. International organizations and regional forums, the Asian Development Bank, the European Bank for Reconstruction and Development, APEC and the envisioned Northeast Asia Development Bank, could also play a role. Close attention must be paid to local interests and “win-win” strategies in energy use adopted. A region-wide “energy picture” is needed to identify complementary options in pursuit of cleaner energy and sustainable development. A comprehensive “track-two” type effort may be needed to contribute to the ongoing discussions, involving targets and principles of cooperation in the field of energy-environmental governance.

[1] In 1995, energy-related CO_2 emissions for the US (carbon content of the CO_2 only) were estimated at 5,469 (1,510) million metric tons, for China – 3,192 (777) million metric tons, for Russia – 1,818 (457) million metric tons, Japan – 1,127 (345) million metric tons, South Korea – 374 (105) million metric tons, and North Korea – 257 (estimated at 75) million metric tons. See 1988 *World Development Indicators* (Washington, D.C.: World Bank, 1998), pp. 146-148, *World Economic and Social Survey*, *1997: Trends and Policies in the World Economy* (New York: United Nations, 1997), pp. 201-202.

[2] For the same amount of caloric units coal produces almost twice as much CO_2 compared with natural gas and approximately 25 percent more CO_2 compared with oil.

[3] *1988 World Development Indicators* (Washington, DC: World Bank, 1998), p. 145. See also Ministry of International Trade and Industry, *Energy in Japan*, <http://www.miti.go.jp/intro-e/>.

[4] Projections of China's GDP and corresponding forecasts for energy consumption, production, and imports differ significantly. The IEA views China's energy supplies as roughly doubling between 2000 and 2020 (*World Energy Outlook 1998)*, p. 297. The assumption made by the authors of the World Bank's *China 2020* report is that at an average annual growth rate of 4.5 percent, total energy consumption will triple over the next twenty-five years (*China 2020,* (World Bank: Washington, DC, 1997), p. 75. On the other hand, the Energy Information Administration, a part of the US Department of Energy, projects China's energy consumption to triple by 2020 under the "high growth" scenario. See *International Energy Outlook 1998. With Projections Through 2020* (Washington, DC: Energy Information Administration, 1998).

[5] See *World Energy Outlook 1998* (IEA/OECD: Paris, 1998), p. 293, and Energy Information Administration, *Annual Energy Outlook 1999, With Projections to 2020* (Washington, DC: Energy Information Administration, 1998), p. 139.

[6] See *Japan National Oil Corporation 1999* (Tokyo: Ministry of International Trade and Industry, 1999).

[7] A list of natural gas projects (with modifications) includes the following options: Sakhalin—PNG—domestic market; Sakhalin—LNG—overseas markets; Sakhalin—PNG—Japan; Sakhalin—PNG—domestic market—China (the Koreas); Irkutsk—PNG—Mongolia—China—South Korea—Japan; Irkutsk—PNG—Mongolia—China; Irkutsk—PNG—domestic market—China's northeast; Yakutia—PNG—domestic market—the Koreas; Yakutia—PNG—domestic market—China; Yakutia—PNG— Irkutsk—China (via Mongolia or Far East).

[8] See Amy Meyers Jaffe and Robert A. Manning, "The Shocks of a World of Cheap Oil," *Foreign Affairs*, January/February 2000, pp. 16-29.

[9] As Hisashi Owada noted, "nuclear energy itself can be a security concern with regard to 1) safety of the reactor; 2) non-proliferation; and 3) management of nuclear waste." See Hisashi Owada, "Security in Asia and Stability of Energy Supply," in Symposium on Pacific Energy Cooperation 2000, *Energy Security in Asia*, Papers, February 15-16, 2000, Tokyo, 2. The Tokaimura accident added new concerns and further contributed to declining public trust. Delay in consensus building and the problem of siting also lead to delays in some new projects such as the Maki nuclear power plant. There is also the issue of storage capacity to handle the politically difficult waste-disposal problem.

[10] *Natural Gas Market Study*, Sakhalin Energy/Marketing Service Providers, December 1996.

[11] See Hyun-Bum Sunwoo, "LNG Market in Korea: Policy Options and Future Perspectives," "Security in Asia and Stability of Energy Supply," in Symposium on Pacific Energy Cooperation 2000, *Energy Security in Asia*, Papers, February 15-16, 2000, Tokyo, 66.

[12] *Natural Gas Market Study*, Sakhalin Energy/Marketing Service Providers, December 1996.

[13] See *Studies on Long-term Energy Development Strategies of China* (Beijing: State Development Planning Commission, 1999).

[14] Richard Rhodes and Denis Beller, "The Need for Nuclear Power," *Foreign Affairs*, January/February 2000, pp. 30-44.

[15] This competition may encompass the following combinations: LNG *vs.* oil and coal; LNG *vs.* nuclear; natural gas pipelines *vs.* LNG, oil, and coal; natural gas *vs.* oil as a fuel for the auto industry; natural gas *vs.* oil in households; natural gas *vs.* electric power in households; HEP *vs.* natural gas; and HEP *and* natural gas *vs.* nuclear power generation.

[16] It is important to note that the trans-China pipeline project is seen in the context of a larger socio-economic development plan for Western China.

[17] In total, emergency stockpiles of oil are sufficient for 85 days. Private sector oil stockpiling is for 79 days of consumption.

[18] By integrating pollution costs into national accounts, strengthening pollution control regulation and enforcement, phasing out fossil fuel subsidies, providing economic incentives for cleaner energy, energy efficiency and conservation