

The Third International Workshop on Energy Security and Sustainable Development in Northeast Asia: Prospects for Cooperative Policies

Vladimir I. Ivanov, Senior Researcher, Research Division, ERINA

On September 17-19, 2002, an international workshop¹ co-organized by the Economic Research Institute for Northeast Asia (ERINA) with the Administration of Khabarovskiy Krai, the Khabarovsk-based Economic Research Institute of the Russian Academy of Sciences (ERI), the Korean Energy Economics Institute (KEEI) and the Northeast Asia Economic Forum (NEAEF) was held in Khabarovsk in Far Eastern Russia. Participants from China, the Democratic People's Republic of Korea, Japan, Mongolia, the Republic of Korea, the United States and such international organizations as APEC's Asia-Pacific Energy Research Center, the United Nations' ESCAP and the Northeast Asia Gas & Pipeline Forum took part in the meeting, along with members of ERINA and Russian participants.² A number of observers from the local government, research institutions, diplomatic missions and business groups also attended the workshop.

During the opening session chaired by Alexander B. LEVINTAL, Vice-Governor of Khabarovskiy Krai, brief welcome remarks were made by the Chair and the co-organizers of the workshop, beginning with Hisao KANAMORI, Chairman of the Board of Trustees of ERINA, who welcomed the participants and expressed his hopes for the final workshop of the series, commenting that the content of discussions has become increasingly substantial. Sang-Gon LEE, President of KEEI, Lee-Jay CHO, Chairman of Northeast Asia Economic Forum and Pavel A. MINAKIR, Director of ERI also addressed the gathering, reiterating the need to transform the region's energy supply system into an efficient, flexible environmentally friendly one that can help manage energy supply disruptions and price instability, at the same time as addressing environmental concerns. Professor LEE emphasized that, given the abundance of environmentally friendly natural gas and hydropower reserves in the region, the answer lies in collective efforts in the field of regional energy cooperation.

About the project

This project, undertaken by ERINA in cooperation with experts from the United States and participants from Northeast Asia, aims to identify viable policies and highlight both the urgent need for and the benefits of cooperation in the energy-environment realm.

What is needed is a vision for a cooperative framework and policy coordination that encompasses the energy-development-environment triad. Participating institutions and experts will propose a shared vision for and approaches to reconciling energy use and environmental protection, where the economies of the subregion today operate independently. In addition to the matter of energy use, a further project objective is to assess the prospects for a cooperative approach to energy security, outlining an institutional framework that could reduce the vulnerability arising from the region's dependence on energy imports.

The ultimate goal is to lift the "strategic sights" of governments and the public above the limits of national policies and prepare a path for them through the complexities of specific cross-border projects, which have a role to play as efficient tools of economic development, a means of providing a stable, cost-effective energy supply, and cohesive confidence-building devices.

The main conceptual pillar of the project is the expectation that the vital interests of the economies of the subregion overlap. All players are motivated by the desire for greater energy security, development and prosperity, political stability and environmental safety, and the belief that this could constitute a framework for both cooperative engagement and multilateral, cross-border solutions in the energy sector.

The technologies, engineering skills and managerial experience critical to the success of advanced energy ventures are also available, but have rarely been applied in this area in a bilateral or multilateral format. The exceptions are limited to the Sakhalin oil and gas projects and the Korean Peninsula Energy Development Organization (KEDO), which recently came under question.

This subregion is also unique to the world of energy because it has a low gas penetration rate, while transportation and distribution infrastructure is either limited or has yet to be assembled. It is assumed that imports via a pipeline would promote diversification in modes of transportation, allowing gas-to-gas competition

¹ At the meeting in Khabarovsk, the project participants focused their attention on Russia, and policies and developments in the energy sectors of its neighbors, as well as other issues related to sustainable development and regional economic cooperation in Northeast Asia.

The first workshop of the project, which focused on China, was held in June 2001, in Tainai, Niigata (**ERINA Report** no. 41, August 2001, pp. 44-51). It served as a follow-up to an earlier ERINA effort to study prospects for regional cooperation in the energy sector. At that workshop, held in December 1999 with the support of the Japan Foundation, the focus was on Japan-Russia relations, as well as energy-related interests and policies. The second workshop, which focused on the Korean Peninsula, took place on March 28-30, 2002 in Seoul, Republic of Korea and was co-hosted by KEEI. Reports are available online at <http://www.erina.or.jp/publication/Energy.htm>

² See the list of workshop participants and their affiliation at the end of this overview.

and eventually an expansion in the use of gas. Various options for cross-border gas pipelines are under discussion. The problem is that the price tag of these projects is very high, improvements in the investment climate are still inadequate, and markets are neither easily accessible nor sufficiently secure to justify huge investments. Moreover, many of these cross-border projects require multilateral financing and concerted implementation efforts. The worst aspect, however, is the lack of long-term, comprehensive strategies that could enable partnership, both in negotiations and in the implementation of the projects.

All these factors make the economies of the Northeast Asian subregion a unique case study for observing both the domestic economic and political hurdles, and the external obstacles impeding cross-border cooperation in the energy sector. The various obstacles and sources of uncertainty are wide-ranging and have yet to be fully accounted for and analyzed. Nevertheless, they amplify the necessity of working together to obtain the economic and political benefits of cooperation.

Keynote addresses were delivered by Ambassador Takehiro TOGO, Counselor to MITSUI & Co. LTD (Japanese language summary included in this issue), Robert MANNING, Senior Counselor for Energy, Technology and Science of the Department of State, as well as Evgeniy N. GALICHANIN, who represented the Committee on Energy, Transport and Communications of the State Duma of the Russian Federal Assembly.

Ambassador TOGO touched upon the changing geopolitical situation in Northeast Asia in the context of energy security. For decades, Russia has been supplying gas to countries in Europe via pipelines and has forged a status for itself as a partner that can be trusted. Moreover, the political and economic stability of recent years is intensifying a sense of trust and anticipation vis-a-vis Russia on the part of neighboring countries and gas customers in Northeast Asia. A cooperative framework in the field of energy in this subregion requires many difficulties to be overcome and a considerable record of achievement to be built up at the private sector level. In this context, the development and supply of natural gas through the promotion of the Sakhalin II project is of the utmost significance.

This project is based on the first ever production-sharing agreement enacted in Russia and both investors and the governments of the Russian Federation and Sakhalinskaya Oblast have cooperated in various ways in implementing this project, for example, by revising twelve laws relating to production-sharing agreements. More broadly, however, cooperation that embraces energy issues has the potential to become a vehicle for greater regional cohesion on a hitherto unprecedented scale.

Robert MANNING emphasized that historically, energy has been the focus of conflict and competition, but current trends seem to indicate that it is increasingly becoming an integrative force, both regionally and globally. Most of the major players have a much greater stake in moving in the direction of cooperation rather than competition. In recent years, U.S. and European oil companies have become more

involved in Russia and Russian oil companies with a global reach have also emerged. Natural gas will grow in importance, especially in Asia, and will be a huge factor in the burgeoning of Eastern Russia's energy development. This will be the next step in Russia's evolution as an energy producer and should be seen as a part of a broader change in the world of energy.

In the past quarter of a century, Asia has driven world energy markets. Although natural gas consumption in Asia has been growing rapidly, it is still substantially below the OECD average of about 24% (about 8% in Asia). Thus there is a fair amount of scope for expansion, with the environmental aspect proving to be a very important factor. In the near-term, there will be increasing moves towards natural gas, and investment in cleaner coal and next-generation energy technologies will be required. There is a great deal of uncertainty regarding global warming, in terms of how much can be attributed to natural variation and how much to human behavior. However, the goal of stabilizing emissions will not be reached by 2012 as specified under the terms of the Kyoto Protocol. In the near term, the one available non-carbon source of energy is nuclear power, but while safety in the nuclear industry has improved dramatically, spent fuel is still a major problem. In Northeast Asia, Japan, Taiwan and South Korea are all facing the problem of what to do with their nuclear waste; Russia has passed a law on commercial handling of nuclear waste and this ought to be explored as a vehicle for regional cooperation.

Evgeniy N. GALICHANIN provided an overview of state policy in the energy sector, its legal underpinnings and projects to be implemented in the near future in Eastern Siberia and the Far Eastern region, including the long-term strategy for the development of the energy sector, federal legislation - both that already enacted and that still in the pipeline - relevant to the energy sector, and the current status of the electric power industry as the most important part of the Russian fuels and energy complex.

The new approach towards energy sector management in Russia has been encapsulated in the framework called "Russia's Energy Sector: Towards Sustainable Development Through State-Civil Society Cooperation". The framework incorporates prevailing trends in energy sector development, including the expansion of energy-saving technologies, reduced environmental impacts of energy use, shifts in the fuel mix and new approaches to the management of resources. It also accounts for broader economic developments, including those affecting Russia, such as energy exports and energy markets. Due attention has been paid to growing energy consumption on the part of Asian economies, including China, India, Japan and South Korea, and the potential role of the Far Eastern region and Siberia as energy exporting regions.

The energy sector management framework defines prospects for the sustainable development of the Russian energy sector for the next five decades, balancing public and civil interests, economic development and improved quality of life, inter-generational justice in accessing resources and environmental conservation.

Short-term priority issues to be dealt with in 2000-2003 include the enforcement of legal and economic

mechanisms in the energy sector that will allow the improvement of the investment climate. New methodology and legal requirements concerning the sustainable energy sector can then be formulated.

The list of mid-term problems to be attended to in 2004-2010 includes the development of new energy infrastructure, support for structural adjustment, completion of groundwork on long-term development programs and projects, and their early implementation in the regions of Russia within an integrated, nationwide energy sector management program.

The long-term goals for 2011-2020 and beyond include the transition towards a new energy sector in Russia, adopting advanced energy efficiency and environmental standards and creating basic conditions to ensure harmony in the "energy-development-environment-society" quadrangle.

Vladimir A. POPOV, Vice-Governor of Khabarovskiy Krai, delivered a report on regional and local energy needs. He emphasized that the energy sector is the key to the economic and social development of every province in the Far Eastern region, considering both climatic conditions and the 26% share occupied by the fuel and power complex in the regional economy. Over the last three years, primary energy production has increased by 6%, while the demand for electricity grew by 11%. In March 2002, in collaboration with the provinces of the Far Eastern region, the federal government launched a comprehensive program aimed at the economic and social development of the region's eleven provinces up to the year 2010. Energy sector development is by far the most important part of this plan, which pursues two main goals: enhanced energy security and energy self-sufficiency for the entire region and the development of export-oriented cross-border energy links with neighboring economies.

It is important to note that, by 2010, the production of oil, natural gas and coal will significantly overtake domestic demand and large-scale energy exports will constitute a very important field for cooperation with the economies of Asia-Pacific region, and the Northeast Asian subregion in particular. Moreover, the share of clean hydroelectric power in total electricity production will rise to 36%. In 2010, the share of natural gas in power and heat generation will double compared with 2000, reaching 24%. However, implementation of these plans will require considerable investment, estimated at about US\$1 billion a year, necessitating the nurturing of an investment climate that encourages both domestic and overseas investors.

Moreover, promoting cross-border energy links would require the opening and liberalization of energy markets, particularly in the power sector. Russia is also interested in exploring opportunities for the joint implementation of large-scale energy projects within the Kyoto Protocol framework, including gas pipelines and wider reliance on natural gas, the modernization of coal-fired power plants and the expansion of hydroelectric power generation. An institutional framework for energy cooperation in Northeast Asia could assist the implementation of these plans.

Susumu YOSHIDA, Director General of ERINA added to this, pointing out that Russia is rich in natural resources and is conveniently located near such potential users of

these resources as Japan, South Korea and China. However, the acknowledgement of these facts has yet to be followed by concrete action. The situation in Northeast Asia is improving, including the stabilisation of the domestic political situation in Russia under the leadership of Vladimir Putin. Russia maintains good relationships with the United States, China, the newly-independent states of the CIS and other countries. Its economy has also improved since the 1998 crisis and is projected to grow at 5% annually until 2010. Naturally, economic growth leads to increased demand for energy. At the same time, Russia is enhancing its presence in world energy markets, expanding its oil exports. Several export-oriented oil pipeline projects are in the implementation or planning stage, including an oil pipeline from Eastern Siberia to China. Offshore oil production has begun on Sakhalin and new projects are taking shape, in addition to Sakhalin I and II. Russia could potentially export electricity to China and the Korean Peninsula.

Japan is also keenly interested in gaining access to the energy resources of the Far Eastern region. In cooperation with Japan, Russia has successfully developed coal reserves in Yakutia, as well as oil and natural gas fields in Sakhalin, although such mega-projects as the Western Siberia-Pacific cost pipeline project have yet to be realised. In the 1990s, Japan supported feasibility studies on three gas pipelines and a hydropower station. In general, there are many opportunities for the development of energy resources in Eastern Russia and the establishment of mutually beneficial energy trade links with the economies of Northeast Asia. Russia is trying very hard to establish framework conditions for export-oriented projects. However, the practical implementation of these projects requires considerable time, in addition to the participation of neighbouring economies.

In his report, which focused on international organisations, the Kyoto Protocol and Northeast Asia, Yonghun JUNG, of the Asia Pacific Energy Research Center (APEREC), indicated that the issue of sustainable development is serious to the extent that regional economies are interlinked in terms of both economic development and environmental conservation. As globalization advances, mutual dependence among Northeast Asian economies will increase in various areas, including trade, investment and the environment. Many issues will require collective and concerted efforts by the region's component countries if they are to be resolved with less economic cost and political friction.

Unlike in ASEAN, Europe, or North America, the economies of the Northeast Asian economic subregion have neither a multilateral regional agreement for cooperation, nor an established common market or even intensive cross-border energy links. Northeast Asia lags well behind in regional energy cooperation because of the lack of initiatives among these economies and there is no active involvement by international organizations as a pathfinder for and supporter of regional energy development.

The need for energy-environment cooperation seems to be urgent. Since energy consumption is forecast to rise steadily for the next twenty years, it is not inconceivable

that in the near future, some cities, particularly those in China, may suffer an environmental and ecological disaster that will take a heavy toll, both on health and economic growth. Moreover, the failure to contain local air pollution will result in the migration of pollutants seriously damaging the environmental quality of neighboring economies. This implies that timely efforts to improve local air quality need attention now rather than later, because it can be extremely costly to restore certain ecological environments once damaged, assuming that they are not already in an irrecoverable state.

However, the global environment is still a remote issue as far as most people are concerned, because they do not directly feel the impact of damage to it and causality is often hard to prove. Furthermore, the lack of understanding the "common tragedy" aspect of global atmospheric pollution actually encourages local inaction. For the time being, the improvement of local air quality is likely to be the main impetus for mitigating greenhouse gases until the Kyoto Protocol enters into force and reaches the implementation stage.

Shagdar ENKHBAYAR, Visiting Researcher at ERINA, indicated that recent developments in the ratification process of the Kyoto Protocol have fuelled hopes that it will enter into force shortly. More than 90 countries have ratified or acceded to the Protocol, encompassing countries that were responsible for 37.1% of industrialized countries' emissions in 1990. The recent announcement by Russia that it will ratify the Protocol virtually makes it operational.

It is believed that both developed and developing countries will benefit from the Kyoto Protocol mechanisms, as they enable developed nations to mitigate the costs of compliance with their greenhouse gas reduction commitments and, at the same time, allow developing countries to acquire funds for clean development projects. Northeast Asia has an ample opportunity to benefit from the Kyoto mechanisms as, firstly, it consists of both Annex I and Non-Annex I countries. China, Japan, and Mongolia are already parties to the Kyoto Protocol, so the mechanisms can be implemented in a subregional framework. Secondly, as a major industrialized nation, Japan faces immense challenges in meeting its Kyoto targets. At the same time, the industrial structure and technology in some economies of the region are still dominated by inefficient, wasteful and polluting technologies, and energy intensive machinery and equipment. Therefore, there is presumably a close match of "demand and supply" for the Kyoto mechanisms in the subregion. Thirdly, inefficiency in resource use and over-reliance on coal for power generation, as well as excessive agricultural development and forestry exploitation are considered to be the major causes of environmental degradation. Accordingly, Northeast Asian countries must actively take comprehensive measures to reduce their energy-related greenhouse gas emissions.

In order to address the aforementioned issues, joint projects should be initiated on (1) CDM/JI capacity building and (2) launching a web-based eco-industry network. The objective of the latter is to facilitate project initiatives, promote the expansion of the international market for environmental goods and services through

enhanced trade in eco-products and services, and contribute to the nurturing of domestic environmental industries through the transfer of clean technologies and best practices in different industrial sectors.

Jianyi HU, Executive Vice President of the Asia Gas and Pipeline Cooperation Research Center of China spoke about natural gas in China and Northeast Asia, and stated that in the coming 10 years, gas demand in Northeast Asia is anticipated to grow at a rate of over 10%, from a level of 130 Bcm in 2000, increasing to 260 Bcm in 2010 and reaching 460 Bcm by 2020. In China, gas demand is expected to increase from 30 Bcm in 2001 to 110 Bcm in 2010. It is projected that a gas trunkline network connecting major cities in China will be completed by 2020, with annual gas consumption reaching up to 200 Bcm. By that time, the construction of a gas pipeline network in Northeast Asia may have been completed, forming what could be the third-largest regional gas pipeline network after those in Europe and North America. The first step for developing a gas pipeline system in Northeast Asia is to explore and establish the mechanism and regulations for gas cooperation. This can be realized by establishing an intergovernmental committee that would incorporate non-governmental organizations, in addition to various bilateral dialogues. A formal mechanism and set of regulations for cooperation in the oil and gas sectors will accelerate the economic integration process in Northeast Asia.

The next speaker, Joonbeom LEE of the Korea National Oil Corporation discussed the problem of oil security for Northeast Asia. More people have begun recognize the fragile nature of the energy security framework in Northeast Asia and a need for building closer relations in the field of energy. Oil occupies center stage in energy security policies and reliable access to sources of oil supply is a strategic imperative for oil-importing economies. In establishing an emergency oil system and agreeing collectively to respond to supply disruption, oil-consuming countries have taken a step towards energy security cooperation. In summary, energy security policies have progressed toward greater cooperation rather than self-sufficiency and autarchy.

Northeast Asia's role in the global oil trade is very important, accounting for more than one-fifth of crude oil and oil product imports. On the other hand, Northeast Asia is extremely dependent on oil from the Middle East. Behind only Japan and Korea in terms of oil dependence on the Middle East, China is expected to increase this region's share in its oil imports to between 70% and 80% by 2010. Severe political tension in the Middle Eastern region, leading to a decrease in oil production, would inevitably have an impact on the oil supply to Northeast Asia. The rapid rise in dependence on the Middle East in Northeast Asia is quite in contrast to the situation in the U.S. and Europe, which have much lower dependence levels than those of Northeast Asia countries.

In addition to the limited diversification of oil sources, the economies of Northeast Asia are charged an unfair price for oil, paying more than the United States and Europe do. This price difference, known as the 'East Asia Premium', varies, but in the 1990s Saudi Arabia charged

Asian buyers \$0.83/bbl on average more than European buyers and \$0.93/bbl on average more than U.S. buyers. In addition, the heavy reliance on Middle Eastern oil brings the safety of oil shipments into question, given the terrorist attack on the United States in September 2001. That attack and recent terrorist activity in Southeast Asia increase concerns that sea lanes in the region may be endangered. The Shanghai APEC summit (2001) declared that member economies should enhance counterterrorism cooperation in responding to threats of energy supply disruption. The best method of reinforcing oil security in Northeast Asia is to use alternative oil supply sources.

Ying CHEN of China's Research Institute of Petroleum Exploration and Development said that the high dependence of the three countries on oil from the Middle East, including the potential security threat to the sea-lanes, made oil supply security a particularly crucial issue. Since China became a net oil importing country in 1993, oil imports have increased rapidly, from 60 million tons in 2000 to 70 million tons in 2001. It is predicted that by 2005 and 2010, the shortfall could reach 100 million tons, boosting import dependence to 38%.

According to the available data, South Korea has been involved in 95 overseas oil exploration and development projects in 36 countries and has obtained oil reserves of 120 million tons, allowing the production of 2 million tons of oil per year. In addition, the ROK's gas industry has experienced significant development with the most comprehensive, best-developed gas pipeline network in the whole of the Northeast Asian subregion. This will undoubtedly promote the diversification of gas supply sources, enhancing the reliability of the energy supply.

Susumu ABE, Advisor to Toshiba Corporation and its former vice-president, discussed the problems of energy efficiency and new technologies. One of the most important messages of his presentation was that a technology strategy for reducing greenhouse gas emissions must be devised today, but should focus simultaneously on both the short-term and long-term goals. The expansion of energy supply is important for meeting future global demand, but energy efficiency improvements will also play a crucial role. Greater efficiency enables the available supply to last longer, helping to lower pollution. Technological development has lowered the cost of producing energy-efficient products. In numerous end-use applications, including computers, home appliances, vehicles, manufacturing equipment, and office machines, efficiency has improved dramatically. Additional advances are possible as a result of expanded R&D efforts and the proliferation of new technologies. Governments have an important role to play, often in cooperation with the private sector, in removing barriers to the deployment of clean and efficient energy technologies.

The energy-environment dilemma appears to be particularly important in Northeast Asia, where energy consumption continues to increase rapidly, reliance on coal remains high and fossil fuel imports from distant sources are growing. Moreover, there is growing recognition that the ability of an individual country to deal with these issues is limited; therefore, regional cooperative approaches are required. In this regard, it is important to start with

cooperative recognition of the need to aim for simultaneous achievement of the 3E's as the long-term policy goal. If this goal is promoted, it will be necessary to clarify the role of each nation (or market) in such realms as responses to emergencies, the diversification of supply, infrastructure construction, efficient energy use and the environment.

Currently, natural gas is coming to the forefront as an alternative to oil and coal, and an international gas pipeline network could be essential infrastructure for sustainable development in Northeast Asia in the 21st century, strengthening socio-economic ties and contributing to energy security. The conversion of existing coal-fired power plants to running on natural gas could significantly increase the efficiency of power generation and reduce carbon emissions. The simplest approach is re-powering, where the existing power plant site is reused; this, however, requires significant capital investment. A more conventional approach to re-powering includes new gas turbines and heat recovery system generators used with existing turbines and other equipment. Because of the equipment's age and the steam turbines being designed for linkage to a coal-fired boiler, this approach results in lower efficiency and higher operating costs, but requires less investment. A gas turbine can also be coupled to the existing coal boiler, with 80% of the coal firing being maintained. Such an approach could reduce CO₂ emissions by 35% to 40% with only minor dislocation.

In addition, developing, adopting and disseminating energy-saving technologies and promoting higher energy efficiency standards would improve energy security in Northeast Asia. In economic terms, Northeast Asia is no longer merely a geographic region; it is an important part of the world economy. The future economic development of this subregion has to coexist with and contribute to the sustainable development of the world economy. As of today, we can anticipate that the increase in subregional energy production will not keep pace with rising demand, making the region increasingly dependent on imported energy, especially imports from the Middle East. In this regard, the dual goal of achieving energy security and finding solutions to environmental problems must be pursued.

Keiji TAKIMOTO of the research arm of Osaka Gas made a presentation on the heat-based gas engine co-generation system for households. Household gas engine co-generation is an innovative system that reduces household energy consumption by eliminating the losses suffered by existing systems. To be more specific, in addition to generating electricity using a gas-powered engine installed in the customer's home, it can utilize energy more efficiently by using excess heat generated in the process in the household heating system and to heat water. The electricity generated by means of household gas co-generation can be used efficiently, without the losses that inevitably occur in transmission.

Under this system, heat loss is reduced considerably due to the use of excess heat in the thermal load, such as the hot water supply and heating system. In addition, not only can it be installed in new houses, but it can also be used in existing ones, thereby allowing energy conservation to be popularized in many homes. By means of an inverter,

the electricity generated by the gas engine is converted into electricity of the same quality as that provided by electricity companies and supplied to electrical equipment such as lighting and televisions via the distribution board in the customer's home. After accumulating in the hot water tank, the excess heat from the engine is used in the hot water supply. In addition, the excess heat from the engine can be used directly in the heater and dryer in the bathroom, as well as the rest of the heating system. Although at 1kW it has a relatively small output, the system has a generating efficiency of 20%. Moreover, by increasing the collection rate of excess heat, it achieves a combined efficiency of 85%. Even when the electrical load of the customer's house is less than the output of the electricity generator, it is possible to channel the surplus electricity to the heater and store it as heat in the tank. The gas engine used in this system was developed for use in geothermal heat pumps, and has a good track record in terms of its durability.

Household gas engine co-generation mainly targets detached homes, and its installation in residential areas will become more common. The noise levels of the equipment are therefore a major issue, however the gas engine is excellent in this regard, generating only about 45 dB, which is roughly equivalent to the noise generated by the external part of an air-conditioning unit. Moreover, this system predicts the amount of heat necessary for one day and length of time for which it will be used (or this information is entered using the remote control) and decides what time to start and stop the engine based on this. Thus, the system comes equipped with a learning capability that enables the hot water tank to run very efficiently, with little heat loss.

In order to improve the user's awareness of energy efficiency, the system's remote control incorporates such features as a display showing the amount of hot water currently being stored and various lifestyle-related reference functions, as well as being equipped with navigation functions that enable the user's lifestyle to be adapted to an energy conserving usage pattern. Therefore, the system aims to improve energy conservation in the home of the customer.

Kengo ASAKURA's paper, which was co-authored with Hirofumi Arai of ERINA, dealt with the culture of natural gas use in Japan - the largest natural gas consumer in Northeast Asia and the world's leading importer of LNG. There are 21 LNG terminals in Japan, which mainly serve the power plants to which they are annexed and the city gas needs of the surrounding area. Furthermore, pipeline gas from the Sakhalin offshore fields is about to enter the Japanese gas market, which could stimulate the emergence of a fundamentally new gas culture in regions along the proposed pipeline routes, either to Tokyo or Niigata. Of course, the Sakhalin projects alone cannot change the current situation totally. There are several factors that might affect further development of gas use in terms both of quality and quantity, but Japanese gas consumption culture has certainly reached a turning point in its history. The decentralization of power generation has come into its own with the advent of new technologies, such as co-generation systems, fuel cells (FC), gas microturbines (GMT), compressed natural gas (CNG) vehicles and other

technologies. In fact, co-generation itself is not a fundamentally new technology, because heavy industries have a long history of using power-generating facilities that also provide heat on their sites. However, the development of smaller-scale systems that are suitable for small factories, commercial users and residential users is stimulating the decentralization of power supply. FC and GMT are core technologies for downscaling co-generation systems. At the moment, the energy substitution process in favor of natural gas requires appropriate infrastructure, namely an LNG transportation system and a pipeline system.

Alexander OGNEV's paper focused on prospects for using renewable hydroelectric power in Far Eastern Russia. The author, working at the Vostok-Energo, United Energy Systems "Russia", provided a comprehensive account that covered both the current status of and future prospects for utilizing hydroelectric power in the region. In general, the rivers of the Far Eastern region allow the consideration of about 400 other large and medium-sized hydroelectric power plant projects, including about 100 technically feasible options with an annual electric power output of 200 billion kWh. Of these, 10-12 projects could be economically efficient and realistic sometime around 2020.

Various hydropower projects on more than 130 large and medium-sized rivers have been proposed, with an estimated output of close to 400 billion kWh, equivalent to almost half of the current annual power consumption in Russia. Only 3.3% of this potential is actually being used. In Siberia, this rate is close to 20%, rising to 46.4% in the European part of the country, while the national average utilization rate is 19%. More than two-thirds of electricity is produced by thermal power plants. In 2000, they accounted for 69% of the total electric power output, while within the Vostok Unified Power Grid (UPG Vostok) this share was above 81%. Hydroelectric power plants (HPP) provide 26% of total power generation in the region, while within the UPG Vostok this share is 18.7%. At present, four new HPP projects are under way, with a total generating capacity exceeding 3 GW.

In their co-authored paper, Vladimir I. IVANOV of ERINA and Boris G. SANEEV of the Energy Systems Institute of the Siberian Branch of the Russian Academy of Sciences discussed the policy problems of energy cooperation in Northeast Asia. Access to energy markets in the Asia-Pacific region is high on Russia's list of priorities. Its eastern neighbors could undoubtedly absorb large quantities of Russian oil, natural gas and electricity. In theory, Russia could contend for a share of vast energy markets in relative geographic proximity. However, export projections regarding these new markets tend towards the overly optimistic. The down-to-earth prospects for such exports have yet to be clarified in both quantitative and qualitative terms. Among the central questions is the time frame of the proposed projects, what constitutes a realistic market share, and delivery technologies and routes. The investment attractiveness or otherwise of the projects poses yet another uncertainty.

What seems to be a problem is that the assumptions entertained by bureaucrats and politicians alike do not necessarily accurately reflect the existing scope for energy

demand and exports in the context of new trends in power sector management. In particular, natural gas export projections underestimate both the current role and potential competition on the part of LNG (liquefied natural gas), not to mention ongoing improvements in technology that could reduce the cost of LNG supplies. In the longer term, the issue of whether LNG spot market development will enhance its competitiveness vis-a-vis the pipeline projects is open to question.

Furthermore, although electricity exports to China and the Koreans are technically feasible, the realization of such projects will take longer to accomplish, given complexities related to the reform of China's domestic power sector and high investment risks in the case of trans-Korean transmission infrastructure. The oil sector seems to be the only exception to these many uncertainties. In the oil trade, in particular, the dependence of regional economies on the Middle East is very high and rising. Consequently, sources of oil in Eastern Russia can be seen as a decisive factor in ensuring the security of supplies, in addition to economic benefits.

The relative value of Russian oil sources increased in the aftermath of the September 11th terrorist attacks. Russia's growing oil output and exports enhance global energy security and cushion the risk to supplies from violence in the Middle East or potential volatility of supply from OPEC nations. As well as being partially reflected during the recent G8 Energy Ministers meeting held in Detroit, particular emphasis was placed on this by President George Bush and President Vladimir Putin during their May 2002 summit. The two sides will seek to promote access to world markets for Russian energy. Exploring Russia's untapped reserves of energy in Eastern Russia would be part of that process, as well as developing and modernizing its ports.

In this context, Russia's new energy policy and long-term development plans deserve prime attention. This policy was born out of the decade of severe domestic confusion it experienced after the fall of the Soviet Union. The overall situation was characterized by a lack of political leadership, a shortage of investment and frequent changes to the top echelons of federal energy authorities. The Energy Strategy of the Russian Federation 2020, adopted in November 2000, has been recently revised. It seems that Russia has yet to come up with a long-term comprehensive approach for promoting its oil, electricity and natural gas in Northeast Asia. This strategy must envisage coordination among specific projects, regional development needs and export opportunities. Furthermore, such a strategy should be realistically coordinated with existing and projected security trends and geopolitical

developments.

Conclusions and topics for discussion and research

2002 is poised to become a major turning point in global energy politics. Ongoing and anticipated changes in the realm of energy policies are similar to the developments caused by the oil shocks of the 1970s. Although post-September 11th policy decisions could have a moderate mid-term impact on existing crude oil flows, the concerns unleashed by the terrorist attacks are likely to force deep changes, leading to long-term shifts in the energy security strategies of OECD member economies and possibly the external energy positioning of China. For the Northeast Asian economies, diversification of sources and types of energy will be increasingly important. High import dependence on the Middle East will not only make the energy supply structure vulnerable to outside shocks, but also make the price higher.

The first and most prominent conclusion to be reached at the Khabarovsk conference, not to mention the two previous workshops, is that the policy environment for cross-border energy projects is as important as demand for energy, market access, or the availability of delivery infrastructure. In this respect, current policies in Northeast Asia cannot be characterized as pragmatic or rationally responsive to the vital economic needs of the energy-importing economies of the subregion. However, both regional and broader international policy settings have been improving steadily since 1992, fuelling hopes that a sensible cooperative approach will prevail sooner rather than later.

On the other hand, it is time for Russia to focus its efforts on proposing a comprehensive development plan for its energy riches in Eastern Siberia and the Far Eastern region based on domestic regional development priorities - something that is missing in the proposals currently under discussion. In developing and promoting such a plan, Russia could strengthen its feasibility by working more closely with the United States, Japan, China and the Koreans. In this regard, its declaration of "non-interference" in private investment decision-making accompanied by an implicit hesitation to pursue regional development goals is misleading and hazardous. Priority-setting and coordination among various energy projects appear to be key preconditions for a successful strategy for the development of energy resources. Such coordination is impossible without the government providing a lead to the domestic private sector, multinationals and the local interests, but it is unclear how much insight the government possesses in promoting energy cooperation with the economies of Northeast Asia and how effective its negotiating strategy could be. As of today, inter-agency coordination does not

³ When Russian Energy Minister Igor Yusufov met his counterpart Takeo Hiranuma of METI at the G8 Energy Ministers meeting in Detroit in May 2002, he reportedly proposed a pipeline from Nakhodka to Japan. He mentioned that a written proposal regarding such a project from Eastern Siberia to the Pacific was in progress. Contradicting his proposal, the federal program for the Far Eastern region's economic and social development in 1996-2010 stated that the core of the natural gas transportation system for Eastern Siberia "is the trunk gas pipeline from Irkutskaya Oblast to China and the Korean Peninsula". This federal program was revised and re-adopted by the Russian government in March 2002, with the Ministry of Economic Development and Trade in charge of coordination. Yet another program item - the Chubais-proposed Southern Yakutiya-Sakhalin-Japan "Energy Bridge" - reveals a profound lack of understanding of the Japanese electricity sector situation.

seem to be encouraging.³

New large-scale natural gas projects currently under consideration require firm policy commitments in combining the interests of local communities, regions and industries with those of central bureaucracies, as well as exporters and importers. This is particularly relevant to the issue of routing natural gas pipelines in Eastern Siberia and the Far Eastern region. To be fundable, any strategy for the development of natural gas reserves should be based on domestic needs and comprehensive plans for gas reprocessing complemented by export plans, not the reverse.

As far as oil is concerned, the situation is quite the contrary. The Far Eastern region needs oil, but not in quantities that justify huge investment in projects in Eastern Siberia. To be feasible, these projects must be linked with oil consumption centers in Northeast Asia, a potentially unlimited outlet for Russian oil. What could improve the overall political climate in practical terms is cooperation in strategic petroleum reserves - something that should be investigated further. Regional cooperation in establishing joint stockpiling will help enhance energy security, promoting the development of Eastern Siberian oil reserves.

Obviously, the unique hydroelectric power potential in Eastern Russia presents an opportunity for projects that are highly efficient in both economic and environmental terms. By 2010, the total newly commissioned hydroelectric power plant capacity in both areas is planned to reach only 4 GW, including 1.5 GW in Eastern Siberia and 2.5 GW in the Far Eastern region. During the following decade, new capacity is expected to total 2.2 GW, including 1.4 GW in Eastern Siberia. These relatively modest volumes reflect the limited size of the domestic market and export opportunities. If adequate investment is secured, the seven hydropower projects currently under construction and those at the planning stage will generate up to 50 TWh of electricity by 2010 at competitive prices. However, the expansion of transmission capacity and the formation of cross-border electric power network infrastructure are key prerequisites for even partial implementation of such plans.

What is needed is enhanced political trust among the country's neighbors, as well as a shared vision of how to promote energy security and the sustainable use of energy in the 21st century.

Realism in assessments is also needed, including close attention to the investment attractiveness (economic feasibility) of the projects under consideration. Energy infrastructure projects are not necessarily the most attractive of the numerous investment opportunities throughout the globe that are competing for finance. Efforts are needed to make energy investments more attractive and provide a transparent and stable environment for potential investors. In this context, it is of paramount importance to harmonize investors' interests and the host economy's needs.

The economies of Northeast Asia are in need of a regional organization to harmonize their goals and interests in order to achieve a sustainable and prosperous future for the region. A Northeast Asian subcommittee within APEC could be useful in discussing a regional development

program that focuses on energy issues. However, the contribution of international organizations and international treaties to regional development is likely to be limited, as the focus of their attention does not match specific regional opportunities. Thus, regional governments and private sectors should mobilize the necessary resources and concentrate on the list of potential projects that will pave the way for regional prosperity.

There were five round table-type discussions during the workshop: one addressing **Japan-U.S. interests**, moderated by Susumu YOSHIDA, Director General of ERINA; one on **Korea**, moderated by Sang-Gon LEE; the **Policy Issues** round table, moderated by Lee-Jay CHO; the round table on **China**, moderated by Jianyi HU; and the round table on **Russia**, moderated by Pavel A. MINAKIR. Due to the space available for this overview being limited, a detailed account of discussions during these sessions will be made available through the Workshop Report, which is in the process of being compiled and will be placed on ERINA's homepage before the end of the year.