

# North Korea, the Korean Peninsula Energy Development Organization, and Russia<sup>1</sup>

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## Introduction

In September 2000, during his official visit to Japan, President Vladimir Putin mooted the idea of linking the railways of Japan and Far Eastern Russia via two submarine tunnels. It was proposed that one tunnel would link Sakhalin Island and the mainland, with another one constructed between Sakhalin and Hokkaido. Ironically, when Gennadiy Fadeev was appointed Minister of Railways in January 2002, he instantly declared that there were neither the investment resources nor an urgent need to proceed with such a project.

In the list of cross-border energy projects currently under discussion in Northeast Asia, one can find similarly exotic proposals that may appeal to politicians and the public. At the same time, experts can view these proposals as unrealistic. Repeatedly, discussions aimed at Northeast Asian energy cooperation have focused on considerations of "engineering," rather than the economic soundness of the proposed projects. On the other hand, political and security gains of the cross-border undertakings sometimes could be in the lead and the benefits may become particularly significant when cross-border infrastructure involves the two Korean states.

In terms of energy cooperation in Northeast Asia, the Korean peninsula represents both a challenge and an opportunity. The challenge is the complex nature of the political relationships centered on the DPRK. The opportunity is the strong catalytic impact that the Korean Peninsula Energy Development Organization (KEDO) and other successful inter-Korean energy ventures would have on the whole of Northeast Asia. The Russian government, however, decided thus far to avoid participating in KEDO. Russia is not a part of KEDO framework. The irony is that as early as June 1999, the statement by G8 foreign ministers supported the ROK's policy of engagement with the DPRK, the Agreed Framework and KEDO, proposing to encourage broadened support for its work.<sup>2</sup> Since then,

Uzbekistan has joined KEDO, but not Russia.<sup>3</sup> On the other hand, the 1994 Agreed Framework is not a treaty or even an agreement. The policy of "comprehensive engagement" with the DPRK is now under review in the United States and it is not yet clear whether the concept of "improved implementation" of the Agreed Framework will be acceptable to Pyongyang. This paper, among other things, is aimed at providing some background information on KEDO and surrounding political trends.

## What is KEDO?

KEDO is an international, non-profit organization established to carry out two key provisions of the Agreed Framework negotiated in 1994 by the United States and the Democratic Peoples' Republic of Korea (DPRK). Specifically, in exchange for the DPRK freezing and eventually dismantling its graphite-moderated nuclear reactors, KEDO provides for the financing and supply of two proliferation-resistant light-water reactors (LWR) with a capacity of approximately 1,000 megawatts each (total cost estimated at US\$4.6 billion). Also, the Agreed Framework is arranging for the supply of interim energy alternatives (500,000 metric tons of heavy fuel oil each year before the first reactor is completed), to substitute for electric power from the graphite-moderated reactors that were shut down<sup>4</sup>

KEDO aims, above all, to "promote peace and stability on the Korean Peninsula," while serving as "an example of how a cooperative and targeted international diplomatic effort can lead to the resolution of regional security or political crises."<sup>5</sup> KEDO's Mission Statement also begins with a pledge to "contribute to the strengthening of the international non-proliferation regime."<sup>6</sup>

KEDO is funded through financial support from ten members, both states and international organizations. In

<sup>1</sup> This paper was prepared for the International Workshop on Energy Security and Sustainable Development in Northeast Asia: Prospects for Cooperative Policies co-organized by the Economic Research Institute for Northeast Asia and the Korea Energy Economics Institute, with the support of the Japan Foundation Center for Global Partnership, held at the Seoul Palace Hotel, March 29-31, 2002.

<sup>2</sup> Text of G8 foreign ministers' statement, Cologne, Germany, June 10, Kyodo News Agency.

<sup>3</sup> To ensure that eligible KEDO member countries have the opportunity for their companies to participate in supplying materials, equipment and components for the LWR Project in Kumho, North Korea, KEDO is making available procurement information. There are two types of procurement packages. There are "open" packages, in which companies from all KEDO member countries may participate. There are also "closed" packages in which only companies from the original three KEDO member countries may participate. There are 177 open packages and 28 closed packages in total. The original KEDO member countries are the U.S.A., Japan, and the Republic of Korea.

<sup>4</sup> See "KEDO's Approach to Nuclear Safety," American Nuclear Society, Nuclear News, January 2001.

<sup>5</sup> See KEDO's official web site at <http://www.kedo.org/facts.htm>

<sup>6</sup> See KEDO's *Annual Report, 2000-2001* (New York: KEDO, 2001),

1995-2001, it received financial support from 29 sources, including Australia, New Zealand, Mexico and Finland. In December 2001, the EU signed an agreement pledging to continue its support for KEDO. It is represented on the Executive Board of KEDO (the other board members are Japan, the Republic of Korea, and the United States).

The views of those who monitored the progress of the Agreed Framework, including KEDO, vary considerably and also change over time.<sup>7</sup> On the upbeat side, the core view is that KEDO would play a positive nonproliferation role, contributing to the implementation of the Geneva Agreed Framework, which is aimed at the comprehensive engagement<sup>8</sup> of the United States, ROK and Japan with the DPRK.<sup>9</sup> This would also represent a convenient "multilateral cover" and the channel of contact between officials in the South and the North.<sup>10</sup> In addition, the United States praised KEDO as a tool strengthening Tokyo-Seoul ties and the triangular security relationships among the three countries.

Moreover, Japan's envoy to KEDO, Kojiro Takano was appointed the head of the Japanese delegation for negotiations on the normalization of diplomatic relations between Japan and the DPRK. As a "leading KEDO member," Japanese officials described KEDO as a "very wise and lenient" method for preventing nuclear development in contrast to the measures taken against Iraq. Tokyo not only strongly urged the DPRK to cooperate adequately with the IAEA and related nations to fulfill its obligations, but also claimed that implementation will help reduce greenhouse gas emissions.

### The Project ...

KEDO is responsible for the overall management and nuclear safety of the LWR project until the reactors are turned over to the DPRK. KEDO has been meeting with the DPRK regulatory authority on a periodic basis since 1998 to discuss nuclear safety-related issues. In addition, KEDO has been discussing with the DPRK problems related to strengthening regulatory infrastructure and has developed a training program for the North Korean staff, providing codes and standards and other safety-related technical documents.

KEDO's primary contractor is the Korea Electric Power Corporation (KEPCO), which will provide the

DPRK with two Korean standard nuclear plant model reactors. These transactions will require an approval from Washington because the reactors are based on U.S. designs and the South Korean companies would import major components for these reactors from Combustion Engineering, requiring a government-to-government agreement.

On September 1, 2001, the DPRK nuclear regulatory authority issued a Construction Permit to KEDO and excavation work at the plant site has begun. The operator of the LWR plant is the DPRK's General Bureau of Atomic Energy. The DPRK will take ownership when KEDO has completed all system testing and thereafter it will assume full responsibility as the operator of the reactors. The DPRK is expected to be in full compliance with its IAEA safeguards obligations to allow such an agreement. It will proceed when a significant portion of the LWR project is completed but before delivery of key nuclear components. After such components are transferred, the DPRK must begin shipping spent fuel rods abroad and after the first reactor is completed, it will begin dismantling its graphite reactors and reprocessing plant.<sup>11</sup>

On January 31, 2000, KEDO concluded a ¥116.5 billion-loan agreement with the Japan Bank for International Cooperation (JBIC). The loan agreement was concluded in accordance with the "Agreement between KEDO and the Government of Japan on the Provision of Financing for the Implementation of the Light-Water Project" approved by the Japanese Diet in 1999. A larger loan agreement concluded on December 15, 1999 would cover 70% of the cost of the project through funding from the Export-Import Bank of Korea.

The European Union joined KEDO in September 1997. In October 2000, the Third Asia-Europe Meeting (ASEM 3) convened in Seoul expressed support for KEDO. Also, the European Commission proposed to extend EU involvement in KEDO, including its financial contribution, under the new agreement in exchange for membership of the Board of Directors, a presence in the Secretariat and EU industry involvement in contracts awarded to KEDO contributors.<sup>12</sup> The EU Commissioner for External Relations Chris Patten described KEDO as a vital international project in fighting nuclear proliferation, which also contributes to international efforts in engaging the

<sup>7</sup> See Energy, Environment and Security in Northeast Asia: Defining a U.S.-Japan Partnership for Regional Comprehensive Security," Nautilus Institute and Center for Global Communications, 1999, at <http://www.nautilus.org/papers/energy/ESENAfinalreport.html>

<sup>8</sup> It should be noted that a policy of engagement was among the scenarios proposed in the report of the Congressional Research Service published in June 1993, ahead of the actual emergence of the Agreed Framework. Two other options highlighted in the report were "pressure" and "outwaiting." The strategy of "outwaiting" was described as a combination of both engagement and pressure that requires close coordination between Washington, Seoul and Tokyo and a concerted international effort in order to prevent North Korea producing a nuclear weapon, while avoiding action that would give support or legitimacy to the regime.

See Ripp-Sup Shinn, "North Korea: Policy Determinants, Alternative Outcomes, U.S. Policy Approaches (Rep. 93-612 F)," *CRS Issues Brief*, Congressional Research Service, Report for Congress, June 24, 1993.

<sup>9</sup> *Challenges of Building a Korean Peace Process: Political and Economic Transition on the Korean Peninsula*, Special Report, The United States Institute of Peace, June 1998, p. 2.

<sup>10</sup> South Korean delegate Chang Sun Sup quoted by Asian Political News, October 2, 2000.

<sup>11</sup> See Jennifer Weeks, "Iran and North Korea: Two Tests for U.S. Nuclear Cooperation Policy," Proceedings of *Global '99 Nuclear Technology—Bridging the Millennia*, a conference held in Jackson Hole, Wyoming, 30 August—2 September 1999.

<sup>12</sup> In 1995-1999, EU has provided food aid and other humanitarian assistance of Euro 180 million to North Korea.

DPRK in responsible policies.<sup>13</sup>

### ... Its problems ...

It is widely known that the KEDO's current capacity in alleviating the energy crisis in North Korea is limited. Initially the first light water reactor was due to be completed in 2003, but its actual commissioning is likely to be delayed until 2008-2010. In the meantime, the DPRK reports serious power shortages that affect railway transportation, heating and lighting, in addition to industry, construction, and agriculture.

Also, as Charles Kartman, KEDO's Executive Director stated, the HFO [heavy fuel oil] project continues to face financing difficulties, particularly with the sustained increase in fuel costs. The nuclear liability aspects of the LWR project appear complex and will require, according to the KEDO's officials, an "enormous amount" of attention to ensure a comprehensive nuclear liability regime within the DPRK. The provision of sufficient labor to the LWR project remains unresolved in spite of a number of discussions between KEDO and the DPRK.<sup>14</sup>

On the other hand, Choi Jang-eun, a researcher at the Korea Electric Power Corporation (KEPCO) estimated that 85% of North Korea's hydroelectric power plants remain damaged after the floods in the mid-1990's due to a shortage of components needed for reconstruction and renovation.<sup>15</sup> Potential suppliers of these spare parts are the manufacturers in Russia and China. Also, coal-fired power plants are experiencing shortages of coal. These plants also need the equipment maintenance and modernization. The shortage of electricity badly affects the coal mining and coal transportation, aggravating the energy crisis.

Pyongyang is blaming the United States as responsible for all the difficulties. Stalled construction of the light-water reactors led the DPRK to demand from ROK during the inter-Korean cabinet-level talks that it provides about 500 MW of electric power capacity via a 90 kilometer-long cross-border power line. On the other hand, North Korea more than once threatened to abandon the Agreed Framework, accusing the United States of employing this agreement to stifle the North by delaying its implementation. Moreover, the DPRK more than once threatened to end its nuclear freeze, if the U.S. failed to compensate it for delays. Worse, even when the two LWR

commissioned, the problem will be the North Korean power grid. The integration of the LWRs into the DPRK's electricity system could be difficult, considering the grid's small size, deteriorating condition and reliability, blackouts and frequency fluctuations.<sup>16</sup>

In addition to various technical and financial difficulties, KEDO came under continued attack as both the United States and the ROK were perceived as making concessions and participating in coercive bargaining favorable to the North.<sup>17</sup> Some critics suggested that the Clinton administration's "creativity" in engaging the DPRK via the Agreed Framework was born out of desperation and the Bush team might convince the DPRK that conventional power plants would serve its interests as well as or better than nuclear ones.<sup>18</sup> Others argue that LWRs still produce plutonium that is usable for nuclear weapons, while the power grid is inadequate for integrating such reactors and that coal or gas-fired plants would be more appropriate.<sup>19</sup>

KEDO's opponents expressed concern that the Agreed Framework was in contradiction to the economic sanctions imposed on the DPRK by the same powers that formed the organization. Moreover, views were expressed that U.S.-DPRK dialogue has also contributed to reinforcement of the "compensation for crisis" mentality.<sup>20</sup> In other words, there are conflicting views on whether the North Korea's engagement with the United States supports non-proliferation goals or encourages more tension-oriented behavior on the part of the DPRK. On the other hand, some observers describe the rationale for KEDO as being the avoidance of "the danger of a second Korean War"<sup>21</sup>, considering that "the perceived nuclear threat has allowed Pyongyang to win the assurance of survival and bargain for vital economic and technical aid."<sup>22</sup> In general, it seems that the main source of anxiety on the part of Americans was the understanding that the North Korean negotiators at the Geneva talks were able to correctly identify the nuclear issue as a priority of the United States, gaining significant leverage in negotiations.<sup>23</sup>

The strongest criticism of the engagement policy towards North Korea launched by the Clinton administration originated from U.S. Congress, including the House of Representatives, as well as the legislatures in South Korea and Japan. For example, Doug Bereuter, Chairman of the Subcommittee on Asia and the Pacific

<sup>13</sup> Europe Information Service, *Europe Energy*, February 4, 2000. However, the founders of KEDO repeatedly requested the EU to increase substantially its contribution. See *Asian Political News*, December 25, 2000.

<sup>14</sup> KEDO's *Annual Report, 2000-2001* (New York: KEDO, 2001), p. 5.

<sup>15</sup> *Korea Herald*, February 15, 2001.

<sup>16</sup> See John H. Bickel, "Grid Capability and Safety Issues Associated with Nuclear Power Plants," Paper presented at the Workshop on International Grid Interconnection In Northeast Asia, Beijing, May 14-16, 2001.

<sup>17</sup> See Victor D. Cha, "The Continuity Behind the Change in Korea," *ORBIS*, Fall, 2000.

<sup>18</sup> Michael Parks and Gregory F. Treverton, "Keep North Korea on Life Support," *The Los Angeles Times*, March 27, 2001.

<sup>19</sup> James R. Lilley, "North Korea: A Continuing Threat," Testimony Before the House Committee on International Relations, March 24, 1999.

<sup>20</sup> Ralph A. Cossa, "U.S.-DPRK Talks: Time to Break Bad Habits," *PacNet*, no. 47, Pacific Forum/CSIS, Honolulu, December 4, 1998.

<sup>21</sup> See Sharif M. Shuja, "North Korea and the West," *Contemporary Review*, December 2000.

<sup>22</sup> See Sharif M. Shuja, "America and Asia: Some Challenges for the Bush Administration," *Contemporary Review*, August 2001.

<sup>23</sup> See Scott Snyder, "Negotiating on the Edge: Patterns in North Korea's Diplomatic Style," *World Affairs*, Summer 2000.

stated that although the conventional military capability of the DPRK has declined, "significant evidence exists to suggest that an undeclared nuclear weapons development program continues."<sup>24</sup> The policy review team headed by William J. Perry admitted that although the ROK supports the Agreed Framework, its National Assembly, like U.S. Congress, is carefully scrutinizing the DPRK behavior, while Japanese regard missile activities as a direct threat.<sup>25</sup>

Indeed, at various points during the existence of KEDO, members of the National Assembly of the Republic of Korea have questioned its value. The U.S. Congress threatened to terminate all funding for KEDO. President Kim Young Sam threatened to halt KEDO operations entirely, while Japan suspended its support for KEDO in the aftermath of the 1998 missile launch by the DPRK over Japanese territory. On June 30, 1998, the European Parliament blocked the EU's annual contribution to KEDO, while its Budget Committee backed the report by former Belgian Prime Minister Leo Tindemans, which complained that the KEDO process reveals a "democratic deficit" and excludes national parliaments and the European Parliament. In February 1999, the European Parliament's Committee on Foreign Affairs and Security approved this report, threatening again to freeze KEDO funding as an international agreement to be included under articles of the Euratom Treaty.<sup>26</sup>

There was no shortage of criticism of the Clinton administration's policy towards Pyongyang either before or after the change of administration in the White House. In January 1995, the chairmen of three Senate committees—Energy and Natural Resources, Foreign Relations, and Intelligence—demanded that the 1994 agreement with North Korea be redefined as a formal treaty that requires the advice and consent of the Senate. Various amendments followed, including the one proposed by John McCain to make aid to KEDO on condition of presidential certification that the DPRK had halted its nuclear program (or a waiver on national security grounds).<sup>27</sup>

In February 2002, the House Policy Chairman Christopher Cox (R-CA) released a bipartisan letter, urging

President Bush to cancel Clinton administration plans to supply nuclear technology to North Korea.<sup>28</sup> In addition to the members of the Senate and House of Representatives, some academic observers proposed an "intrusive" approach to monitor provisions of humanitarian aid, expressing skepticism with regard to the Agreed Framework and prospects for its implementation.<sup>29</sup> A number of authors pointed out that the Geneva accord was the result of a "coercive bargaining" strategy on the part of the DPRK.<sup>30</sup> Others, however, praised the value of the deal, proposing to create an external context that encourages reform, including initiatives that could involve the DPRK in subregional cooperation in Northeast Asia, in such areas as cross-border energy projects and sustainable development.<sup>31</sup>

### ... And prospects

In this context of uncertainty, the question looms large how resilient (or vulnerable) KEDO could be and how it will influence prospects for energy cooperation between the Koreans. There is also the question of how the implementation or delay of the KEDO plan could potentially affect non-nuclear projects, including a Trans-Korean gas pipeline or power transmission project.

Initially, feelings of uncertainty began to surface with the challenge that KEDO faced in establishing itself as a credible negotiating partner with the DPRK. Down the road, there were problems in technical negotiations, the difficulties of inter-KEDO consensus-based coordination, the issue of indemnity for potential liabilities created by the plant, and the overall political environment. KEDO members, for example, saw the participation of General Electric (GE) in the project as favorable, but the reality proved different.<sup>32</sup> At the same time, the ABB technology company signed a US\$200 million contract to deliver equipment and services to KEDO.<sup>33</sup>

There were also uncertainties and problems related to the HFO deliveries, caused in part by the domestic political divisions in the United States and Japan over the KEDO process, and other problems such as "incomplete regional membership." China did not join KEDO, although Beijing

<sup>24</sup> Remarks Delivered at the Heritage Foundation by the Honorable Doug Bereuter, Chairman, Subcommittee on Asia and the Pacific, March 17, 2000

<sup>25</sup> See Dr. William J. Perry, Special Advisor to the President and the Secretary of State, Unclassified Report "Review of United States Policy Toward North Korea: Findings and Recommendations," Office of the North Korea Policy Coordinator, United States Department of State, October 12, 1999.

<sup>26</sup> In the summer of 1998, KEDO faced an acute financial crisis related to the HFO deliveries (Europe Information Service, *European Report*, July 8, 1998 and August 1, 1998, *Europe Energy*, February 26, 1999). In September 1998, on the first day of KEDO's general meeting in New York, a Japanese delegate to KEDO explained Japan's freezing of contributions to the project. In January 1999, South Korean President Kim Dae Jung urged Japan not to halt funding to KEDO. On the other hand, Japanese authorities decided to disconnect the KEDO issue and the intrusion of two suspected spy ships into Japanese waters in March 1999. (Kyodo, *Asian Economic News*, October 5, 1998, January 11, 1999 and March 29, 1999).

<sup>27</sup> See Ryan J. Barilleaux, "Clinton, Korea, and Presidential Diplomacy," *World Affairs*, Summer 1999.

<sup>28</sup> Policy Chairman Urges End to Nuclear Subsidies for North Korea. Press release from the House Policy Committee, Washington, February 13, 2002.

<sup>29</sup> Nicholas Eberstadt, "The Dangerous Korea (North Korea)," *National Review*, December 31, 1998.

<sup>30</sup> See "Key Trends on the Korean Peninsula After September 11 and the June 2000 Summit," Testimony of Dr. Victor D. Cha, Associate Professor of Government, Director, Project on America's Alliances in Asia, Edmund A. Walsh School of Foreign Service, Georgetown University, Before the United States House Subcommittee on East Asia and the Pacific, House International Relations Committee, November 15, 2001.

<sup>31</sup> See Sharif M. Shuja, "Reforms and Changes in North Korea," *Contemporary Review*, February 1999.

reportedly has been requested by the United States to supply the HFO to the DPRK under the KEDO framework.<sup>34</sup>

A view was also expressed that the United States should gradually shift to a "two-Koreas security policy" and that enhanced U.S. access to the DPRK via nuclear-related security negotiations, as well as diplomatic contacts stimulated by the food crisis served the needs of the U.S.-ROK allies.<sup>35</sup> Indeed, KEDO has displayed a real improvement in Japan-ROK relations through the joint financing of the project,<sup>36</sup> and a number of observers in Japan have proposed to do more to assist the economic reconstruction of the DPRK.<sup>37</sup>

The policy of "comprehensive engagement" with the DPRK and the concept of "improved implementation" of the 1994 Agreed Framework became the most actively debated topic during the testimony of James A. Kelly, Assistant Secretary of State for East Asian and Pacific Affairs before the Subcommittee on East Asia and the Pacific of the Committee on International Relations.<sup>38</sup> According to Kelly, the United States will continue to abide by its commitments under the Agreed Framework and expects the DPRK to do the same, considering that the Bush administration offers Pyongyang the opportunity to demonstrate the seriousness of its desire for improved relations, including renewing cooperation with the IAEA, full compliance with IAEA safeguards, removal of the spent nuclear fuel from the country (timetable and mechanism) and other issues such as a verifiable end to the missile production and export program, and a less threatening conventional military posture.<sup>39</sup>

According to some observers, to achieve long-term peace and stability in the region, the United States must do more to fulfill the non-nuclear provisions of the Agreed

Framework, including steps to reduce trade sanctions, expand economic and political relations with the DPRK<sup>40</sup> and facilitate its contacts with the World Bank and Asian Development Bank.<sup>41</sup> The problem, however, is that according to William Perry, "we don't have any basis yet for forecasting a positive outcome for negotiations [with the DPRK]. The benefits of a positive outcome are so great that it is important that we try and give it a very serious effort to try to reach that outcome."<sup>42</sup>

In July 2001, the U.S. special envoy for Korea peace talks, Charles Pritchard said to the Asia and Pacific Subcommittee of the House of Representatives International Relations Committee that the DPRK must begin active cooperation to avoid serious delays in the KEDO project. For example, North Korean workers employed by KEDO have been on daily strikes since early 2000, demanding an almost six-fold pay hike, while the monthly pay for the laborers from Uzbekistan was reported to have been set at US\$110, the same as for the North Koreans.<sup>43</sup> In the early 2002, 1,241 workers were at the construction site, including 715 persons from South Korea, 96 from North Korea and 430 from Uzbekistan.<sup>44</sup>

### Russia and North Korea

For Russia, the decade of the 1990's was a time of maturing diplomatic and trade links with South Korea, in contrast with shrinking economic contacts with North Korea. At the very same time, the United States managed to develop a proactive engagement strategy towards the DPRK, beginning with the adoption of the Agreed Framework, while the Administration of President Kim Dae-Jung came up with its own "sunshine policy."

Russia-North Korea bilateral trade shrank in volume from US\$600 million in 1992 to only US\$105 million in

<sup>32</sup> GE was originally chosen to supply the generators, but pulled out of the project when the issue was not resolved to its satisfaction. In January 2001, it was announced that a consortium of Japanese firms, led by Hitachi and Toshiba, would supply the generators and turbines. See "North Korea," Country Analysis Briefs, Energy Information Administration of the United States at <http://www.eia.doe.gov/emeu/cabs/nkorea.html>

<sup>33</sup> Business Wire, January 20, 2000.

<sup>34</sup> See Scott Snyder, *The Korean Peninsula Energy Development Organization: Implications for Northeast Asian Regional Security Cooperation*, North Pacific Policy Papers 3, Program on Canada-Asia Policy Studies, Institute of Asian Research, University of British Columbia, Vancouver, 2000.

<sup>35</sup> See Edward E. Olsen, "U.S. Security Policy and the Two Koreas," *World Affairs*, Spring 2000.

<sup>36</sup> Mel Gurtov, "Alignment Despite Antagonism: The United States—Korea—Japan Security Triangle," (Book review), *American Political Science Review*, June 2000.

<sup>37</sup> *Asahi Shimbun Asia Network. Report 2001* (Stability and Progress in Northeast Asia), Tokyo, March 2001.

<sup>38</sup> 2001 U.S. Foreign Policy in East Asia and The Pacific: Challenges and Priorities for the Bush Administration. Hearing before the Subcommittee on East Asia and the Pacific of the Committee on International Relations, House of Representatives. One Hundred Seventh Congress, First Session, June 12, 2001, p. 46, <http://www.house.gov/international—relations>

<sup>39</sup> *Ibidem*, pp. 108-9.

<sup>40</sup> See Jennifer Weeks, *op. cit.*

<sup>41</sup> The designation of North Korea as a state supporter of terrorism by the United States effectively precludes direct lending by international financial institutions such as the World Bank. On January 29, 2002, in his first State of the Union address, President Bush stopped short of calling the DPRK a "terrorist regime," describing North Korea as a "regime arming with missiles and weapons of mass destruction, while starving its citizens." Reportedly in 1998, the World Bank offered to North Korea some limited technical assistance through the United Nations Development Program.

<sup>42</sup> William Perry, "Persuade North Korea to forgo its missile and nuclear program," Interview by Kiichi Fujiwara and Yoshitaka Sasaki, *Asahi Shimbun Asia Network. Report 2000* (Cooperative Security in Northeast Asia), Tokyo, 2000, p. 58.

<sup>43</sup> Kyodo, *Asian Political News*, February 19, 2001.

<sup>44</sup> *Joonang Ilbo*, November 20, 2001

2000, a decline of nearly 85%. Investment cooperation was also suspended in 1992. In 2000, Russian exports to the DPRK amounted to US\$54.6 million and imports to US\$50.4 million. The main exports to the DPRK are machinery, equipment and spare parts, oil and petroleum products, timber and coal, as well as fish and various sea products. The DPRK use inport imported a significant amount of coal and oil products from Russia. In addition, the former USSR was a very important export outlet for North Korean industries (Table 1).

In 1994-1999, Russian exports to the DPRK decreased from US\$51.4 million to US\$38.4 million, while imports declined from US\$43.7 million to only US\$7.7 million.<sup>45</sup> Bilateral trade has shown a trend towards stabilization since Vladimir Putin visited Pyongyang in July 2000, with the trade volume growing at 10-15% in 2001. The financial authorities of the two countries continue to talk about how to restructure the DPRK's debt to Russia, which was accumulated before 1991 through unbalanced trade operations and previously received loans and credits.

The border station Khasan, located 200 kilometers south of Vladivostok, was the main cross-border point for cargo transit between the DPRK and Primorskiy Krai. In 1988, the two-way cargo traffic exceeded 5 million tons annually, but by 2001 the total volume had dropped to only 144,000 tons. Railway is the dominant mode of transportation in the DPRK, accounting for 90% of total freight cargo and 60% of passengers. The entire system has 5,200 kilometers of tracks, 79% of which are electrified.

A stable supply of electric power for its economy depends on rail transport, but the rail system of the DPRK is falling apart. Moscow demonstrated an interest in supporting the DPRK in rebuilding a railway, but its investment capacity is limited. Refurbishing technologies could also be applicable for existing hydroelectric power plants in the DPRK that could become a part of the regional power grid.

In August 2001, the DPRK and Russia signed a

railway cooperation agreement. At the follow-up expert-level meeting, prospects for a cross-border rail connection were discussed with a view to linking South Korea with the Trans-Siberian Railway. The total length of the railway that must be improved within the borders of the DPRK, between Tumangan and Keson is 981 kilometers, with 587 bridges (27 kilometers of the total length), 4,250 ferroconcrete tubes and 165 tunnels (67 kilometers of the total length).

According to Russian experts, the track's condition over the majority of bridges is unsatisfactory, but 173 bridges and 42 tunnels require emergency renovation and/or replacement work. Today, the maximum safe speed of train is less than 30 kilometers per hour. The communications and signals systems of the North Korean railways are antiquated and the technical condition of the locomotives and rolling stocks cannot guarantee safe transportation. The estimated cost of rehabilitating the Tumangan-Keson line exceeds US\$1 billion.

### Conventional options

Given the current uncertainty, the question looms large of how resilient (or vulnerable) KEDO could be and how its dynamics could influence prospects for energy cooperation between the Koreas. Under the best-case scenario, as some experts indicate, hydroelectric power and other external sources of electricity could allow the Koreas to gain from load sharing and the integration of power grids. Others suggest that a cross-border high-voltage transmission line would improve the power supply, contributing to KEDO's implementation.<sup>46</sup> The worst-case scenario, however, could involve the revision and/or cancellation of this project.

The central question is whether Russia could be helpful beyond the framework of KEDO.<sup>47</sup> All experts admit, however, that the DPRK needs a "grass-root assistance" in its energy infrastructure rehabilitation. Aggravated power shortage in the DPRK is one of its most

Table 1. **THE USSR'S TRADE WITH THE DPRK, 1970-1988**  
(Million rubles\*)

	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988
<b>Exports, total</b>	207.0	186.8	287.9	278.9	318.5	262.4	347.2	654.8	757.2	800.2	1062.2
Machinery	89.4	75.6	82.1	84.5	74.7	47.2	99.1	147.4	138.4	96.0	156.4
Solid fuels	12.4	7.3	19.9	19.1	22.5	24.3	25.6	28.3	46.9	56.1	57.1
Oil and products	27.7	26.6	81.5	67.7	101.4	87.8	103.9	121.0	188.0	162.6	116.1
Cotton fiber	8.4	4.1	6.1	5.6	11.7	12.2	13.1	13.5	14.8	17.2	15.8
<b>Imports, total</b>	128.9	151.4	284.2	250.3	362.0	325.5	367.1	404.4	450.7	431.9	539.5
Machinery	7.1	12.3	19.3	6.2	26.3	26.3	52.6	61.4	81.7	69.3	65.2
Rolled metal	32.5	41.2	64.5	43.3	81.8	70.9	80.9	84.0	83.5	89.0	73.3
Magnesium	10.6	19.0	65.0	65.7	71.9	78.1	75.5	85.4	103.4	75.3	70.2
Garments	12.1	10.9	20.0	19.3	48.1	45.2	51.0	65.0	97.2	94.8	213.1
<b>Total trade</b>	335.9	338.2	572.1	529.2	681.0	587.4	714.3	1,059.2	1,207.9	1,232.1	1,601.7

\* In the 1980s, under the official exchange rate one ruble was equivalent to US\$1.30- US\$1.40.

Source: Vladimir Ivanov, ed., *USSR & Pacific Region in the 21<sup>st</sup> Century* (New Delhi: Allied Publishers, 1989), p. 166.

<sup>45</sup> As statistics demonstrate, with only few exceptions, Soviet exports outstripped imports, in particular from 1985, meaning that the DPRK gradually accumulated a state debt now estimated at US\$3.5 billion.

<sup>46</sup> The integration of the LWRs into the DPRK's electricity system could be difficult, considering the grid's deteriorating condition and reliability, blackouts and frequency fluctuations.

threatening economic problems. Its obsolete power plants and fuel shortage limit power generation to only 20-30% of capacity. The North depends highly on hydroelectric and coal-fired power generation. The country's annual estimated demand is 43.8 billion kWh<sup>48</sup>, while actual generation is only a fraction of that amount. Cost-effective means of assisting the DPRK's energy sector should be considered.

Prior to 1991, the DPRK received technical assistance and a sizable portion of power generation equipment, technologies and designs from Russia. While discussing bilateral economic and trade issues with Russia, the DPRK consistently raises the question of receiving aid for reconstructing and modernizing the four key power plants built with the assistance of the former Soviet Union. Those power plants are the Pyongyang, the East Pyongyang and the Chongjing heat-and-power plants, as well as the Pukchang thermo-power station. In the meantime, the North Korean government is paying special attention to the construction of the East Pyongyang heat-and-power plant.

It is important to note that the technical aspects of cooperation in the power sector have already been worked out, including the projects' designs, equipment manufacturing and delivery for the Pukchang thermoelectric power plant and the Pyongyang heat-and-power plant, the extension of the Chongjing heat and-power-plant and the construction of the second phase of the East Pyongyang heat-and-power plant. All the equipment required for these projects can be produced and delivered to the DPRK at an early date.

Technically, the parties involved could agree to update the scope of KEDO, considering changing circumstances and the immediate energy needs of the DPRK, providing it with alternative technologies for power generation, including the transmission and distribution networks rebuilding, coal-fired power plant modernization and coal supply and coal transport infrastructure improvement, alternative small-scale energy source development and improved efficiency of energy use.

The advocates of this approach, however, emphasize that it would be wrong either to pursue the construction of new coal-fired power plants (the DPRK's installed electric generation capacity is much larger than the capacity currently in use), or to abandon the LWR project. On the other hand, they admit that the cost of grid refurbishment is likely to be about the same as the entire KEDO project cost.<sup>49</sup> Finally, they point out that the two LWRs must be complemented by power grid interconnection between Far Eastern Russia, China and the ROK/DPRK.<sup>50</sup>

### Natural gas pipeline

From the early 1990's, Russia was prominently present in discussions regarding the supply of pipeline gas and electric power to the ROK.<sup>51</sup> Russia's share in the global natural gas trade could reach 30% by 2020 and it is expected that Northeast Asia will absorb a sizeable portion of natural gas exports. Russia's total capacity to export natural gas to customers in Northeast Asia is very significant and could be estimated at 100-120 billion cubic meters (Bcm) a year by 2020. For the sake of comparison, in 1995 Canada exported 78 Bcm of gas to the United States, while Russia's exports of gas reached 200 Bcm.

The problem is that Russian government and prospective gas exporters are yet to come up with an integrated strategy for developing gas reserves in Eastern Russia for both export markets and domestic needs. Such an integrated strategy must be attractive to the potential investors, including those from the United States, Europe and Asia, including South Korea.

There are various plans currently under discussion with regard to how to build export pipelines. One option favored by Exxon/Mobil is to link Sakhalin Island and the main island of Japan by a pipeline with a capacity of 12-15 Bcm. Another plan is to build a larger pipeline from Kovykta giant gas field near Irkutsk to China and the ROK. A trans-Korean pipeline that carries natural gas from Russia to both Koreas is another alternative under discussion.

In this context, Canada could serve as a model for designing and developing a natural gas industry, including delivery systems in Eastern Russia. Although there is considerable consumption of natural gas in the producing provinces, the Canadian gas industry is still characterized by "production in the west, consumption in the east." This is clearly reflected in the gas delivery infrastructure with all production fields, gathering pipelines and processing plants located in the west and the single West-East transmission pipeline that carries gas across the country along the border with the United States. The export points for gas to the United States are spread out along the Canadian-U.S. border and there are currently 16 pipeline interconnections with a total maximum annual capacity of 86 Bcm.

Similarly to Canada, in Eastern Russia, vulnerability to supply shortages and disruptions in a West-East trans-continental gas delivery system must be mitigated by substantial upstream storage and reserves of natural gas in Western Siberia. A trans-continental trunk pipeline constructed along the Trans-Siberian Railway would enable the commercialization of natural gas reserves in Krasnoyarskiy Krai, Irkutskaya Oblast and Yakutia. These integrated reserves will be sufficient to fuel a network that will supply gas to domestic users (in Canada, 61 Bcm of

<sup>47</sup> Oil exports from Russia to North Korea were interrupted, creating difficulties. In addition, it has been left out of a multilateral framework called the "Four Party" talks. Only recently has high-level dialogue with Pyongyang been restored.

<sup>48</sup> KOTRA, Dalian, April 6, 2001.

<sup>49</sup> David Von Hippel, et. al., "Modernizing the US-DPRK Agreed Framework: The Energy Imperative," Nautilus Institute for Security and Sustainable Development, February 16, 2001, pp. 2-3, 12.

<sup>50</sup> "Workshop on Power Grid Interconnection in Northeast Asia. Summary Report," Beijing, May 14-16, 2001, Nautilus Institute, Berkeley, California, June 8, 2001, pp. 8-9.

<sup>51</sup> See Peter Hayes, "Asia's New Dynamics of Energy Supply/Demand in the 21<sup>st</sup> Century," Paper presented at the 2001 Electricity Summit in Hokuriku, Northeast Asian Economic Forum, November 5-6, 2001, Toyama City, Japan.

gas is consumed domestically). They will also allow significant cross-border exports of gas to Mongolia, China, the Koreans.

In September 2001, North Korea and South Korea agreed in principle to conduct a joint survey on the possible passage of a pipeline from a Russian gas field to the ROK via the DPRK. South Korea's six-member delegation to the talks in Pyongyang was headed by Kim Jong Sool, vice-president of the Korea Gas Corporation (KOGAS). It was expected that the inter-Korean talks on Siberian gas project are likely to become an agenda item at the ministerial talks between North Korea and South Korea.<sup>52</sup> If the international pipeline passes through the DPRK, it will serve as a source of transit fees, in addition to an opportunity to use natural gas for power generation along the pipeline route.<sup>53</sup>

The recent OECD study on the costs of generation confirmed the strong economics of gas-fired combined-cycles for base-load power generation. Of the 18 countries providing estimates for two or more base-load options, gas-fired combined cycles were the cheapest option in 11 countries at a 10% discount rate. The average capital cost of the combined cycle generation turbine (CCGT) reported in the OECD study is half of that of coal-fired plants and just one-third that of nuclear plants. The time needed to construct a combined cycle plant is about one year less than that required for coal-fired plants and more than two years less than that for nuclear power plants.

Today, the most common type of plant re-powering has been to replace boilers with the combined-cycle steam generation system, using existing steam turbines and other steam cycle equipment. Normally, a plant's capacity is multiplied by three since gas turbine output is double that of steam turbines. Efficiency increases by roughly one-third and emissions decrease by about one-third. Moreover, the plant re-powered with gas turbines can generate electricity at nearly the same cost as a new combined-cycle plant, but with lower total investment. This could be a relevant option for the re-powering of the DPRK's power plants, provided that a trans-Korean pipeline is built.

Moreover, of the more than 200 new power plant projects announced, more than 90% of the projects plan to use natural gas and most of them will employ gas turbines in "combined cycle" power generation. Gas turbines have had the highest growth rate of any generation technology in the past decade. The disadvantage of the CCGT technology is that fuel costs account for 60% to 75% of the total generation cost, whereas in plants powered by renewables, nuclear or coal, the share of fuel in the total cost ranges from zero to 40%. Therefore it is quite possible that new plants will rely heavily on gas turbines in areas with access to pipeline natural gas.

The main challenge is how to increase the thermoefficiency of such plants from the current 50% for

the best turbines to the 60% level. Because natural gas represents the largest single cost component of running a combined cycle power plant, an increase in efficiency of 10% can reduce operating costs by as much as \$200 million over the life cycle of a typical gas-fired 400-500 megawatt combined cycle plant. In the United States, an advanced gas turbine burns gas at higher temperatures, and operates more cleanly, producing fewer nitrogen oxide and carbon dioxide emissions per kilowatt of electricity than conventional gas turbines.

Also, in May 2001, German Gref, the Russian Minister for Economic Development and Trade, mentioned that the Japanese company "Nippon Kokan" has studied the prospects for building a large dimethyl ether production plant in Eastern Russia, which could supply this fuel to Japan and other countries.<sup>54</sup> Dimethyl ether (DME) has emerged only recently as an automotive fuel option and is made from natural gas. Stored as liquid under moderate pressure, DME competes in engine efficiency with diesel fuel and could become price competitive, provided that it is produced in large volumes. Data on DME vehicle emissions range between very low to equivalent with diesel on all components.

### ***Hydroelectric power***

Successful large-scale hydropower schemes demonstrate limited negative environmental effect. According to OECD assessments, technologies currently exist to refurbish many operational hydropower plants in ways that increase their output, while reducing their environmental impact.

The use of hydropower accounts for about 20% of the world's electricity supply. To maintain its present degree of reliance on hydroelectric power will require substantial capacity expansion, most of which is expected to occur in Asia, and especially in China. In China, hydroelectric power contributes the second largest share in electricity generation, accounting for 17% in 1996. China's reliance on this type of renewable energy will grow after the completion of the 18,200-megawatt Three Gorges Dam project in around 2009 and several other large hydropower projects.

On the other hand, the hydroelectric resources of Eastern Russia are plentiful. The annual technical potential of Eastern Siberia is about 660TWh, of which 14% is utilized, while the technical potential of the Far Eastern region is 680TWh, of which only 2% is utilized. In contrast, the hydroelectric resources of the whole of North China are about 20TWh.<sup>55</sup>

In Russia, about 20% of electric power is generated by hydroelectric power plants (70% in Eastern Siberia and 30% in the Far Eastern region). Moreover, Eastern Russia has a substantially underdeveloped hydroelectric power capacity. The Far Eastern provinces and Eastern Siberian regions possess more than 80% of the hydropower

<sup>52</sup> Kyodo, *Asian Economic News*, September 17, 2001.

<sup>53</sup> Kengo Asakura, "Trans-Korean Gas Pipeline Could Help Asia Energy Security, Environmental Problems," *Oil and Gas Journal*, May 15, 2000.

<sup>54</sup> Report by German Gref, Minister for Economic Development and Trade of the Russian Federation at the plenary session of the First Russia-Japan Forum, May 29, 2001, Moscow. Available at <http://www.csr.ru/conferences/doclad.html>

<sup>55</sup> David G. Streets, "Environmental Aspects of Electricity Grid Interconnection in Northeast Asia," p. 3.



resources of the Russian Federation. In the long term, they can produce about 450-600TWh of electricity annually, which is about 45% to 60% of the electricity generated in Japan or China in 1995.

The Far Eastern region's hydroelectric power potential is estimated at 300TWh and only 6% is developed or in the planning and construction stages, compared with 33% for Eastern Siberia. If adequate investment is secured, the seven hydropower projects currently under construction and those in the planning stage will generate up to 50TWh of electricity by the year 2010. Currently, excess power produced in Irkutsk and Krasnoyarsk regions is estimated at about 20 billion kWh. Together with the underutilized electric power output in Chitinskaya Oblast (after completion of the Kharanorskiy power plant) it could reach 25-30 billion kWh. This surplus energy will be even greater after the Bureiskaya hydropower station begins operating.

### Conclusions

In theory, hydroelectric power and other sources of electricity from Eastern Russia could allow the Koreans to gain from load sharing and the integration of power grids. An option could be a transmission line connecting these three areas, including the site of the nuclear reactors. Also, in theory a cross-border high-voltage transmission line between Eastern Siberia, the Far Eastern region, and the Korean peninsula would improve power supply reliability, contributing to KEDO's implementation. The real issue, however, is that the concept of power interconnection to supplement the KEDO project appears as complex and long-term as the concept of KEDO itself.

On the positive side, we find a rather convincing attitude expressed by experts from South Korea that the nuclear power plant in North Korea would enhance incentives for cross-border energy cooperation between the two Koreas. This approach is based on an assumption that a reliable supply of a backup electric power for the two LWRs and larger and more stable power grid that are needed for safe and efficient operation can be provided by South Korea alone. This does not necessarily require the reactors' integration into the ROK-China-Far Eastern Russia cross-border system. Instead, the KEDO power plant could transmit all its output to the ROK, in exchange for several thermal power plants build in North Korea and assistance in gradual improvement of its power transmission grid and distribution network. Also, the DPRK could benefit more and at much earlier date because this approach envisions low-scale, dispersed imports of

electricity from ROK.<sup>56</sup>

Assisting the DPRK's energy sector rehabilitation definitely requires multilateral effort and mechanisms. By the same token, the potential benefits could be also felt by many. Indeed, the inter-Korean and trans-Korean "energy and infrastructure bonds," including railways, pipelines and power transmission lines would facilitate the flow of energy resources in the region, leading to peace and stability in Northeast Asia.

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<sup>56</sup> See Lee, Sang-Gon, "Energy Security and Cooperation in Northeast Asia," Paper prepared for the SPEC 2002, February 2002, Tokyo, pp. 11-12. See also Chung, Woo Jin, 2001. "Energy Co-operation between North and South Korea," June 2001, KEEI, Republic of Korea, pp. 6-7.