THE GEOPOLITICS OF ENERGY

IN

NORTHEAST ASIA

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Northeast Asia's configuration of energy resources is distinctive in international perspective. In contrast to North America or Europe, Korea, Japan, and Taiwan as a group lack a single significant oil or gas field among them. China has more energy resources, but they are generally located far from the energy-short and rapidly growing South and East of the country.

The region's supply patterns are also unusual. In contrast once again to North America and Europe, which have well-developed regional gas grids for piped natural gas, Northeast Asia has no such grid, and relies on liquefied natural gas (LNG) for the bulk of its gas supplies. Oil must come 7000 miles and more from the Persian Gulf, or from Southeast Asian fields, especially those in politically and economically unstable Indonesia.

Much of Northeast Asia has also been characterized by explosively rapid economic growth. This intensifies a steady expansion of regional demand that is simultaneously fueled by the highly energy-intensive character of the regional economy itself. Heavy, energy-intensive sectors such as steel, petrochemicals, fertilizer, and plastics fill a large share of local economies in the region, and automobile usage of the lighter distillates intensifies regional energy demand still further.

The key to the geopolitics of energy in Northeast Asia is clearly the Korean peninsula. Russia, to the North and East, possesses nearly one third of global natural gas reserves, yet has no way to easily supply the rapidly rising demand of China, Korea, and nations further south, in the absence of a regional gas grid. Such a grid would, under normal circumstances, naturally traverse Korea. The alternative, of course, is the Middle East, nearly one third of the way around the world, with profound instabilities of its own.

Korea's energy future has many dimensions, conceptualized in a broad variety of ways. To engineers it can be a problem in boiler efficiency and reactor safety. To energy economists it is an issue of tradeoffs among fuel sources such as coal, natural gas, and nuclear power.

. For economists with structural perspectives, energy is a constraint on economic growth in North Korea.[1] To specialists in regional integration it is a catalyst for bringing Northeast Asia together. And for many security analysts and policy makers, it is a lever for simultaneously blocking dangerous nuclear proliferation, and subverting unwanted geopolitical change.

The central economic and security elements of the North Korean energy equation are inseparable in policy terms. Nuclear proliferation in North Korea, a security problem of global importance, deserves its central place in the minds of policy makers. Yet for analytical purposes it is important to dis-entangle economic and security aspects of the energy problem without denying their legitimate policy interdependence. North Korean politics, after all, could change radically over the coming years, altering the security equation profoundly. Yet the DPRK's resource endowments, which must inevitably shape economic calculations, will remain constant.

Amidst the myriad uncertainties of the North Korean energy equation, one strong likelihood is that the Korean Peninsula Energy Organization (KEDO), as presently constituted, has little future. Much of the U.S. Congress, not to mention the Bush Administration, has been consistently skeptical of KEDO, and cooperation with North Korea has never had much constituency in the United States in any case.[2] The program has, to be sure, survived a remarkable number of crises in the relations of its member nations with North Korea, including the North Korean submarine incursion into South Korean waters in the fall of 1996, and the North Korean Taepodong missile launch of August, 1998.[3] Yet KEDO will find it much harder to survive the major, direct violation of the Agreed Framework involved in North Korea's covert HU program, especially given the suspension of the heavy fuel oil supply program (December, 2002), the extended suspension of reactor construction activities (from November, 2003), the lack of U.S. Congressional budgetary authorization for future operations, and the continuing heavy skepticism in the current Administration regarding a seemingly dis-functional institution inherited from the past.

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[1] Known formally as the Democratic People's Republic of Korea (DPRK), a term that will be used inter-changeable with North Korea in this paper.

[2] Leon V. Sigal. Disarming Strangers: Nuclear Diplomacy with North Korea. Princeton: Princeton University Press, 1998.

[3] On the details of these incidents, and their impact on KEDO, see Scott Snyder. The Korean Peninsula Energy Development Organization: Implications for Northeast Asian Regional Security Cooperation. Vancouver: University of British Columbia North Pacific Policy Papers Series, No. 3, 2000. Accessed at http://www.iar.ubc.ca/pcaps/pubs/snyder.pdf on February 1, 2004.

Over KEDO's more than seven years of operation, from its establishment in March, 1995 until the HU program revelations in late 2002, that tri-national organization did, to be sure, quietly foster useful interpersonal networks between North Korea and the broader world, while scoring important technical accomplishments in consolidating U.S.-Japan –Korea triangular relations. There are also substantial sunk costs that—rhetoric aside—it is rational to recoup. The United States has expended over $700 million on heavy fuel oil supplies to North Korea, and on the administrative costs of running KEDO. South Korea and Japan have together already invested well over $1 billon in construction of a now partly-built light water reactor in Kumho, North Korea.[4]

Future international efforts to cope with North Korea's energy problems can reasonably build, either figuratively or even literally, on these foundations. Yet the duplicity in the covert North Korean HU program, coupled with the economic irrationality of much of the 1994 Agreed Framework that established KEDO, and domestic political controversies regarding the organization in virtually all of the participating nations, make it likely that KEDO will need to be scrapped and re-configured. There is thus a pressing need for a "post-KEDO framework" for North Korean energy—the analytical focus of this paper.

This essay begins with a brief overview of North Korea's current energy situation. It then places the DPRK in broader national and regional context, focusing on prospective energy ties with neighboring South Korea, Russia, and China. This framework will highlight the important ramifications beyond North Korea of the energy-policy choices now being considered for the DPRK itself, particularly relating to natural gas and a Northeast Asian electric-power grid. The paper then reviews and evaluates KEDO and the Agreed Framework on which it is based, stressing the current need for new policy options, and the felicitous opportunity which the six-party talks afford to consider them. Integrating economic and political considerations for Korea as a whole, the paper outlines elements of a post-KEDO approach to North Korean energy, building on the hard experience of the past while considering emerging imperatives.

[4] KEDO Annual Reports, and New York Times, February 3, 2004.

North Korea's Dire Current Energy Realities

North Korea has, like South Korea, historically had a high energy-use economy.[5] Primary commercial energy use in the DPRK was approximately three times the level of China in 1990, and about half the level of Japan, which had a GDP per capita twenty times as high as North Korea at that time.[6] North Korean energy use has been relatively high for three reasons: (1) industrial structure, with a high concentration of energy-intensive sectors like steel and fertilizer production; (2) inefficient use of fuels, due to obsolete equipment, as well as lack of market pricing; and (3) reliance on relatively less efficient fuels, such as coal, as a source of energy. This high energy intensivity of the economy, together with poor underlying energy resource endowments and the importance of energy to North Korea's military, make energy a priority concern for the DPRK's political-military leadership.

North Korea's domestic energy situation needs to be considered in terms of four basic aspects: (1) supply of basic energy; (2) electric power generation; (3) electric-power transmission; and (4) secondary energy usage apart from electric power. The DPRK's circumstances are dire along all four dimensions, and the energy problems that it confronts in all these areas are inter-related. Yet the nature of the difficulties involved is somewhat different in each area.

In terms of basic energy supply—that is, the availability of coal, hydro-electric power, oil, natural gas, and nuclear power—North Korea's energy insecurities are broadly similar to those of South Korea, Taiwan, and Japan. North Korea has, for example, no operating oil fields, although there have been some modest positive seismic surveys by Sweden's Taurus Petroleum and Singapore's Sovereign Ventures, mostly since mid-2002. A Norwegian firm, Global Geo Services, reportedly contemplates initial offshore seismic work in the first half of 2004.[7]

Most of North Korea's neighbors experience underlying energy-resource scarcity similar to that of the DPRK itself. Indeed, there is not a single major producing oil field in the vast, economically powerful swath of Northeast Asian territories stretching from Hokkaido and the rest of the Japanese archipelago, across the Korean peninsula, to the southern tip of Taiwan.[8]

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[5] Marcus Noland. Avoiding the Apocalypse, p. 143; and Kent E. Calder. Korea's Energy Insecurities, pp. 2-9.
[6] Marcus Noland. Avoiding the Apocalypse, p. 144.
[7] U.S. Department of Energy. International Energy Outlook, 2002 edition.
[8] See Kent E. Calder. Pacific Defense. New York: William Morrow and Company, 1996, Chapter I.

And there are no major natural gas fields either. With respect to oil and gas, the economies of Northeast Asia are all heavily dependent on the politically volatile Middle East. For North Korea, Iran is an important traditional energy supplier, as well as political-military ally, even though it is 7000 miles distant from Pyongyang.

With virtually no indigenous oil or natural gas production, North Korea's only substantial domestic fossil-fuel source is coal. The DPRK has substantial reserves of anthracite and lignite coal, mostly produced from underground mines.[9] This domestic coal is North Korea's main fuel for electricity generation, but coal mining *itself* usually requires electricity for lighting, jackhammers, and moving coal out of the mines. In addition, many important coal seams are actually beneath the seabed, especially off the western coast near Anju, and require sea water to be continuously pumped out for the mines to operate. Several of these mines were flooded in the mid-1990s. Even the coal that can be produced is uneven in quality, creating significant operational problems, especially for new coal-fired power plants.

In 2001 coal provided about 86 percent of North Korea's primary energy consumption, a share that has been rising as the country's isolation from the broader world has intensified since 1990.[10] Yet estimated coal output in the DPRK declined more than 50 percent between 1990 and 1996, and has probably declined considerably more since then.[11] Coal shortages thus contribute substantially to North Korea's overall energy problem, even though the country has, ironically, relatively plentiful domestic coal supplies. What coal there is often proves to be of uneven quality. In addition, most coal supplies for coal-fired power plants are transported by rail, like 90 percent of North Korean freight cargo generally, so chronic problems with rolling stock and railroad safety further constrain electricity production. As a consequence, most coal-fired plants in the DPRK operate well below capacity, due to difficulties in securing suitable inputs.

Electric-power generation is a second serious domestic energy problem that North Korea confronts. In 2001, hydro-electric power plants generated about 69 percent of North Korea's electricity, and thermal plants 31 percent.[12] All except one thermal plant, which relies on the heavy fuel oil that the United States has been supplying to the North since 1995 under the KEDO agreement, is coal-fired, and thus subject to the difficulties described above. As much as 85

[9] David Von Hippel, Peter Hayes, Masami Nakata, Timothy Savage, and Chris Greachen. Modernizing the US-DPRK Agreed Framework: The Energy Imperative, p. 12.
[10] U.S. Department of Energy. Country Analysis Brief: North Korea, p.1.
[11] Ibid., p. 10.
[12] Ibid., p. 2.

percent of the DPRK's hydro-electric capacity has also been damaged by flooding.[13] Overall, as little as 20-30 percent of installed capacity for electric-power generation may actually be operable.[14]

Electric-power transmission is, as noted, a third major domestic energy supply-difficulty. North Korea's original power grid was created in Japanese colonial days, well over sixty years ago, and was decimated during the Korean War. Refurbished by the Soviet Union in the 1960s and 1970s, it has had inadequate servicing since the collapse of the USSR more than a decade ago. The lack of spare parts, scavenging of metal (as barter for food) from remote lines in the countryside, and general physical deterioration have severely degraded the system. Power outages are thus common throughout the country, including even Pyongyang, and energy loss through inefficient transmission is enormous.

The poor state of North Korea's power transmission grid has major implications for the functional role of the Agreed Framework and KEDO in North Korea's relations with the world, as will be seen. The grid is in such a deplorable state of disrepair that the light-water nuclear reactors to be provided through the KEDO framework could not be connected to the grid without raising major safety problems. Without an extensive modification of the grid and a connection to another system, such as that of South Korea, Russia, or China, the promised nuclear reactors could not be used. Additionally, as von Hippel and Hayes point out, light-water reactors (LWRs) need a stable source of backup power for coolant pumps and other equipment, and must be operated such that the sudden loss of load is kept to an absolute minimum.[15] Neither of these requirements could be met with the DPRK grid as it is currently configured.

North Korea's energy problems are even more acute outside the electric-power sector than within it. Since 1990, when China and the former Soviet Union began demanding payment at commercial rates in hard currency for oil, crude oil imports into North Korea have dropped by roughly 85 percent.[16] China has also recently been using oil supplies as a strategic lever, reportedly suspending pipeline deliveries for three days in early 2003, to protest North Korea's HU (highly enriched uranium) nuclear program.

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[13] Vladimir I. Ivanov. North Korea, KEDO, and Russia, p. 13.
[14] David von Hippel et. al. Modernizing the U.S.-DPRK Agreed Framework: The Energy Imperative, p. 13.
[15] U.S. Department of Energy. Country Analysis Brief: North Korea, p. 12.
[16] Selig S. Harrison, "Gas and Geopolitics in Northeast Asia", World Policy Journal, Winter, 2002-2003, p 31.

Oil shortages have immobilized important industries dependent on petroleum, including fertilizer factories. These bottlenecks have in turn precipitated low agricultural production, intensifying the impact of the 1995-1996 famines. Oil shortages also shut down tractor operations and many of the power generators in rural areas that were needed to run irrigation pumps.

The energy sector of the North Korean economy, in short, is in a highly precarious state. Underlying resources are scarce outside the coal sector, and production and distribution of coal itself are antiquated and inefficient. Moreover, the energy generation and distribution systems themselves are close to non-functional.

Implications for the North Korean Political Economy and Beyond

Energy is clearly North Korea's Achilles Heel. Neither its military nor its organized civilian economy can function effectively without adequate energy supplies, for any prolonged period.. Therein lies both the danger and the opportunity for the broader world, in addressing North Korea's energy problems. Ignoring the security dimensions of energy could make North Korea prospectively more dangerous as an adversary, and enhance its ability to aid subversive and even terroristic efforts by others. Yet failing to see the positive contribution that energy cooperation with North Korea could make, under the right security circumstances, to Northeast Asian and indeed global economic growth would be equally short-sighted. It is thus crucial to stand back and assess the linkages between North Korean energy and broader national, regional, and global concerns.

Energy shortages have clearly inhibited economic growth in recent years. They have, for example, complicated rail and motor transport, as well as industrial production. The lack of energy also contributed to the chronic food shortages of the mid-1990s, through their impact on fertilizer production, which helped contribute to the massive famines of 1995-1996.

Beyond North Korea itself, the DPRK's energy situation has broader implications for nations throughout the North Pacific. For the United States, of course, the central concern is security-related: the potential of North Korean nuclear programs for generating fissile materials that might be used as warheads and other explosive devices, either by the North Korean military or by terrorists. For Russia, China, and South Korea, an additional, and often more immediately expressed concern is more cooperative: the prospect of addressing North Korea's energy

problems through regional solutions such as natural-gas pipelines and electric power grids, potentially transiting North Korea, and thus transforming South Korea from a geo-strategic island, as it has been for over half a century, into an interactive part of the Asian continent.[17]

Concretely speaking, the resolution of North Korea's energy problems could potentially be linked to the broader resolution of the entire Northeast Asian region's fundamental energy need: to diversify its supply of energy away from oil, and away from heavy dependence on the Middle East. Northeast Asia is, after all, the only major region of the industrialized world without a well-developed natural-gas grid, and the region has a correspondingly low reliance on that highly attractive fuel source: natural gas.

As is suggested later in greater detail, there are strong complementarities between South Korea and China's rapidly rising energy demand, on the one hand, and the massive natural gas reserves and hydro-electric power potential of Siberia, on the other. This equation could be resolved through pipelines and power grids someday transiting North Korea, once the nuclear crisis is resolved. Virtually all parties to the ongoing six-party talks on North Korean nuclear issues—which after all represent the major participants in the prospectively integrated Northeast Asian energy economy of the future-- also have economic interests in a cooperative resolution of the nuclear crisis. Such a resolution should rationally involve large new infra-structural projects in the area of energy.

KEDO as a Vehicle for Addressing Northeast Asian Energy Issues

KEDO, it is increasingly clear, does not and cannot, in its present form, address North Korea's central energy problems, pressing as they clearly are. It emerged originally to defuse a security crisis, rather than to address an economic agenda. KEDO's deficiencies as a vehicle for resolving energy problems—together with its subtle value as a forum for mid-level technical communication with North Korea—are clear from a brief review of that fragile, controversial organization's origins and original mandate.

KEDO emerged from a long history of confrontation, and North Korean belligerency, on the Korean peninsula. In the spring of 1993 North Korea test-fired a potentially nuclear-capable

[17] On the geopolitical transformations implicit in a changing relationship of North Korea to Northeast Asia, see Kent E. Calder, "The New Face of Northeast Asia", Foreign Affairs, January-February, 2001, pp. 106-122; and Samuel S. Kim and Tai Hwan Lee. North Korea and Northeast Asia. Lanham, Maryland: Rowman and Littlefield Publishers, 2002.

missile, the Nodong 1, into the Sea of Japan, and threatened to withdraw from the Nuclear Non-Proliferation Treaty. In May, 1994, the DPRK defied the anti-proliferation regime by removing spent fuel from its experimental reactor at Yongbyon, thus making verification of its nuclear stockpile impossible, and precipitating a major crisis with the United States. After a confrontation that came, in the view of many participants and observers, perilously close to war, Jimmy Carter and Kim Il-sung achieved a breakthrough in informal discussions leading ultimately to the formal Agreed Framework of October, 1994. Even the negotiators of the agreement admitted it to be imperfect, viewing it only as the best among many imperfect options. At its heart were calculated ambiguities that made it controversial and difficult to operationalize from the start.

KEDO itself was created in March, 1995 to implement the Agreed Framework between the United States and the DPRK, under which North Korea agreed to freeze and ultimately dismantle its existing nuclear program. In return KEDO was to provide the DPRK with alternative sources of energy, in the form of two 1,000 megawatt light-water reactors, by a target date of 2003, and 500,000 metric tons of heavy fuel oil annually until the reactors were operational, to replace the potential energy supply from the suspect nuclear projects on which North Korea was to suspend construction under the Agreed Framework. Upon completion of the reactors, North Korea was to begin repaying the cost of these new reactors over seventeen years, after a three-year grace period.

Effectively, the Agreed Framework, upon which KEDO was and is based, traded ambiguity about past North Korean nuclear activities for a cessation of future activities. It thus postponed the "moment of reckoning" about the North Korean nuclear program, and gave the North for nearly a decade the advantage of a certain strategic ambiguity which that militant, yet vulnerable, economically depressed, and isolated nation found valuable in balancing the growing relative power of the outside world.[18] The moment of truth under the agreement was to come around 2003, when KEDO was obligated to deliver the reactors, and the North Koreans would be obligated to submit to unrestricted IAEA inspections to which they had previously been highly resistant.

[18] Marcus Noland. Avoiding the Apocalypse, p. 152.

Once formally established, KEDO experienced a long series of political frustrations[19], rooted partially in the ambiguous character of the Agreed Framework, and partially in the broader relationships between the US and the DPRK themselves. As Scott Snyder has pointed out, early tactical mistakes by the Clinton Administration, chiefly in consultations with Congress, or the lack thereof, may well have compounded KEDO's problems.[20]The Congress was never enthusiastic about either the Agreed Framework or KEDO, voting to provide only half the money needed to purchase the heavy fuel oil in 1996, and in 1998 came close to appropriating no funds at all.

On its side, the North clearly poisoned the atmosphere for cooperation with its Taepodong missile launch of August, 1998, and by minor yet politically damaging steps such as demanding exorbitant salaries for the workers detailed to the Kumho reactor-building project. And the final blow to the Framework was North Korea's admission in October, 2002 of its continuing covert HU(heavy uranium) nuclear program, a step which led to freezing of heavy oil deliveries in December, 2002, and the one-year freeze on the Kumho reactor project in November, 2003.

Overall, to be sure, the KEDO project has achieved a few modest successes. It has slowly and quietly built unprecedented interpersonal networks, mainly of technical specialists, between North and South Korea. It has likewise established previously unknown forms of direct communication, including an air link between Yangyang airport in South Korea and the reactor project site at Kumho in the North, initiated on October 15, 2002, and a training program for North Korean workers. It has stationed eight KEDO employees on site in North Korea for the past several years, and installed flow meters at seven North Korean power plants, to monitor the flow of heavy fuel oil, provided by the United States under the agreement.[21]

The KEDO framework also has the important geopolitical merit, from an American perspective, of providing a framework for trilateral interaction among the United States, Japan, and South Korea on Northeast Asian issues. In contrast to the four-party framework inherited from Korean War armistice negotiations (US, PRC, ROK, and DPRK) that it succeeded, KEDO's tri-lateralism has provided an unprecedented opportunity to consolidate the

[19] On the details, see Jonathan D. Pollack, "The United States, North Korea, and the End of the Agreed Framework", Naval War College Review, Summer, 2003, pp. 11-49.and Marcus Noland. Avoiding the Apocalypse, pp. 151-170.
[20] Scott Snyder. The Korean Peninsula Energy Development Organization, pp. 21-22.
[21] See Korean Peninsula Energy Development Organization. Annual Report, 2002 edition. Accessed at: http://www.kedo.org/ on February 1, 2004.

comprehensive security relationship among US allies in Northeast Asia. It gave birth to the TCOG consultation talks among ranking US, Korean, and Japanese officials that since the North Korean missile test of 1998 has become a significant part of diplomacy in the North Pacific. This process, however, is now well-institutionalized, and is in no sense reliant on KEDO for future momentum.

Despite the modest technical successes, and the opportunity for US-ROK-Japanese tri-lateral dialogue that it has provided, however, KEDO has failed, perhaps unavoidably, given its small staff, precarious mandate, and lack of enforcement and monitoring capacity. It failed, in particular, to prevent North Korean subversion of the Agreed Framework, through its 1998 missile test or, more seriously, through the covert HU program. Since December, 2002 heavy fuel oil deliveries to the North have been suspended, and since November, 2003 construction on the Kumho reactor project itself has been in abeyance. Given KEDO's original imperfections, as a result in significant part of the crisis circumstances in which it originated, the irrelevance of its original time framework, and its loss of legitimacy due to persistent violations of its provisions, the KEDO framework should be seriously re-thought and revised, to make it relevant to the new circumstances of Northeast Asian energy now emerging.

New Options for the Future

As suggested above, there are serious problems with KEDO, and the Agreed Framework on which it is based, as a comprehensive blueprint for North Korea's energy future. With fuel-oil deliveries and reactor construction at Kumho now suspended, and with six-party talks on the nuclear question in progress, the time is right to think analytically and dispassionately about what sort of mechanism should supplant KEDO. Clearly it should capitalize on KEDO's achievements in network building, and on sunk investments already made, while addressing North Korea's acute energy problems *more directly, fundamentally, and efficiently* than KEDO has done.

The original Agreed Framework made no provisions regarding connection of the two 1,000-megawatt reactors to be built under the agreement and North Korea's electric power grid. Indeed, both differences in technical standards and recent degredation of the network would make it both technically difficult and quite dangerous to attach the Kumho reactor currently under construction, or its prospective counterpart, to the North Korean grid. The power to be produced through the KEDO venture could presumably be exported to South Korea or elsewhere in the world, but it would be very difficult to use within the DPRK itself.

At a projected cost of $5 billion, the two large reactors contemplated under KEDO would be both extremely expensive, and virtually impossible to connect to the North Korean power grid, as suggested above.[22] To be sure, roughly $1.5 billion has already been expended on the construction of the first reactor, which has been ongoing since 1996. These sunk costs, and the possibility of exporting the power produced to South Korea or elsewhere in the region, once a modernized regional grid is established, would plausibly justify completion of at least one reactor. Yet cancellation of the second reactor, and its substitution for more rational energy infrastructure, should definitely be a central element of any post-KEDO arrangements.

The indispensable condition for any alternatives to KEDO—indeed, for any form of continued energy cooperation with North Korea at all—must be a verifiable non-proliferation agreement. Provided that such an agreement is forthcoming, the nuclear dimension of the energy-support program should be scaled down. In place of this, the over-riding imperatives are two-fold: (1) to modernize the North Korean electric power grid, with an emphasis on increased efficiency, and (2) to proceed, in a related fashion, with pipeline proposals that would allow both North and South Korean access to Russian gas. This could be used in part to generate much needed electric power.

Natural gas is one of the most energy efficient and environmentally attractive energy sources in the world, in the view of ever-growing numbers of energy experts worldwide. Yet Korea, like its Northeast Asian neighbors, uses relatively little gas, despite that fuel's intrinsically attractive properties. Only 12 percent of South Korea's primary energy is derived from gas, compared to about 21 percent in Germany, and 26 percent in the U.S.[23] Indeed, South

[22] These reactors, at around $5 billion, would reportedly cost more than the prospective cost ($3 billon to $3.5 billon) of the proposed Seoul to Sakhalin natural-gas pipeline. See Selig Harrison, "Gas and Geopolitics in Northeast Asia", World Policy Journal, Winter, 2002/2003, p. 33.
[23] BP Amoco. Statistical Review of World Energy, 2003 edition, p. 38.

Korea's total gas usage, as a share of overall energy consumption, remains significantly less than levels in Japan, despite a vigorous recent support policy in Seoul for natural gas.[24] In North Korea gas use is negligible.

There is thus considerable potential for expansion in gas consumption on the Korean peninsula as a whole, particularly in the North. And Russia is the logical source of supply. It has nearly one third of the proven natural gas reserves in the world, many of them located within commercial distance of the Korean peninsula. South Korea, to be sure, can easily access liquefied natural gas (LNG) from the Persian Gulf, and is, in fact, the second largest LNG importer in the world, following Japan. Yet Middle Eastern LNG is a much less attractive proposition for North Korea, for both geographical and infra-structural reasons.

There are three basic pipeline options between Russia and Korea. The simplest would run roughly 3200 kilometers from Sakhalin through the Russian Far East and North Korea, down the Korean east coast, toward Seoul. Japanese, and more recently American and Anglo-Dutch interests, have been discussing these reserves with the Russians since the mid-1960s.[25] The Sakhalin route, a central piece of the Soviet Union's Vostok Plan of the early 1990s[26], has substantial attraction to the Russians, since it could provide important gas infrastructure to major urban centers of the Russian Far East, such as Khabarovsk and Vladivostok enroute.

The second pipeline option—a longer and more complex route—would run from the massive Kovykta gas field, northwest of Lake Baikal, through Manchuria and either under the Yellow Sea or along the western coast of North Korea, toward Seoul. Two variants have been proposed: one via Mongolia, and a second solely within Russian and Chinese territory. The Chinese have strongly preferred the latter route, and have promoted it above other Russian pipeline alternatives, as it would provide fuel directly to Northeast Chinese urban centers, before passing on to Korea.

The third pipeline option between Russia and Korea, and the most attractive alternative to Sakhalin, from a Korean perspective, is the Sakha Republic (Yakutia) option. Yakutia is a sprawling area over 3000 kilometers north of Korea, covering one-fifth of the vast Russian

[24] Ibid. In 2002 natural gas provided 11.5 percent of South Korea's primary energy consumption, compared to 13.7 percent in Japan.
[25] William E. Burrows and Robert Windrem. Critical Mass. New York: Simon and Schuster, 1994, p. 435.
[26] See Mark Valencia and James Dorian, Multi-Lateral Cooperation in Northeast Asia's Energy Sector, pp. 5-7.

Federation (3.1 million square kilometers), but hosting a population of only 1.3 million people. Much of Yakutia's desolate Arctic and sub-Arctic terrain remains unprospected.

Initial recoverable gas reserves in Sakha/Yakutia are estimated at over 8 trillion cubic meters, at depths from one to four kilometers. Together with the massive South Pars field of Iran/Qatar, the Sakha fields are thus the largest gas fields ever discovered on earth. They could supply Korea, and potentially much of the rest of continental Asia as well, with natural gas for at least another half-century, at an estimated present-value development cost of around $20 billion.

This route has the considerable merit, from a Korean perspective, of being prospectively a Korea-centric, rather than a Japan-centric, concept, in contrast to Sakhalin. The Japanese, to be sure, held ten years of discussions during the Soviet era over Yakutsk gas, involving Bechtel and El Paso Natural Gas of the United States at one point. Yet disagreement over pipeline routes, liquefaction sites, and security (the Soviet invasion of Afghanistan) stalled the project. Since a dramatic January 1989 initiative by Chung Ju-Yung, founder of the Hyundai Group, South Korea has been a central player with respect to Yakutsk. [27]

Chung's bold notion, the basis on which discussions have since proceeded, was to construct a 3,200-kilometer gas pipeline across Russian territory near the Chinese border along the Amur and Ussuri Rivers, across North Korea, toward Seoul. Former Korean president Kim Young Sam and Russian president Boris Yeltsin jointly agreed to support a detailed feasibility study at their 1994 summit. Nevertheless, the project remains in abeyance. Uncertainties in enrgy demand and financing since the Asian financial crisis exploded in late 1997, including the collapse of the major chaebol Daewoo in November, 1999, compounded the short-run difficulties of proceeding further. Despite its long-term attractiveness, from a Korean point of view, the Yakutia option thus appears to have less short-term feasibility than the other two pipeline alternatives.

All of the three basic Russia to Korea gas pipeline options, it is important to note, at least consider the prospect of transiting North Korea. The ultimate locus of consumption, after all, is South Korea, and the source of supply is one of the three Siberian locations mentioned above—all located to the north of the Korean peninsula. In the absence of a verifiable nuclear non-proliferation agreement with the DPRK, it is obviously premature to move toward agreement on

[27] On the complex, frustrating history of these these Siberian and Sakhalin projects, see Keun-Wook Paik. Gas and Oil in Northeast Asia: Politics, Projects, and Prospects. London: Royal Institute of International Affairs, 1995, pp. 207-221.

a trans-North Korea pipeline, from any of the three major prospective sources of Russian gas, even though it would be cheaper than alternatives, and more attractive to most Korean parties concerned.

The recent international feasibility study on the Kovykta field, recommending a 4,887 kilometer, $12 billion pipeline under the Yellow Sea to South Korea—bypassing the North—was thus the correct decision.[28] Yet if North Korea is forthcoming on the nuclear issue, within the six-party talks framework or elsewhere, the issue of transit pipelines across North Korea, from either Kovykta or Sakhalin, or ultimately from Yakutia as well, should be re-visited. Indeed, they have prospectively strong political-economic merits that could make them the heart of a realistic "grand bargain" between North Korea and the nations of the North Pacific, provided that the nuclear issue is satisfactorily resolved. Such a "grand bargain", with natural-gas pipeline projects at its heart, and also involving a related modernization of the North Korean electric power grid and power generation systems, could be a highly constructive element of a broad, long-range Northeast Asian economic development plan.

From the perspective of North Korean economic development, as well as political preference, the Sakhalin route is definitely more attractive than Kovykta. The DPRK apparently fears that Beijing, with rapidly growing domestic demand for gas, and geopolitical leverage, would not be willing for very long to let Kovykta gas go to Korea.[29] Kim Jong Il has repeatedly conveyed his preferences for a Sakhalin pipeline to Russian President Vladimir Putin.[30]

One possible alternative to a gas pipeline—or a long-run supplement, should Korea's explosive growth in energy demand continue—would be a long-distance electric-power transmission line, of around 235 miles from Vladivostok in the Russian Far East, into North Korea. Russian hydro-electric potential is massive, and could help to ameliorate Korea's prospective energy shortages. The electric-power transmission line option would also be substantially cheaper than the long-distance gas pipeline.

The Northeast Asian pipeline options could be highly synergistic with North Korean energy development, addressing many of the problems discussed above. They could harness long-term *regional* energy imperatives to the solution of serious *local* North Korean infra-structural problems. Concretely, gas-fired power stations could be built along the pipeline route,

[28] On the details, see Gas Matters Today, February 3, 2004.
[29] Selig Harrison, "Gas and Geopolitics", World Policy Journal, Winter, 2002-2003, p. 30.
[30] Ibid.

with two 500-megawatt combined cycle stations, which combine optimal energy efficiency and positive environmental traits, compensating for the electric power prospectively foregone in the cancellation of one of the 1000 megawatt reactors contemplated under the KEDO agreement. Three such gas-fired stations were contemplated in the 2001 understanding between a consortium of three Dutch trading companies (one since acquired by Bechtel, although it has indicated a desire to scuttle the deal) and North Korea, and the underlying conception would seem to have economic logic.[31]

Another possibility would be building a network of smaller 250-megawatt gas-fired power stations along the pipeline route, connected to a series of small local transmission grids. This could be an alternative to constructing a large-scale national transmission grid, which would likely be much more expensive. Korean energy specialist Keun Wook Paik has calculated that it would cost roughly $1.4 billion to construct such a network of eight regional gas-fired power stations linked to a trans-North Korea pipeline and connect them with a decentralized transmission grid such as that discussed above.[32] At that cost, this proposal would be one third as expensive as the estimated total cost of the two over-sized reactors promised under the Agreed Framework, and much better adapted to North Korea's basic energy needs.

Northeast Asia at present is the one major region of the industrialized world that still lacks a regional gas grid, as noted above. As a consequence, the region has remarkably little reliance on natural gas, despite that fuel's many attractive properties. With a quarter of the world's population, the region has little more than five percent of its natural-gas usage.[33] Gas is, in particular, both a highly efficient form of energy, and environmentally friendly. Yet the costs of large-scale pipeline development could be massive.

While Japan does not appear likely to establish a national gas grid anytime soon, as such a grid could cost as much as $25-40 billion to build, calculations appear to be somewhat different in South Korea. Just in the past five years, South Korea has built a network of domestic pipelines that already surpasses Japan's, and is pursuing much more varied and ambitious uses for national gas than is Japan. Seoul, for example, has been promoting demand for natural gas through tax incentives, aid for introduction of natural-gas vehicles (NGVs) such as gas-powered buses, and

[31] On the details, see Selig Harrison, "Gas and Geopolitics", World Policy Journal, p. 32.
[32] Ibid., p. 33.
[33] Kent E. Calder. Korea's Energy Insecurities, p. 12. Figures are from The BP Amoco Statistical Review of World Energy, 2000 edition, pp. 26-27.

expansion of the domestic natural-gas grid. This growing gas network would appear to be establishing a solid economic basis for key Korean involvement in region-wide pipeline ventures in the foreseeable future—potentially including trans-North Korea pipelines.

The attractiveness for Korea of piped gas, as opposed to LNG or other fuel choices such as nuclear power, depends to an important degree on the inter-relationship between global energy prices and the progress of major North-South political-economic détente on the Korean peninsula itself. If global energy prices are predictably high, and the prospect of North-South détente with Korea is also strong, there is a strong political-economic rationale in Korea for rising dependence on Russian piped gas, and for the construction of the extensive Northeast Asian pipeline system that is often discussed. Conversely, if the political prospects are for North-South confrontation, the case for nuclear power may be strengthened.[34]

Apart from the economics of a natural gas-based alternative to KEDO's nuclear bias, there is also a geo-political rationale: one especially relevant under the assumption of a nuclear non-proliferation agreement, and intrusive inspections, as a precondition for the energy initiatives toward North Korea that are outlined here. The trans-North Korean pipelines contemplated here—like the railroads and regional electric-power grids also frequently discussed—would transform North Korea (or a united Korea that could well succeed it) from an outsider in the regional political economy into a central player. North Korea's crucial transit role for a panoply of infra-structural projects, including pipelines and railways, as well as trans-national electric power grids, would yield it ongoing revenue, to offset the otherwise depressed state of its domestic economy. Yet this transit role would also provide—through the advantages it would bestow on neighboring nations—positive international economic leverage for a transformed North Korea as well. This leverage would compensate, at least in part, for the increased vulnerability that the DPRK or a successor state would experience through abandonment of its nuclear program. It would clearly provide a much healthier basis for political equilibrium in the region than would otherwise exist, if the North continued to rely, as it has done for so long, purely on military might and brinkmanship to gain recognition from the broader world.

[34] On the political-economic assumptions involved, see Kent E. Calder. Korea's Energy Insecurities, p. 17.

CONCLUSION

Northeast Asia is clearly a region where energy and geopolitics come together to a remarkable degree, both due to regional shortages of energy and to the rapid pace of economic growth, which tends to make those shortages appear particularly urgent. . The heart of that interdependence is in North Korea. North Korea has faced a severe energy crisis over the past decade, along several dimensions: primary energy supply (apart from coal); electric power generation and distribution; and fuel for transportation. Indeed, energy has been the Achilles Heel of the economy as a whole, with energy shortages also crippling industry and agriculture. These shortages have inhibited North Korean military adventurism, to be sure, but they have also crippled economic growth, both in the DPRK and in surrounding areas.

KEDO helped defuse the dangerous military confrontation of 1994-1995, and helped reinforce the important triangular relationship among the US, Japan, and South Korea. It also helped forge delicate but often useful inter-personal ties, mainly technical, between North Korea and the outside world. Yet the organization could not forestall the covert North Korean HU nuclear program, and has been continually weakened by political cross-fire. Given the inappropriate energy choices with which it started, the body needs to be fundamentally transformed, with due consideration for the sunk-costs and the residual benefits involved.

A post-KEDO energy development body for North Korea should of course include all the nations involved at present as central members of that organization, with a central role for the United States. To elicit needed political support in the United States, any successor will also need to provide significant commercial opportunities for American firms, and at least some jobs for American workers. Yet a successor body to KEDO should also broaden to include Russia and China in more systematic ways. With a more substantial mandate centering on developmental issues such as trans-national natural-gas and electric-power grids that naturally involve neighboring nations as well as North Korea, such a post-KEDO body could reasonably expect to avoid the nuclear-power specific resentments and sourcing difficulties that have rendered relationships between KEDO and its massive neighbors so complex. By including all the nations now involved in the six-party talks on the North Korean nuclear crisis, a “KEDO II” could also appropriately institutionalize that six-party forum to promote the long-term energy development of the Northeast Asian region as a whole.

A new Northeast Asian energy-development body, based on the emerging six-party talks framework, should keep its energy-specific character, but broaden its mandate, and focus particularly on the development of natural gas resources in the region. While one of the 1000 megawatt nuclear reactors proposed under the Agreed Framework should be continued, due to sunk costs, the other should be cancelled, and a systematic network of medium-scale gas-fired power plants, connected to a trans-Korean pipeline grid, should be substituted in its place. All such planning, of course, needs to be contingent on a resolution of the nuclear crisis consistent with the imperatives of global security.

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