HOW PYONGYANG’S STANCE ON THE PROVISION OF LIGHT WATER REACTORS HAS EVOLVED OVER THE TWO NORTH KOREAN NUCLEAR CRISSES

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in Security Studies

By

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Introduction

North Korea’s interest in securing light water reactors in exchange for dismantling its nuclear programs in Yongbyon has long been at the heart of the international negotiations on the DPRK’s denuclearization. However, this topic has not received a devoted attention it deserves. In academia, most academic literatures or research designs are focused on the North’s motivation for going nuclear or the current status of North Korea’s nuclear weapons program. Although some researchers have been interested in a light water reactor project, they paid attention to how to safeguard the civilian nuclear reactor (Michael May et al., 2001), or how to secure international support for the success of the reactor project (Hyungjung Park et al, 2003). In the policymaking community, the failed experience of the Agreed Framework and the overwhelming skepticism about Pyongyang’s willingness to abandon its nuclear weapons program seemed to render discussions of Pyongyang’s aspiration for a light water reactor project somewhat futile.

However, exploring North Korea’s interest in the provision of light water reactors provides a valuable insight into the new aspects of North Korean nuclear crises. In this study, Pyongyang’s security concerns and energy shortage, both of which have been counted by the North Koreans themselves as the main drivers for the North to develop its indigenous nuclear programs (Wit, Poneman and Gallucci, 2005), are adopted as the two independent variables to explain Pyongyang’s interest in securing a light water reactor project. If Pyongyang’s security concerns and energy shortage combined with each other can explain its interest in securing light water reactors, researchers and policymakers have
to review whether an ‘all-for-all’ approach, such as ‘dismantling’ the existing nuclear programs ‘for’ the ‘construction’ of new light water reactors, is workable, in that Pyongyang might not be willing to give up either of them.

At this critical juncture for the Six-Party Talks process on its way to either the third phase of the DPRK’s denuclearization or its collapse to another “failed diplomacy,” this study will raise important questions to consider for the policymakers of the states-concerned.

**Working Hypotheses: Dependent and Independent Variables and Causal Mechanism**

This research aims to explore how North Korea’s position on the provision of light water reactors has evolved over the two North Korean nuclear crises as well as what factors have affected Pyongyang’s stance how. *As a dependent variable*, the DPRK’s position on the light water reactor project is measured by what Pyongyang was willing to trade for the light water reactors in the negotiations that purportedly defused the North’s nuclear crises, and how Pyongyang has implemented the agreements settled in the negotiation. These indicators will provide a valuable insight into what North Korea has wanted to get from a light water reactor project. *As independent variables*, which have affected the North’s stance on the provision of civilian nuclear power plants, this research will explore: North Korea’s security concerns and the energy situation in the North.
Causal mechanisms are laid out according to the independent variables as follows. Firstly, Pyongyang’s security concerns are shaped by its shifting relationships with other states, particularly Moscow, Washington, Beijing, Seoul and Tokyo. They result from fundamental changes in the international political structure, such as the end of the Cold War, or hostile policies on the North of other state(s). If the North Korean regime perceives such changes in its external relations as negatively affecting its survival, North Korea will be more willing to engage in dialogues with the state(s) capable of addressing its security concerns. However, mutual distrust between the North and the engaging state(s) will make Pyongyang reluctant to give up its leverages over its negotiating partner. In this way, as North Korea’s security concerns are exacerbated, it will be more willing engage diplomatically, present a proposal for cooperative behavior on the condition of being provided with light water reactors, but leave the details of ‘cooperative behavior’ ambiguous or narrowly defined (Hypothesis 1).

Secondly, the energy situation will have a mixed impact on the North’s position on a light water reactor project. If Pyongyang finds its energy situation gets worse off, it will be more willing to secure the promise and actual provision of light water reactors as an efficient and stable source of energy. However, if the North perceives that the energy shortage poses so serious a blow to its economy that it cannot wait until the reactors are constructed, it will be more interested in readily available “alternative” energy resources, “conventional energy” such as heavy fuel oil. Until its energy need is significantly addressed, North Korea will be more enthusiastic about securing foreign assistance for non-nuclear energy resources rather than moving forward to secure construction of light
water reactors which are time-consuming and thus not readily available. Such a causal mechanism can be summarized in a hypothesis that if North Korea’s energy situation is getting more deteriorating and destabilizing, it will be more interested in short-term benefits of a light water reactor deal, in terms of external assistance with readily available energy resources, rather than the longer-term and ultimate benefits of the deal in terms of the provision light water reactor in the end (Hypothesis 2).

**Methodology**

This study adopts a process-tracing approach within the case of North Korea’s negotiations and settled agreements with external powers on the provision of light water reactors in return for Pyongyang’s cooperation in its own denuclearization. It draws from broad academic literature, governmental statements, policy papers or statistical databases of the states-concerned and relevant news releases on a North Korean light water reactor deal. The research also refers to the negotiation records publicly available in the form of memoirs of the former or incumbent government officials of states-concerned who were/are involved in dialogues with North Koreans.

However, due to the opacity of the North Korean society, it should be noted that the literature review reveals its limits on how accurately it addresses the reality Pyongyang has faced. In this regard, in order to fill the gap between the literature and the reality in North Korean affairs, the author conducted 5 interviews with the former and incumbent
government officials of the states-concerned who have experience to talk to their North Korean counterparts, as well as other North Korean experts. Due to their request on the condition of anonymity, their statements are quoted with only brief connotation of the interviewee. While some interviews were conducted in person, others were done via e-mail. Each interview used standardized interview questionnaire which contains questions common to all interviewees as well as those specially tailored according to the interviewee’s field of expertise. It also should be noted that their statement does not reflect the views of their organization but their own opinions.

**Definitions and Other Background Discussions**

1. *Light Water Reactors and Graphite-Moderated Reactors*

Like conventional thermal power stations which generate electricity by harnessing thermal energy released from burning fossil fuels, nuclear power plants convert the energy released from the atomic nucleus during a process called ‘nuclear fission’. In this process, the atomic nucleus, in particular that of fissile material such as uranium-235 and plutonium-239 absorbs a neutron, causing splits of the atom into smaller nuclei with the release of gamma radiation and free neutrons. Some of these neutrons may be absorbed later by other fissile nucleus, creating more fissions and neutron releases which might

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trigger the chain reactions.  

These chain reactions are initiated, controlled and sustained in a nuclear reactor at a steady rate for the safe and stable power generation with the use of ‘moderator.’ Light water reactors and graphite-moderated reactors are different in what is used for their moderator. While light water reactors use ordinary water to be moderated and cooled down, graphite-moderated reactors depend on graphite as its name indicates. North Korea’s 5 NW(e) nuclear reactor in Yongbyon as well as unfinished 50 MW(e) and 200MW(e) reactors are gas-graphite ones the North Koreans have indigenously developed with the use of its abundant reserves of graphite and uranium ore.

2.  

Proliferation Resistance of Light Water Reactors

One of the reasons Washington agreed to replace North Korea’s 5 MW(e) graphite-moderated reactor in Yongbyon with new light water reactors under the Agreed Framework is that light water reactors are more proliferation-resistant than graphite-moderated reactor.  

Chemical reprocessing of spent fuel rods removed from the reactor core produces plutonium, one of the fissile materials used in nuclear weapons.

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Light water reactor proponents maintain that light water reactor is easier to safeguard than graphite-moderated reactor on the ground of following reasons:

1) Reprocessing spent fuel from the light water reactors does not yield weapons-grade plutonium (isotopic composition: 3-7% plutonium-240).  

2) Reactor-grade plutonium (isotopic composition: 18-30% plutonium-240) separated from the light water reactor spent fuel does not yield enough explosion to serve as a weapon.

3) Light water reactors should be shut down for the extraction of its spent fuel rods, thus allowing the easy detection from outside, unlike the case of on-line refueling of the heavy water or graphite-moderated reactors.

However, light water reactor is not proliferation-proof. As the proliferation concerns in the US raised suspicions that civilian nuclear technologies could be converted to serve the interests of proliferators, the aforementioned assumptions on the proliferation resistance of the light water reactors have been challenged on the basis as follows:

1) If the would-be proliferators have the enrichment technologies using the gas centrifuges, they can covertly divert and enrich fresh fuel rods for the light

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water reactors to obtain weapons-usable highly enriched uranium.\(^7\)

2) It is not technically impossible to improve the quality of the plutonium in the spent fuel to the weapons grade one - 90% content of the plutonium 239.\(^8\)

3) If the nuclear proliferators have ‘limited goals’ of causing chaos in the target society rather than to completely destroy the enemy’s retaliation capabilities, low-yield explosion of the reactor grade plutonium, will be destructive enough for them to achieve their goals.\(^9\)

3. **The DPRK’s Self-Reliance Energy Policy**

As a national ideology of North Korea, the concept of *Juche* or self-reliance

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\(^7\) Victor Gilinsky, Marvin Miller and Harmon Hubbard, *A Fresh Examination of the Proliferation Dangers of Light Water Reactors* (Washington: Nonproliferation Policy Education Center, 2004) pp.24-27

\(^8\) The isotopic composition of the plutonium in the LWR spent fuel, which affects the weapons usability of the plutonium, varies with the period of fuel cycles in which the fuel elements stay in the reactors. For example, assuming that the fuel rods are completely burn out in the 1,000 MW(e) Korean standard light water reactor for the full fuel cycle, namely 15 months, the spent fuel rods would contain only 57% of plutonium 239 along with high content of other isotopes, which reaches far below the threshold of weapons grade plutonium.\(^8\) If the reactor were operated for less than its normal cycle, let’s say 9 months, however, the burn-up of the fuel elements would be reduced and the quality of the plutonium in the spent fuel could be ‘improved’ to the weapons grade one - 90% content of the plutonium 239. Michael May et al., *Verifying the Agreed Framework*, (CA: Stanford University Press, 2001) [http://www.nautilus.org/DPRKBriefingBook/monitoringVerification/Stanford-Livermore-VerifyingtheAgreedFramework.pdf](http://www.nautilus.org/DPRKBriefingBook/monitoringVerification/Stanford-Livermore-VerifyingtheAgreedFramework.pdf)

\(^9\) Gilinsky and Miller, pp.24-27
emphasizes “the ability to act independently without regard to outside interference.” Adopted as a check against excessive Soviet or Communist Chinese influence under the leadership of Kim Il-sung, the founder of the DPRK, the concept of self-reliance has been reinterpreted from time to time for the regime’s need. According to Kim, *Juche* means “the independent stance of rejecting dependence on others and of using one’s own powers, believing in one’s own strength and displaying the revolutionary spirit of self-reliance,” geared to address North Korea’s contemporary goals—an independent foreign policy, a self-sufficient economy, and a self-reliant defense posture.

In terms of North Korea’s energy policy, self-reliance indicates relying on domestic energy resources rather than securing them through trade with other states. If the resources in need is scarce in North Korea and thus to be acquired only through foreign trade, Pyongyang restrains the consumption of the imported resources to the utmost extent and seeks to substitute domestic resources for the imports. In this regard, the DPRK has resorted to its abundant coal deposits and hydroelectric power plants for its power generation rather than its oil import. However, as its deteriorating economic situation rendered North Korea more dependent on the outside world for its energy and


humanitarian needs.

Evolution of North Korea’s Stance on the Provision of Light Water Reactors over the Nuclear Crises

_The First North Korean Nuclear Crisis and the 1994 Agreed Framework between the US and the DPRK_

The first North Korean nuclear crisis resulted from the international community’s concerns about Pyongyang’s alleged violation of its non-proliferation obligations under the Nuclear Non-Proliferation Treaty (NPT)\(^\text{13}\) and its resistance to accepting the IAEA’s special inspectors at its suspected nuclear facilities in Yongbyon. As tensions escalated with Pyongyang’s withdrawal from the NPT in March 1993 and the adoption of UN Security Council Resolution 825 in May 1993 urging the North to reconsider its decision,\(^\text{10}\)

\(^{13}\) The IAEA discovered a mismatch between the plutonium product Pyongyang declared in May 1992 in its Initial Report under the Safeguards Agreement and the Agency’s analysis on nuclear waste solutions and swipe sample from the radiochemical laboratory of North Korea. In the IAEA’s opinion, this implied that the DPRK separated more plutonium than it had stated in its Initial Report. The Agency demanded ‘special inspection’ of the two undeclared facilities which appeared to be related to the storage of nuclear waste. The IAEA hoped the analysis of the nuclear waste in these facilities would answer the question of the amount of plutonium North Korea had actually separated. David Fischer, “The DPRK’s Violation of its NPT Safeguards Agreement with the IAEA” _History of the International Atomic Energy Agency_, (International Atomic Energy Agency, 1997), “Fact Sheet on DPRK Nuclear Safeguard” _In Focus: IAEA and DPRK_ the International Atomic Energy Agency available at [http://www.iaea.org/NewsCenter/Focus/IaeaDprk/fact_sheet_may2003.shtml](http://www.iaea.org/NewsCenter/Focus/IaeaDprk/fact_sheet_may2003.shtml)
the United States and the DPRK held high-level talks to resolve the nuclear issues on the Korean peninsula. In the following, North Korea’s stance on trading its graphite-moderated nuclear facilities in Yongbyon for more proliferation-resistant light water reactors will be analyzed to test the hypothesized causal mechanisms based on the two factors: Pyongyang’s security concerns and the DPRK’s energy situation.

1. Pyongyang’s security concerns and its position on a light water reactor project in the first nuclear crisis

When the international outcry arose over the North’s suspected violation of the NPT in the late 1980s and early 1990s, international relations around the globe were undergoing fundamental changes never expected beforehand: the end of the superpower rivalry between the US and the Soviet Union, highlighted by the latter’s dissolution in 1991. The end of the Cold War posed unexpected challenges to the security of North Korea by placing Pyongyang in diplomatic isolation.

The end of the political, military and ideological competitions between the Western and Eastern blocs reduced the threat perceptions of nation-states with respect to one another. This enabled close cooperation between states which had been on different sides of the Iron Curtain. International relations around the Korean peninsula were no exception. Diplomatic relations were established between Moscow and Seoul as well as between Beijing and Seoul, driven by the economic benefits Russia and China expected to enjoy from their ties with Seoul and by diplomatic initiative Seoul expected to get in its
relationship with the North through the support of Pyongyang’s close allies.\textsuperscript{14} However, without corresponding breakthrough in the US-DPRK and Japan-DPRK relations, Pyongyang was put under diplomatic isolation. Washington still maintained multi-layered economic sanctions against North Korea, designating North Korea as “a threat to US national security,” “a state sponsor/supporter of international terrorism,” and “proliferators of weapons of mass destruction.”\textsuperscript{15} Japan-DPRK negotiations initiated by Pyongyang’s offer for talks on normalizing bilateral ties in 1991 finally broke down in November 1992 over Tokyo’s allegation that North Korea had kidnapped of Japanese citizens.\textsuperscript{16} In addition, Moscow and Beijing began to emphasize reciprocal benefits in their trade relations with Pyongyang, asking for payment in hard currency for their military and non-military assistance which they had previously provided on terms favorable to North Korea. This not only worsened the economy of North Korea, which had already been deteriorating due to

\begin{flushright}
\textsuperscript{14} Don Oberdorfer, “Moscow Switches Sides” and “China shifts its Ground” \textit{The Two Koreas: a Contemporary History} (NY: Basic Books, 2002): 197-248
\end{flushright}

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\textsuperscript{15} “At this time, the US economic sanctions were imposed against North Korea for four primary reasons: 1) North Korea posed a threat to US national security, as determined by the President and renewed annually under the terms of the Trading with the Enemy Act and National Emergencies Act; 2) North Korea was designated by the Secretary of State as a state sponsor or supporter of international terrorism, pursuant to the Export Administration Act of 1979; 3) North Korea is a Marxist-Leninist state, with a Communist government, and stated as such in the Export-Import Bank Act of 1945, and further restricted under the Foreign Assistance Act of 1961; and 4) North Korea had been found by the State Department to have engaged in proliferation of weapons of mass destruction pursuant to the Arms Export Control Act and Export Administration Act of 1979.” Dianne E.Rennack, “North Korea: Economic Sanctions” \textit{Report for Congress} January 24, 2003, available at http://www.fas.org/man/crs/RL31696.pdf
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\textsuperscript{16} “Chronology of major events in Japan-North Korea relations” \textit{Japan Times}, September 18, 2002, available at http://search.japantimes.co.jp/cgi-bin/nn20020918e2.html
\end{flushright}
the accumulated problems of its Soviet-type socialist economic system, but also reinforced Pyongyang’s perception that it could not rely upon its traditional allies any longer.

Under these circumstances, Pyongyang needed to secure a diplomatic breakthrough to get out of its international isolation. The United States was the focus of the North Koreans’ interest. As the lone superpower in the post-Cold War era, Washington had the capability to shape the global security environment, in a way to guarantee the North’s security or to seriously undermine it. In addition, if North Korea could be an attractive strategic partner in Northeast Asia, in particular to counterbalance China, Pyongyang would be able to drive a wedge between Washington and Seoul and thus secure political influence over Seoul via Washington. Furthermore, Pyongyang’s rapprochement with Washington was also expected to facilitate normalization of diplomatic ties with Japan, based upon which North Korea would receive a Japanese economic aid package as “compensation” for the Japanese

17 According to the statistics provided by Bank of Korea and Korea Trade-Investment Promotion Agency, North Korea’s foreign trade has decreased substantially since 1991, until its trade volume began to recover in 1999. Its trade volume in 1999 was about 35% in value compared to that of 1990. In addition, its chronic trade deficit throughout the 1990s is explained by the collapse of its main trading partners, the Soviet Union and Eastern European socialist regimes and the new system of trade payment in hard currency without applying beneficial rates upon the request of China and Russia. Along with its shrinking foreign trade, the DPRK’s gross domestic product (GDP) had been consistently decreased throughout the 1990s. North Korea’s GDP in 1999 was about 70% in value compared to that of 1990. Statistical data is available at http://www.kotra.or.kr (website of Korea Trade-Investment Promotion Agency). http://www.bok.or.kr (website of the Bank of Korea) and http://www.unikorea.go.kr (website of Ministry of Unification of Korea)

colonial rule of the Korean peninsula. Along with this, Washington’s leadership in a variety of international regimes, from those for nuclear non-proliferation to economic development, would allow Pyongyang to enjoy political and economic benefits, if North Korea’s efforts to improve relationship with the US succeeded.

Paradoxically, the North Korean nuclear crisis provided Pyongyang with the opportunity to have direct talks with Washington. It was North Korea that made the first move by suggesting the bilateral talks between the US and the DPRK through its mission in New York. It was also the delegation from Pyongyang that raised the idea to trade its existing nuclear facilities in Yongbyon, which posed a serious proliferation threat, for new light-water reactors, which were more proliferation-resistant and would be based on more advanced technology than the soon-to-be-replaced reactors in Yongbyon. Knowing Washington’s priority was on the nuclear non-proliferation, Pyongyang raised the light water reactors deal in order to secure direct and continuous contacts with the US.

However, due to the decades-old mutual distrust and lack of shared experience, North Korea wanted to secure a light water reactor project at the least cost on its side. Its bottom

\[19\] Ibid.
\[20\] Don Oberdorfer, p.283
\[21\] Wit, Poneman and Gallucci, p.71
\[22\] An interview with a South Korean government official, conducted on March 3, 2009. The Joint Statement of the DPRK and the US adopted in New York on June 11, 1993 reflected the North’s desire for continued talk with Washington by stating that “the two governments promised to continue dialogue on an equal and unprejudiced basis.”
line was ‘not letting the Americans get all, while Pyongyang did secure nothing significant.’ Considering the enormous discrepancies in power between the two countries, Pyongyang had a good reason to fear such a coerced settlement of the bilateral negotiations.

In seeking to secure Washington’s guarantee to provide new reactors, Pyongyang was not willing to fully address Washington’s concerns about the ultimate disposal of spent fuel rods from the nuclear reactors in Yongbyon, as well as in Pyongyang’s acceptance of the IAEA’s special inspection. The US chief negotiator, Robert L. Gallucci, emphasized that a US guarantee on the new nuclear reactors should be preceded by consultations with the IAEA on special inspections and shipment of spent fuel out of the country. However, his North Korean counterpart was adamant about its refusal to accept the Agency’s strengthened inspections as well as on tying down the spent fuel rods in its own territory. The North Koreans used the implicit, threatening possibility that they would still have the option to reprocess the spent fuel rods and acquire additional plutonium to build an atomic bomb outside of the IAEA’s monitoring, to maintain leverage over Washington to secure the light water reactors. As a result of political compromise between the two sides, the Agreed Framework has vague provisions on the disposal of the spent fuel rods from the

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23 Wit, Poneman and Gallucci, pp.75, 252

24 In their work Going Critical: the First North Korean Nuclear Crisis, Wit, Poneman and Gallucci state that “[North Koreans] had been surprisingly candid, admitting that Pyongyang did not want to ship the spent fuel abroad because it did not trust the United States to fulfill its end of the deal without keeping leverage until the bitter end.” Ibid., p.253
5MW(e) reactors in Yongbyon that stipulate bilateral cooperation for safe storage and disposal of the rods without further detail.\textsuperscript{25} The Agreed Framework does not have any provisions on the special inspection, either, while the Framework provides North Korea’s compliance with its safeguards agreement with the IAEA.\textsuperscript{26}

In addition, in the proposed roadmap of each side’s commitments regarding the provision of light water reactors to the DPRK in return for dismantlement of the nuclear facilities in Yongbyon, the North Koreans broke its commitments into several phases and sequenced them with each phase of Washington’s commitments. For instance, North Korea suggested in the third round of negotiations in August 1994 that 1) upon Pyongyang’s receipt of the US presidential guarantee on the provision of light water reactors, construction of 50MW(e) and 200MW(e) nuclear reactors in Yongbyon and Taechon would be frozen; 2) these frozen reactors would be dismantled when the light water reactor project was completed; and 3) in compensation for the energy loss due to the dismantlement of Yongbyon nuclear reactors, Washington would annually deliver 500,000 tons of heavy fuel oil.\textsuperscript{27} The basic structure of the North’s roadmap is reflected in the Agreed Framework as summarized in the table below.

\begin{table}[h]
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\begin{tabular}{|c|c|}
\hline
Phase & Commitment Details \\
\hline
1 & Construction of 50MW(e) and 200MW(e) nuclear reactors in Yongbyon and Taechon frozen.
\hline
2 & These frozen reactors dismantled when the light water reactor project completed.
\hline
3 & Annual delivery of 500,000 tons of heavy fuel oil as compensation.
\hline
\end{tabular}
\end{table}

\textsuperscript{25} Article I. 3) and 4) “Agreed Framework between the United States of America and the Democratic People’s Republic of Korea” October 21, 1994, Geneva, Switzerland, available at the website of Korean Peninsula Energy Development Organization(KEDO), \url{http://www.kedo.org/pdfs/AgreedFramework.pdf}

\textsuperscript{26} Article IV. 2) and 3), “Agreed Framework” (1994)

\textsuperscript{27} Wit, Poneman and Gallucci, pp.274-275
### [Table 1] Light water reactor project-related commitments of the US and the DPRK under the 1994 Agreed Framework

<table>
<thead>
<tr>
<th>The US side</th>
<th>The DPRK side</th>
</tr>
</thead>
<tbody>
<tr>
<td>② Deliveries of the Heavy Fuel Oil begin.</td>
<td>① The freeze on the graphite-moderated reactors and related facilities is initiated under the IAEA monitoring.</td>
</tr>
<tr>
<td>③ A supply contract with the DPRK for the provision of the LWR project is concluded.</td>
<td>④ Ad hoc and routine inspections resume under the DPRK’s safeguards agreement with the IAEA with respect to the facilities not subject to the freeze.</td>
</tr>
<tr>
<td>⑤ A significant portion of the light water reactor project is completed.</td>
<td>⑥ The DPRK comes into full compliance with its safeguards agreement with the IAEA.</td>
</tr>
<tr>
<td>⑦ Key nuclear components for the LWR project are delivered.</td>
<td>⑧ Spent fuels from 5MW(e) experiment-al reactor are safely disposed.*</td>
</tr>
<tr>
<td>⑨ Light water reactors are completed.</td>
<td>⑨ Dismantlement of graphite-moderated reactors and related facilities is completed.</td>
</tr>
</tbody>
</table>

(*) Further negotiations are needed.

On the one hand, such a sequencing of phased commitments could facilitate each side’s implementation based on its expectation of its counterpart’s steps in reciprocity. On the other hand, the sequenced Framework could be collapse whenever one side viewed further implementation as incompatible with its own national interest and was willing to accept the loss of expected benefits in the future under the Framework. Under circumstances where Pyongyang was not sure if Washington was fully reliable, the DPRK seemed to want to secure the US implementation of the light water reactor project while maintaining its leverage over Washington to the largest possible extent by committing to the least. This argument is supported by the fact that Pyongyang only has to freeze its
plutonium-based nuclear facilities in Yongbyon, which can be easily reversed and thus nullify the Framework at any time, in return for Washington’s heavy fuel oil supplies and the completion of significant part of the new reactors, both of which cannot be returned to the US after the provision.28

2. North Korea’s energy situation and the North’s stance on a light water reactor project in the first nuclear crisis

Based on its ‘self-reliance’ energy policy, North Korea has heavily depended on its abundant coal deposits in addressing its energy demand (Figure 1).29 However, throughout the 1990s, the DPRK’s coal production had substantially dropped(Figure 2), due to the over-exploitation of the existing mines, aged mining equipment, lack of investment in developing new mines and inflexibility of socialist production management system.30 31


30 Youngyoon Kim, “Current situation and prospect for North Korea’s energy shortage,” Current Situation and Prospect for North Korea’s Economic Difficulties (Seoul: National Unification Institute, 1997) :51

31 Because North Korea’s statement on its coal production is not considered as reliable, the Ministry of Unification of the Republic of Korea as well as the Bank of Korea make their own estimations on the North’s coal production on the basis of a variety of data sources. Hwa-Young Kim et al, p.571
Due to the North Korean industry’s heavy dependence on coal as fuel, the decreased coal production had a direct adverse impact on the North’s industrial development (Figure 3).  

![Figure 1: North Korea’s primary energy consumption trend](source: Korea National Statistics Office)

![Figure 2: North Korea’s total coal production trend](source: Statistics Database of the Bank of Korea)

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td></td>
<td>23,515</td>
<td>26,592</td>
<td>29,542</td>
<td>30,866</td>
<td>25,052</td>
<td>23,121</td>
<td>22,113</td>
</tr>
<tr>
<td>Oil</td>
<td></td>
<td>1,203</td>
<td>2,014</td>
<td>3,094</td>
<td>2,603</td>
<td>1,991</td>
<td>1,461</td>
<td>1,011</td>
</tr>
<tr>
<td>Hydro-electric power</td>
<td></td>
<td>2,192</td>
<td>2,192</td>
<td>2,748</td>
<td>3,351</td>
<td>3,358</td>
<td>2,971</td>
<td>3,309</td>
</tr>
<tr>
<td>Total supply</td>
<td></td>
<td>27,679</td>
<td>31,659</td>
<td>36,304</td>
<td>37,767</td>
<td>31,368</td>
<td>28,547</td>
<td>27,171</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumption</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td></td>
<td>19,269</td>
<td>21,304</td>
<td>23,266</td>
<td>24,653</td>
<td>19,749</td>
<td>18,671</td>
<td>17,736</td>
</tr>
<tr>
<td>Oil</td>
<td></td>
<td>1,092</td>
<td>2,009</td>
<td>2,848</td>
<td>2,322</td>
<td>1,768</td>
<td>1,289</td>
<td>850</td>
</tr>
<tr>
<td>Hydro-electric power</td>
<td></td>
<td>1,286</td>
<td>1,505</td>
<td>1,849</td>
<td>2,135</td>
<td>1,923</td>
<td>1,616</td>
<td>1,638</td>
</tr>
<tr>
<td>Total consumption</td>
<td></td>
<td>22,416</td>
<td>25,679</td>
<td>28,884</td>
<td>30,005</td>
<td>24,407</td>
<td>22,570</td>
<td>21,233</td>
</tr>
</tbody>
</table>

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32 In figure 3, the trend in coal supplies and that in the industrial energy consumption are moving in the same way: the increase in the former is accompanied by the latter, while the decrease in the former is matched by the latter. Youngyoon Kim, p.45
As regards North Korea’s electricity generation, the DPRK has relied mostly on hydro- and thermo-electric power plants, thanks to its mountainous topography as well as its relatively abundant coal reserves. As is indicated in Figure 4, despite the slight increase in North Korea’s power generation facilities from 1990 to 1994, actual power generation dropped by 17.97% from 1990 to 1994. This is attributable to the aforementioned decreased coal production and the ensuing decrease in thermal power generation. Given that most of North Korea’s hydroelectric power plants were built during the Japanese colonial rule in the early 20th century or established with Beijing’s assistance in the 1950s and the 1960s, and its thermal power plants were constructed using the Soviet aids in the middle of the century, outworn generation facilities also contributed to the power shortage. In addition, destruction of the North’s infrastructure to generate electricity due to the floods in the early 1990s and its unstable power transmission system also worsened

33 Ibid., p.40

34 Byun, Hak-moon, “North Korea’s Energy Crisis” (Republic of Korea, 2007) National Archives & Records Services, available at http://contents.archives.go.kr/next/content/listSubjectDescription.do?sessionid=GQQJLn0pv0htPLJQMLhmT1GKythqsphwgBTDRGYJhGlyjK4h13y!-1085671633?id=007179&pageFlag 20
the power shortage.

<table>
<thead>
<tr>
<th></th>
<th>Capacity of Power Generation Facilities</th>
<th>Actual Power Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydro-electric</td>
<td>Thermo-electric</td>
</tr>
<tr>
<td>1965</td>
<td>2,105 (88.3)</td>
<td>280 (11.7)</td>
</tr>
<tr>
<td>1975</td>
<td>2,730 (60.3)</td>
<td>1,800 (39.7)</td>
</tr>
<tr>
<td>1985</td>
<td>3,310 (56.0)</td>
<td>2,605 (44.0)</td>
</tr>
<tr>
<td>1990</td>
<td>4,292 (60.1)</td>
<td>2,850 (39.9)</td>
</tr>
<tr>
<td>1994</td>
<td>4,337 (60.0)</td>
<td>2,900 (40.0)</td>
</tr>
<tr>
<td>1995</td>
<td>4,337 (60.0)</td>
<td>2,900 (40.0)</td>
</tr>
</tbody>
</table>

[Figure 4: North Korea’s power generation capacity and actual generation/unit: 1,000 kwh]
(Source: “Comparison of Socio-Economic Situation in the two Koreas” National Statistics Office (NSO), (Seoul: NSO, 1996) pp.229-230)

It should also be noted that North Korea’s power generation per unit capacity had dropped since the 1990s when the North’s GDP began to decrease (Figures 5 and 6). According to the North Korean experts, such a decrease resulted from the fact that the DPRK’s economic crisis hampered additional construction of new power plants, while the North accelerated deterioration of its existing power plants with excessive operation of them.35

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35 Hwa-Young Kim et al, p.572
As discussed in the previous section, Pyongyang’s main oil suppliers in the Cold War era were China and the Soviet Union. Pyongyang’s crude oil imports from Moscow, marking its culmination in 1984 at 1 million tons, have declined sharply with the fall of the Soviet Union. In addition, as Beijing and Moscow asked Pyongyang to pay for their oil exports with hard currency after 1991, the price of oil

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36 Ibid., p.574
imported to North Korea more than doubled in 1993 compared to in 1991.\textsuperscript{37} North Korea’s shortage of hard currency as well as its economic crisis in the 1990s caused decline in its oil imports, even though the oil import was essential in its economic development (Figure 7).

<table>
<thead>
<tr>
<th>Year</th>
<th>Crude oil</th>
<th>Gasoline</th>
<th>Light oil (diesel fuel)</th>
<th>Kerosene (paraffin oil)</th>
<th>Heavy fuel oil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>1,680</td>
<td>100</td>
<td>300</td>
<td>40</td>
<td>100</td>
<td>2,220</td>
</tr>
<tr>
<td>1985</td>
<td>2,590</td>
<td>100</td>
<td>250</td>
<td>40</td>
<td>100</td>
<td>3,080</td>
</tr>
<tr>
<td>1986</td>
<td>3,119</td>
<td>33</td>
<td>84</td>
<td>13</td>
<td>33</td>
<td>3,283</td>
</tr>
<tr>
<td>1990</td>
<td>2,520</td>
<td>22</td>
<td>55</td>
<td>9</td>
<td>22</td>
<td>2,628</td>
</tr>
<tr>
<td>1993</td>
<td>1,360</td>
<td>20</td>
<td>50</td>
<td>8</td>
<td>20</td>
<td>1,458</td>
</tr>
<tr>
<td>1994</td>
<td>910</td>
<td>15</td>
<td>37</td>
<td>6</td>
<td>15</td>
<td>983</td>
</tr>
<tr>
<td>1995</td>
<td>1,100</td>
<td>15</td>
<td>37</td>
<td>6</td>
<td>150</td>
<td>1,308</td>
</tr>
</tbody>
</table>

[Figure 7: Trend in North Korea’s oil import/unit: 1,000 tons]

(Source: Youngyoon Kim, “Current situation and prospect for North Korea’s energy shortage,” p. 53)

(*) Heavy fuel oil import in 1995 indicates supplies of heavy fuel oil under the Agreed Framework by KEDO.

Against this backdrop, Pyongyang proposed a deal to replace its graphite-moderated reactor in Yongbyon with new light water reactors. In addition, Pyongyang demanded ‘compensation’ of the energy loss resulting from the freeze of its...

\textsuperscript{37} Until 1990, China provided North Korea with its crude oil at half of the international market price. The USSR also exported its crude oil to Pyongyang at 30% of the international market price. Both of them accepted the payment through bartering. Youngyoon Kim, “Current situation and prospect for North Korea’s energy shortage,” p. 52
nuclear activities in Yongbyon with supplies of heavy fuel oil. In terms of energy, such a stance of North Korea on a light water reactor project can be explained by the expected benefits of light water reactors as well as Pyongyang’s desire to address its growing troubles with oil imports in the 1990s.

As a matter of fact, atomic energy did not comprise large portions of North Korea’s energy resources. However, with the decrease in coal production and instability in its hydroelectric power generation due to the amount of rainfall varying largely each year, light water reactors could help address the North’s power shortage by diversifying its energy resources, if secured. In addition, alleviating strains on the existing power plants in the DPRK, light water reactors could also enhance the power generation per unit capacity of North Korea. Furthermore, even though the fresh fuel rods for the new reactors would be provided from outside under the terms of Agreed Framework, the North’s large reserve of uranium ore could extend the ‘self-reliant energy policy’ to light water reactors. This

38 At the third round of the US-DPRK negotiation, Kang Sok Ju, the DPRK’s vice foreign minister emphasized this point to his US counterpart, Robert L. Gallucci, the Assistant Secretary of State for Political and Military Affairs, in order to secure the ‘compensation’ for the energy loss incurred by the freeze of its graphite-moderated reactors in Yongbyon. His logic was that unlike the graphite moderated reactors, which consume natural resources abundant in North Korea, uranium and graphite, the light water reactors require Pyongyang’s dependence on foreign suppliers of enriched uranium to be operated. Wit, Poneman and Gallucci, pp. 72, 275

39 The DPRK has not supplied uranium reserves information to the IAEA Uranium Group which publishes official data on world uranium resources, production and demand. According to uranium experts with access to Russians who have visited North Korean uranium facilities, analyses in the 1960s and 1970s estimated North Korean reserves of uranium ore up to 300,000 metric tons. Joseph Bermudez, a renowned North Korean military expert, also reportedly estimated 4.5 million tons of uranium ore reserves in the DPRK. However, this figure is regarded as dubious, for it appears to refer to uranium resources, not economically justified or usable reserves. Peter Hayes, “North Korea’s uranium exports: much ado about something” the Nautilus Institute for Security
would allow North Korea to establish another light water reactor on the basis of knowledge and technologies it would learn under the Framework process. Besides, the US supplies of heavy fuel oil in return for keeping the freeze on the nuclear reactors and related facilities in Yongbyon would significantly address Pyongyang’s plunging oil imports due to its lack of hard currency and economic difficulties.

However, despite the North Koreans’ demonstrated aspiration of securing light water reactors, they did not show much willingness to move forward beyond the freeze on the existing nuclear facilities in Yongbyon. Under the light water reactor project schedule (Table 1), if the North had wanted the construction to proceed without delay due to the verification activities and procedures required by the IAEA for the delivery of key nuclear components, it should have taken actions to implement its safeguards agreement with the Agency at least in 2002-2003. However, the DPRK was reluctant to fully comply with its safeguards agreement throughout the whole implementation period of the Agreed Framework, and this would have resulted in the suspension of the construction even without the breakout of the second nuclear crisis, triggered by Washington’s allegation of


Interview with a South Korean researcher with expertise in North Korea’s energy policy, conducted on March 25, 2009

The schedule of the light water reactor project in Table 1 is based on the assumption of the case in which the project had not been suspended and cancelled due to the controversy over the DPRK’s HEU program.
Pyongyang’s clandestine highly enriched uranium (HEU) program.\(^{42}\)

[Table 2] Expected schedule of the light water reactor project if the project had not been suspended and cancelled due to the controversy over the DPRK’s HEU program

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Site studies</td>
<td></td>
<td>Construction of the light water reactors (Infrastructure and the portion without key nuclear components)</td>
<td>Construction suspended (the IAEA verification activities and the US export license procedure)</td>
<td>Construction resumed (involving the key nuclear components)</td>
</tr>
<tr>
<td>About 2 years</td>
<td></td>
<td>(8 years)</td>
<td>(2-3 years)</td>
<td></td>
</tr>
<tr>
<td>Signature of the Supply Agreement</td>
<td>Groundbreaking</td>
<td>Completion of significant portion of the reactors</td>
<td>Key components delivered</td>
<td>Project completed</td>
</tr>
</tbody>
</table>


1. This schedule is based on the rate of actual progress in the light water reactor project by December 1, 2003(Lee). Just before its suspension, on November 30, 2003, the project was approximately 34.5% complete (KEDO reports).

2. Values in the parentheses are estimates.

This can be explained by the energy situation in North Korea during the implementation period of the Agreed Framework. As the North’s total coal production continuously decreased to its lowest in 1998, the heavy fuel oil provided by the US under the Agreed Framework came to play a significant role in North Korea’s power generation.

\(^{42}\) Lee, Yong-joon, p.184
(Figure 8). This is also indicated by the fact that suspension of heavy fuel oil supplies in 2002 was followed by a rapid drop in electricity generation by the power plants in Sunbong, Chungjin, Pyongyang, Dong-Pyongyang, Yongbyon, Sunchon and Bukchang.43

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Consumption for Power Generation</th>
<th>Total Oil (1,000 TOE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,000 TOE</td>
<td>%</td>
</tr>
<tr>
<td>1990</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>1991</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>1992</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>1993</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>1994</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>1995</td>
<td>149</td>
<td>1.7</td>
</tr>
<tr>
<td>1996</td>
<td>495</td>
<td>6.1</td>
</tr>
<tr>
<td>1997</td>
<td>495</td>
<td>6.5</td>
</tr>
<tr>
<td>1998</td>
<td>495</td>
<td>7.1</td>
</tr>
<tr>
<td>1999</td>
<td>495</td>
<td>6.4</td>
</tr>
<tr>
<td>2000</td>
<td>495</td>
<td>6.4</td>
</tr>
<tr>
<td>2001</td>
<td>495</td>
<td>6.2</td>
</tr>
<tr>
<td>2002</td>
<td>406</td>
<td>5.3</td>
</tr>
<tr>
<td>2003</td>
<td>306</td>
<td>3.9</td>
</tr>
<tr>
<td>2004</td>
<td>306</td>
<td>3.7</td>
</tr>
</tbody>
</table>

[Figure 8: North Korea’s oil consumption for power generation]
(Source: Korea Energy Economics Institute)

(*) Information on North Korea’s oil consumption for power generation before 1995 was not available.
(*) Values of the North’s oil consumption for power generation from 1995 to 2002 represent the entire amount of heavy fuel oil provided by the United States under the Agreed Framework.
(*) Supplies of heavy fuel oil from the US have been suspended since November 2002.

Against this backdrop, North Korea had a good reason to be more interested in

43 Hwa-Young Kim et al, p.573
securing continuous supplies of heavy fuel oil rather than making progress toward the completion of light water reactors. While heavy fuel oil was available on a regular basis under the Agreed Framework even without further movement beyond the freeze on the nuclear facilities in Bonbon, the North Koreans had to wait a decade or longer to secure the promised light water reactors, implementing the more progressive commitments which Pyongyang was least willing to observe: full compliance with the safeguards agreement with the IAEA and the ultimate disposal of spent fuel rods. Observing Keno’s delayed implementation of the Supply Agreement which regulates the Organization’s provision of light water reactors to the DPRK, the North Koreans may have felt more uncertain about the potential of completing the light water reactor project in time and thus got more reluctant to move forward. 44

The Second North Korean Nuclear Crisis and the Six Party Talks Process under the Bush Administration

A new phase started on October 16, 2002 with the announcement by the US that the DPRK had acknowledged during the visit of US Assistant Secretary of State for East Asia and Pacific Affairs James Kelly that it had a program to enrich uranium(HEU) for nuclear weapons. 45 Subsequently, Washington, along with Seoul and Tokyo, stated that

44 Lee, Yong-joon(2004), pp.170-195

Pyongyang’s clandestine uranium enrichment efforts were a violation of the Agreed Framework,46 and the KEDO Executive Board decided to suspend the delivery of heavy fuel oil to the DPRK.47

With the loss of heavy fuel oil supplies as well as its access to direct discussions with the US, Pyongyang took a series of provocative actions in response: in December 2002, North Korea lifted the freeze on its nuclear facilities by cutting seals, disabling surveillance cameras and expelling the IAEA inspectors who were monitoring the freeze.48 It reloaded and restarted the 5-megawatt reactor, formally withdrew from the NPT, and probably began to reprocess the spent fuel which had been stored under IAEA monitoring.49 These actions led to the KEDO Executive Board’s decision in November

claim that the North Koreans admitted to having the secret program, while the North Koreans deny such admission.

46 *Ibid.* Although the Agreed Framework did not explicitly refer to the uranium enrichment program, it reaffirmed the North’s commitment to the North-South Joint Declaration on the Denuclearization of the Korean Peninsula, which bans uranium enrichment on the Korean Peninsula, and the Nuclear Non-Proliferation Treaty. Agreed Framework between the US and the DPRK Article III-3) and IV

47 Annual Report of the KEDO in 2002, p.9. Considering the US policy priority on stopping additional accumulation of plutonium under the Agreed Framework, the North’s (alleged) acknowledgement of the highly enriched uranium (HEU) program was equivalent to the lift of the freeze on its nuclear facilities, in a sense that the existence of a HEU program would nullify the freeze on the plutonium-based nuclear program. Lee, Yong-joon(2004), p.170

48 Fact Sheet on DPRK Nuclear Safeguard,” IAEA

49 Wit, Poneman and Gallucci, p.379
2003 to suspend the light water reactor project, and finally to terminate it in May 2006.\textsuperscript{50}

In a series of public statements thereafter, Pyongyang denounced Washington for cutting off heavy fuel oil supplies, and suspending and terminating the light water reactor project “on the pretext of” the North’s acknowledgment of its highly enriched uranium program.\textsuperscript{51} Reiterating its denial of such an admission, Pyongyang consistently tried to hold the card of light water reactors within its grip: after the termination of the light water reactor project, Pyongyang banned repatriation and demobilization of KEDO’s assets from the construction site,\textsuperscript{52} demanding compensation for the termination of the project. It has also constantly raised the issue of light water reactors in the Six-Party Talks, a multilateral forum to deal with North Korean nuclear issues which includes China, Japan, Russia, the two Koreas and the US.

With this background knowledge on the developments up to the second crisis, the author will analyze Pyongyang’s stance on the provision of light water reactors in the second North Korean nuclear crisis based on Pyongyang’s security concerns and the DPRK’s energy situation in the following.


\textsuperscript{52} Annual Report of the KEDO in 2005, p.21
1. Pyongyang’s security concerns and its position on a light water reactor project in the second nuclear crisis

The inauguration of the Bush administration in January 2001 turned the tide against Pyongyang’s efforts to engage Washington. President Bush’s personal distrust and dislike of Chairman Kim Jong-il as well as the ascension of neoconservatives in the US foreign policymaking community rendered the succession of the Clinton Administration’s engagement policy toward North Korea less than unlikely.\(^{53}\) Placing its policy priority on fighting terrorism and countering proliferation of weapons of mass destruction (WMD) after 9.11 terrorist attacks, the Bush administration branded the DPRK as a member of the ‘Axis of Evil’\(^{54}\), which was to be contained rather than engaged.

Its hardened attitude toward Pyongyang, expressed in the National Security Strategy and the Nuclear Postures Review of 2002,\(^{55}\) significantly raised North Korea’s security

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\(^{53}\) Chung-in Moon, “Managing the North Korean Nuclear Quagmire: Capability, Impacts, and Prospects” The United States and Northeast Asia (MD: Rowman & Littlefield, 2008): 240, Although Washington announced its intention to meet with North Korean officials at “any time, any place, without any preconditions” in June 2001, official contact between the two countries was virtually frozen.

\(^{54}\) The White House, “2002 State of the Union Address” by President George W. Bush, January 29, 2002

concern. On January 31, 2002, a statement of the DPRK’s Foreign Ministry spokesman\textsuperscript{56} called President Bush’s designation of the North as an ‘axis of evil’ the “open disclosure of its [the US] intention to stifle the DPRK by force of arms.” He also blamed Washington for “having pushed the situation to the brink of war after throwing away even the mask of ‘dialogue’ and ‘negotiations.’” In another statement of the Foreign Ministry spokesman on March 13, 2002, Pyongyang defined the Nuclear Posture Review of the US Defense Department as “the US plan for a nuclear attack on the DPRK” and threatened to “examine all the agreements with the US” and “take countermeasure against it, not bound to any DPRK-US agreement.”\textsuperscript{57}

The controversy over Pyongyang’s highly enriched uranium program and the ensuing collapse of the Agreed Framework exacerbated Pyongyang’s threat perception even more. Pyongyang regarded the Agreed Framework as “the reflection of political will [of the US and the DPRK] to resolve nuclear issues between Washington and Pyongyang on the basis of reciprocity” and “to normalize bilateral ties based on mutual trust and reconciliation.” In this sense, North Korea declared the complete suspension of the light water reactor project as an “inevitable result of Washington’s hostile policy toward the DPRK.”\textsuperscript{58}

\textsuperscript{56}“Spokesman for DPRK Foreign Ministry slams Bush’s accusations” Korean Central News Agency, January 31, 2002 available at http://www.kcna.co.jp/index-e.htm (in English)

\textsuperscript{57}“DPRK ready to take countermeasure against US nuclear attack” Korean Central News Agency, March 13, 2002, available at http://www.kcna.co.jp/index-e.htm (in English)

\textsuperscript{58}“The US will have to pay for its abrogation of the Agreed Framework” Korean Central News Agency, December 19, 2005, available at http://www.daedong615.com/charyo/nouth/n051219.htm (in Korean)
provocative actions and verbal offensives, however, the North did not exclude the possibility to defuse the crisis through direct dialogues with the US. Although Pyongyang stated that it would not trust Washington any longer, it still showed the willingness to make a deal with the United States on the basis of “action for action” principles.⁵⁹

The DPRK’s willingness to engage the US involved a renewed light water reactor project, as it did in the first North Korean nuclear crisis. Defining a light water reactor project as a “foundation for building mutual confidence between the US and the DPRK” as well as a “physical guarantee for the peaceful resolution of nuclear issues on the Korean peninsula,”⁶⁰ Pyongyang consistently demanded in the Six Party negotiations the provision of light water reactors in return for the dismantlement of its nuclear reactors and related facilities in Yongbyon.⁶¹ North Korea’s current stance on a light water reactor project revealed similarities to its position in the first nuclear crisis in the early 1990s. Although its nuclear explosive test in October 2006 raised serious concerns about its nuclear weapons program, in particular, the number of nuclear weapons that might have been manufactured from the reprocessed plutonium, Pyongyang sets the term of a renewed light water reactor deal so narrowly as only to cover its nuclear programs in Yongbyon: the very coverage of

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⁵⁹ Ibid.

⁶⁰ Ibid.

the 1994 Agreed Framework. The DPRK sees the Six-Party Talks process as a multilateral forum to deal with the freeze, disablement and dismantlement of “its existing nuclear facilities in Yongbyon,” and wants to establish another bilateral track with the US to discuss “simultaneous nuclear disarmament” “on an equal footing as a (self-asserted) nuclear weapon state.” Should these two separate negotiation tracks be established, North Korea will be able to secure an increased number of channels with the US to address its concerns. In addition, it might be able to drive a wedge between Washington and Seoul by emphasizing its asserted status as a state with nuclear weapons capability and succeeding to secure a tacit recognition from Washington.63

Pyongyang’s reluctance to proceed to the verification and dismantlement of its nuclear weapons program at the critical juncture is also similar to its previous hesitation to move forward the compliance with its Safeguards Agreement with the IAEA and the ultimate disposal of spent fuel rods. Although Pyongyang presented a list of its nuclear activities according to its commitment under the February 13 agreement and the follow-up October accord, it was not ready to accept intrusive verification mechanism before the conclusion of the second phase of North Korea’s denuclearization.64 Once taken, these measures, such


64 The sixth and seventh rounds of heads of delegations meeting were held in July and December 2008, respectively, in order to discuss ways to verify Pyongyang’s nuclear declaration, ways to
as verification of its nuclear activities and dismantlement of its existing nuclear programs, cannot be reversed, and therefore, the North Koreans cannot retain ambiguity over their nuclear weapons program. In the absence of mutual confidence between Washington and Pyongyang, the North would rather delay final decisions on these measures which might cause the loss of deterrent effects of its nuclear ambiguity. Instead, they would be more cooperative on more easily reversible actions. Moreover, North Korea could maneuver its implementation of reversible commitments under the Six-Party agreements\textsuperscript{65} to secure levers against its distrusted negotiating partner. For instance, North Korea threatened to halt or reverse nuclear disablement in Yongbyon in August 2008 as a protest to Washington’s delay in delisting North Korea from Sponsors of State Terrorism.\textsuperscript{66} 

\begin{flushright}
conclude the second-phase actions, the initiation of nuclear disarmament talks and the Six-Party Foreign Ministers’ Meeting. However, divergence among the state parties over the objects and methods of the verification did leave much to be agreed upon. Article 1, “Press Communiqué of the Heads of Delegation Meeting of the Sixth Round of the Six-Party Talks” Beijing, July 12, 2008, available at the website of Ministry of Foreign Affairs and Trade of the Republic of Korea: \url{www.mofat.go.kr}, Soojin Cho, “Still a long way to six party agreement on verification measures” \textit{Dongah-ilbo Newspaper} December 10, 2008\textparencite{in Korean} available at \url{www.donga.com/fbin/output?n=200812100177}
\end{flushright}

\textsuperscript{65} “Initial Actions for the Implementation of the Joint Statement,” Ministry of Foreign Affairs, People’s Republic of China, February 13, 2007 (full text of Chairman’s statement) available at \url{http://www.fmprc.gov.cn/eng/zxxx/f297463.htm}

\textsuperscript{66} Daniel Dombey in Washington, Song Jung-a in Seoul and Jamil Anderlini in Beijing, \textit{Financial Times} August 28, 2008
[Figure 9] Commitments under the February 13 agreement and the October accord for implementation of the Joint Statement on September 19, 2005
(Source: Ministry of Foreign Affairs and Trade of the Republic of Korea/data rearranged)

<table>
<thead>
<tr>
<th>Timeline</th>
<th>DPRK</th>
<th>Other Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Actions Phase</strong></td>
<td><strong>Within 30 days</strong>&lt;br&gt;Establishment of 5 Working Groups&lt;br&gt;(Denuclearization of the Korean Peninsula, normalization of US-DPRK and DPRK-JAPAN relations, Economy and Energy Cooperation, Northeast Asia Peace and Security Mechanism)</td>
<td><strong>Within 60 days</strong>&lt;br&gt;Shut down and seal the Yongbyon nuclear facilities [reversible action]&lt;br&gt;Provision of emergency energy assistance&lt;br&gt;- Equivalent to 50,000 tons of heavy fuel oil&lt;br&gt;Start of DPRK-US bilateral Talks&lt;br&gt;- US begins the process of removing the designation of the DPRK as a state-sponsor of terrorism&lt;br&gt;- US advances the process of terminating the application of the Trading with the Enemy Act with respect to the DPRK&lt;br&gt;Start of Japan-DPRK bilateral talks</td>
</tr>
</tbody>
</table>
2. North Korea’s energy situation and the North’s stance on a light water reactor project in the second nuclear crisis

Examining North Korea’s behavior in the second nuclear crisis, the author found that Pyongyang responded strongly to the delays or cutoff of heavy fuel oil supplies by exercising leverage which it secured from the implementation of its reversible commitments. For instance, when the controversy over Pyongyang’s clandestine HEU program resulted in the KEDO’s cutoff on heavy fuel oil supplies to the DPRK, this prompted Pyongyang to exhaust its leverages in a strikingly short period of time: as if it were meant to convey the urgent sentiment of the North Koreans, it took only 4 months for the DPRK to use all the leverages it retained - from the reactivation of a 5 MW(e) nuclear reactor in Yongbyon (December 12, 2002) to Pyongyang’s announcement of the reprocessing of spent fuel rods (April 18, 2003).\textsuperscript{67} In addition, when Pyongyang delayed implementing its commitment to make a full declaration of its nuclear activities originally due on December 31, 2007, it insisted that it was “not prepared to present a complete list until the other parties meet their obligations” including the delivery of heavy fuel oil.\textsuperscript{68}

This reflects North Korea’s growing dependence on conventional energy assistance provided under the Six-Party agreements. An analysis conducted by the Unification

\textsuperscript{67} Chung-in Moon, p.241.

Ministry of South Korea reveals that heavy fuel oil deliveries under the Six-Party agreements alleviated North Korea’s oil shortage which had stalled the operation of Sunbong thermoelectric power plant, the only thermoelectric power station in the DPRK fueled by heavy fuel oil with the capacity of 200,000kW.69

[Figure 9] indicates that heavy fuel oil (HFO) deliveries by KEDO comprised more than half of the total supplies of petroleum products in North Korea. From 1999 to 2000, the KEDO HFO deliveries even exceeded the crude oil imports. Considering that more than half of the petroleum supplies in North Korea are used in generating electricity, it can be inferred that heavy fuel oil deliveries by KEDO made a contribution to addressing North Korea’s power shortage.70 Given that North Korean authorities saw coal and electricity as “a lifeline for building a strong and great economy,” and exerted itself to address the power shortage, Pyongyang’s reaction to the cut-off or delay in the HFO deliveries revealed how much value Pyongyang had attached to the HEO deliveries.

[Figure 10] Trends in North Korea’s Oil Imports (unit: 1,000 TOE)
(Source: Bank of Korea, National Statistics Office, Korean Energy Economy Institute)

<table>
<thead>
<tr>
<th></th>
<th>Total Supplies</th>
<th>Crude Oil imports</th>
<th>Total petroleum products</th>
<th>KEDO HFO</th>
<th>Other petroleum products</th>
<th>End-use consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>2520</td>
<td>2520</td>
<td>-</td>
<td></td>
<td></td>
<td>2293</td>
</tr>
</tbody>
</table>


70 The Agreed Framework states that heavy fuel oil will be provided for heating and electricity production. (Article 1-2)
<table>
<thead>
<tr>
<th>Year</th>
<th>Crude Oil Disposal</th>
<th>Petroleum Products Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>1890</td>
<td>1720</td>
</tr>
<tr>
<td>1992</td>
<td>1520</td>
<td>1383</td>
</tr>
<tr>
<td>1993</td>
<td>1360</td>
<td>1238</td>
</tr>
<tr>
<td>1994</td>
<td>910</td>
<td>828</td>
</tr>
<tr>
<td>1995</td>
<td>1100</td>
<td>1001</td>
</tr>
<tr>
<td>1996</td>
<td>1778</td>
<td>1199</td>
</tr>
<tr>
<td>1997</td>
<td>1310</td>
<td>769</td>
</tr>
<tr>
<td>1998</td>
<td>1344</td>
<td>804</td>
</tr>
<tr>
<td>1999</td>
<td>1145</td>
<td>621</td>
</tr>
<tr>
<td>2000</td>
<td>1117</td>
<td>587</td>
</tr>
<tr>
<td>2001</td>
<td>1250</td>
<td>703</td>
</tr>
<tr>
<td>2002</td>
<td>1253</td>
<td>861</td>
</tr>
<tr>
<td>2003</td>
<td>1219</td>
<td>868</td>
</tr>
<tr>
<td>2004</td>
<td>1230</td>
<td>868</td>
</tr>
</tbody>
</table>

[Figure 11] North Korea’s Crude Oil Disposal and Petroleum Products Supplies (unit: 1,000 TOE)
(Source: Korean Energy Economy Institute)

<table>
<thead>
<tr>
<th>Energy Supplies</th>
<th>Crude Oil Disposal</th>
<th>Petroleum Products Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Domestic Production</td>
<td>620</td>
<td>610</td>
</tr>
<tr>
<td>- Imports</td>
<td>620</td>
<td>610</td>
</tr>
<tr>
<td>Exports</td>
<td>-</td>
<td>868</td>
</tr>
<tr>
<td>Energy conversion</td>
<td>(620)</td>
<td>258</td>
</tr>
<tr>
<td>- Electricity generation</td>
<td>-</td>
<td>(306)</td>
</tr>
<tr>
<td>- Petroleum refining</td>
<td>(620)</td>
<td>564</td>
</tr>
<tr>
<td>End use</td>
<td>-</td>
<td>868</td>
</tr>
</tbody>
</table>

Besides, observing the Bush administration’s firm objection to a renewed light water reactor project or even the idea to discuss the deal,\(^71\) Pyongyang had a good reason to

\(^{71}\) Dongsuk Go, “Neocons: ‘Washington will not provide LWR even if Pyongyang abandons its nukes”*Munhwa-ilbo*, September 21, 2005.
be assertive in securing heavy fuel oil supplies, given its chronic energy shortage since the end of the Cold War. Conflicts of interest between Washington and Pyongyang on the issue of a renewed light water reactor project resulted in a vague provision in the Joint Statement of the Six-Party Talks on September 19, 2005. It states: “North Korea stated that it has the right to peaceful uses of nuclear energy; the other parties expressed their respect and agreed to discuss, at an appropriate time, the subject of the provision of light water reactor to North Korea.”

Conclusion: Lessons Learned

North Korea’s stance on the provision of light water reactors in exchange for dismantling its nuclear programs in Yongbyon has evolved over the two North Korean nuclear crises with notable consistencies. Roughly over the two decades, Pyongyang has raised the issue of a light water reactor project in the dialogues with the United States in order to address its diplomatic isolation in the post-Cold War era, the Bush administration’s “hostile policy” toward it and the worsening energy crisis by engaging Washington. However, lack of mutual confidence between the two countries kept Pyongyang from taking irreversible measures which were decisive in securing the

completion of light water reactors, such as verification on its nuclear activities or ultimate disposal of spent fuel rods. Rather, North Korea wanted to secure leverages over Washington by maintaining ambiguity on its commitment to the agreement or by maneuvering its implementation of reversible commitments. In addition, as Pyongyang’s energy shortage got worse, its dependence on readily available energy resources has increased, particularly on the energy assistance provided under the terms of settled agreement on Pyongyang’s denuclearization. Over the years, North Korea came to be more interested and assertive in securing short-term benefits, in terms of heavy fuel oil traded for freeze and disablement of all the existing nuclear facilities, rather than uncertain promises of longer-term benefits, the provision of light water reactors traded for complete dismantlement of the North’s nuclear weapons program. Under these circumstances, North Korea would not make significant progress in its denuclearization, as far as deliveries of conventional energy assistance could be secured.

This has some significant policy implications. Firstly, as far as North Korea’s energy shortage is not fundamentally addressed, current structure of sequenced commitments will not secure considerable progress on the North Korea’s denuclearization process. The North Koreans see no incentives in moving first and forward to secure a light water reactor, for they could get desperately needed energy assistance without moving that far. Therefore, a new framework of sequenced commitments should be explored.

Secondly, serious discussions on confidence-building mechanism in Northeast Asia should now be initiated and sustained at the governmental level, based on the achievements from the exchanges in the non-governmental track. As far as mutual distrust
intervenes in the negotiations and implementation of the agreed commitments on the North’s denuclearization, Pyongyang would keep seeking the room to maneuver in order to secure the most concessions from its negotiating partners at its least cost.

Lastly, Pyongyang has raised the issue of a light water reactor project in order to address its security concerns and energy shortage. This study found that North Korea wanted to “engage” Washington in a direct bilateral dialogue on the provision of light water reactors in a bid to address the aforementioned concerns. At the same time, Pyongyang has also been interested in the development of nuclear ‘weapons’ program to address the same concerns in a different way: to “deter” potential adversaries from taking hostile actions against it. This indicates that it will not be easy for the DPRK to fully commit itself to the current agreements under the Six-Party Talks, as it was not under the Agreed Framework, for under these agreements, North Korea must lose one of the two options both of which it wants to secure. In this regard, the international community has a good reason to cooperate in order to form a favorable security environment for the DPRK in order to more fundamentally address its concerns and thus to change its policy preferences.
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