
THE NORTH KOREAN NUCLEAR PROBLEM: ISSUES FOR U.S. POLICY

Prepared for: OSD/ISA

Sponsored by:
DEFENSE NUCLEAR AGENCY
Contract No. DNA-001-89-C-0038

July 10, 1992

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Executive Summary

Reliance on indigenous technology and materials has enabled North Korea to keep nearly all of its nuclear program free from international safeguards. Aside from its small Soviet-supplied research reactor, which was safeguarded in 1977 under Soviet pressure, North Korea has built or is building the following facilities:

- o one operating reactor believed to be capable of producing enough plutonium for one first-generation nuclear weapon annually;
- o two additional reactors, projected for completion in 1995 and 1996, the first of which could produce as much as seven bombs' worth of plutonium per year; the second could add significantly to this plutonium production rate; and
- o a plant to separate plutonium from spent reactor fuel (also known as a reprocessing facility).

The North also appears to have begun investigating processes to enrich uranium. CIA Director, Robert Gates, indicated that North Korea had begun working with centrifuges. Moreover, the North possesses a cyclotron, a piece of equipment that could provide important training and design information for the domestic production and operation of calutrons to enrich uranium.

There are a number of concerns with regard to the North's ability to translate programmatic elements into a nuclear weapon. First, **the North has admitted to the extraction of a "tiny amount" of plutonium from irradiated reactor fuel in 1990.** It has also been suggested that additional, unreported amounts of plutonium were separated in the 1970s with Soviet assistance. This indicates that if they possessed the appropriate equipment, such activity could be undertaken on a larger scale.

Second, there are discrepancies between Western estimates and North Korean statements concerning the operating history of the completed indigenous reactor. This raises uncertainty as to whether a stockpile of plutonium (or plutonium-bearing spent fuel) may have been hidden away by the North. **The North could thus possess, in total, enough unsafeguarded plutonium for five or six weapons by the end of the year.**

Third, **Pyongyang may have made progress toward weaponization.** Such progress could include the perfection of the high explosive lens system of an implosion design. Pyongyang's success in producing other critical components of an implosion weapon design -- neutron generator, tamper, fuses -- is less certain, but are probably within North Korea's technical competence.

Fourth, **the North may have secret nuclear facilities** -- possibly including a "pilot" plutonium reprocessing facility and/or a plutonium storage site -- that can be discovered only with difficulty through the inspection process.

These concerns highlight the **need for a comprehensive set of options for U.S. action in order to minimize the risks related to the North Korean program.** The objective of such actions should be to gain North Korea's complete abandonment of all nuclear weapons-related work, especially its plutonium-recovery program, and to verify that Pyongyang's commitments in this regard are being carried out. To this

end, the U.S. should continue to press for the full implementation of nuclear inspections, both within the International Atomic Energy Agency (IAEA) framework as well as through the bilateral formula that is still being negotiated between Seoul and Pyongyang.

The underlying question for the U.S. will likely remain: Are North Korea's recent actions merely classical tactical maneuvers for survival of a Stalinist regime, or do they perhaps reflect the beginning of a strategic change in policy and perspective by that regime? So long as North Korea remains an independent and hostile state that complies with its inspection commitments only belatedly and begrudgingly, it will be difficult to confirm unambiguously that it has, indeed, given up its nuclear weapons program.

There may, however, be a number of "carrots" and "sticks" that the U.S. and its allies could wield that would appear to hold promise for guiding the North down the path of compliance. Overall, Washington and Seoul may be able to minimize Pyongyang's predilection toward nuclear arming if the North perceives that its own policy objectives (survival, saving face, and reunification on its own terms) are being met or, at least, not overtly challenged by the various options pursued.

"Carrots"

- o A U.S. policy "roadmap" to recognition of North Korea, spelling out specific milestones along the way for both Washington and Pyongyang
- o Prospective further U.S. troop reductions, contingent upon progress in North-South arms control and confidence-building
- o Yearly extension of a moratorium on Team Spirit, contingent upon the North actually accepting bilateral inspections
- o Limited trade and capital investment from South Korea -- with clear limits on amounts and the threat of a tighter embargo if nuclear cooperation is not forthcoming -- in order to provide a "taste" of the economic benefits that will be available with full cooperation in the nuclear arena
- o Bilateral civil nuclear cooperation between Seoul and Pyongyang in order to build bilateral confidence in the nuclear arena, thereby increasing the likelihood that the bilateral inspection regime will be maintained.

"Sticks"

- o Reaffirm Washington's commitment to Seoul's security
- o Upgrade U.S. forces stationed in the South with the most modern systems, including the latest Patriot systems and possibly periodic deployments of the F-117
- o Resume Team Spirit or initiate another similar joint reinforcement exercise
- o Threaten to intensify Pyongyang's isolation, through extended prohibitions on trade and investment, a refusal to normalize relations, and the prospect of formal U.N.-mandated sanctions

In the near term -- between the recent refusal by the North Koreans at the June 30, 1992 JNCC meeting to seriously discuss North-South inspections and the next North-South Prime Ministers meeting in September -- U.S. policy planning might usefully focus on close consultations with the South Koreans on joint next steps if no inspection agreement is reached by September. In addition to the stated South Korean hold on intra-Korean relations development pending inspections, and the parallel U.S. and Japanese hold on economic and political ties, other policy decisions may be needed to encourage North Korean cooperation. A three-track approach to increase pressure on North Korea might focus U.S. and South Korean policy planners on: (1) planning for a special inspection request to the IAEA (which would require evidence supporting charges of North Korean violations); (2) planning for subsequent U.N. Security Council consideration; and (3) initiating bilateral U.S.-South Korean planning for a Team Spirit exercise in early 1993.

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North Korea's suspected nuclear weapons program threatens both U.S. forces in the region as well as the broader military balance in Northeast Asia. With this point in mind, this analysis examines the North Korean nuclear program, reviews the status of international efforts to penetrate the secrecy surrounding the program, and considers various potential U.S. initiatives that show promise for gaining North Korean compliance with its non-proliferation commitments.

I. BACKGROUND

The North Korean nuclear weapon program is believed to have begun in earnest in the 1970s, perhaps as a result of longstanding DPRK concern over U.S. nuclear guarantees to Seoul. Moreover, following the U.S. post-Vietnam force drawdown in Asia, the North realized that it might face a nuclear threat from the south even without a U.S. military presence on the Peninsula when it was revealed in 1975 that South Korea had initiated its own nuclear weapons-related research. South Korea abandoned its program under U.S. pressure, and signed the Nuclear Non-Proliferation Treaty. However, the U.S. actions which helped to prompt this conciliatory move by the South did little to ease Northern concerns: the U.S. offered an explicit statement that it would use nuclear weapons, if necessary, to protect the South and also initiated the annual Team Spirit exercise, which has been viewed as a provocation by Pyongyang.

During the late 1970s, North Korea witnessed economic and technical advances in the South that spilled over into the military arena. By 1982, the South's military expenditures had surpassed those of the North. While Seoul developed much of its own indigenous military capability but rested under the U.S. nuclear umbrella, Pyongyang became increasingly dependent on the Soviet Union and, to a lesser extent, China, for security assistance for much of its state-of-the-art conventional weaponry.

The end of the Cold War and the demise of the Soviet Union have worsened North Korea's strategic position. The Soviet collapse has accelerated North Korea's economic decline due to the loss of a favorable trade relationship and the loss of its primary sources of credit and grant assistance. Diplomatically, it has left Pyongyang more isolated, as global communism has given way to democratization, and as former allies have turned increasingly to capitalist South Korea for trade and investment opportunities. Militarily, these changes have resulted in the elimination of a clear security commitment by the North's major allies.

These new political, economic, and military pressures may have forced North Korea to use its nuclear program as a political tool for gaining concessions in the international arena in these three areas. Thus, the appearance of openness on the nuclear issue may not mean a readiness to abandon a nuclear weapon option. In fact, a number of motivations to continue nuclear weapon development remain.

First, the North's military situation continues to deteriorate. While the South has been devoting a steadily decreasing portion of its GDP to defense -- a portion that now amounts to about 4% of GDP -- the North continues to pour close to 25% of its GDP into the military, and has technically inferior equipment to show for this expense. Nuclear weapons may be seen as the most cost-effective way to redress the balance. Second, nuclear weapon development may be seen as a means to recoup the prestige that is being lost as the number of the North's friends and allies dwindles. Third, the nuclear program may continue to provide Pyongyang with an important bargaining chip vis-a-vis both allies and adversaries, to gain security and economic assistance as well as military concessions. Fourth, the continuation of the program may result from vested interests and bureaucratic momentum. The program has clearly enjoyed support in the highest echelons of North Korean leadership, although there is currently no information that specifies which segments

of the elite have been behind the program. The locus of the program's support will be of importance in the event that a leadership struggle emerges following the death of Kim Il Sung; if the ascendent elites have favored the program, international efforts will need to be redoubled to ensure that it has been laid to rest. Finally, the North may perceive that pursuit and possession of nuclear weapons is imperative in order to support its reunification objectives. (See Figure 1.)

| <u>DPRK REUNIFICATION GOALS & ROLE OF NUCLEAR WEAPONS</u> | |
|--|--|
| <u>OBJECTIVE</u> | <u>ROLE OF NUCLEAR WEAPONS</u> |
| ON OWN TERMS | → PRESTIGE: BOOSTS MORALE, DEMONSTRATES WILL, SYSTEM NOT A FAILURE |
| MAINTAIN STATUS QUO | → DETERRENT AGAINST SOUTH, US EXPORTS TO RAISE HARD CURRENCY & ACQUIRE TECHNOLOGY TO SUPPORT MILITARY |
| NEGOTIATED DEAL | → BARGAINING CHIP DETERRENT AGAINST SOUTH, US |
| POLITICAL SUBVERSION | → USE CAPABILITY THREAT AS POLITICAL WEAPON -- CREATE POLITICAL DIVISIONS TERRORIST ATTACKS |
| MILITARY OFFENSIVE | → DETER US ACTION, UNDERMINE RESOLVE STRIKE MAJOR AIRFIELDS, LOGISTICS CENTERS |

Figure 1

II. STATUS OF THE NORTH'S NUCLEAR PROGRAM

Several factors have been cause for concern with respect to the true motivations behind the North Korean nuclear program. These include:

- o reliance on indigenous technology and materials that has enabled the North to keep the program free from international safeguards¹;
- o clear reluctance to negotiate a safeguards agreement with the IAEA;
- o the construction of a reprocessing plant to separate plutonium from spent reactor fuel; and
- o veiled rhetoric which has suggested that the North would develop its own nuclear weapons.²

¹The North has received varying degrees of technical assistance over the years from the USSR, the PRC, as well as from the International Atomic Energy Agency. However, their efforts to build up a sizeable nuclear program appear to be independent.

²Although North Korea has repeatedly denied that it is developing nuclear weapons, it did offer a veiled threat to Soviet leadership in 1990 that it would do so if Moscow recognized Seoul. See "North Korea Set to Develop Nuclear Weapons on its Own," Asahi Evening News, January 3, 1991.

North Korean Nuclear Facilities

The first demonstration of North Korea's indigenous capabilities related to upgrading its small Soviet-supplied research reactor from 5 to 8 megawatts thermal (MWth) in the 1970s. This reactor, and its associated fuel, was safeguarded in 1977 under Soviet pressure. In the 1980s, the North constructed a considerably larger reactor which became operational in the 1986-87 timeframe. Its power rating was estimated at 30 MWth prior to the North Korean declaration to the IAEA and was declared by the North at a power level of 5 megawatts electric (MWe).³ It is generally believed that no outside assistance was provided in this effort, although there is some speculation that the North based its construction on either English or French reactor design.

Two additional reactors are under construction, one each at Yongbyon and Taechon -- declared at 50 MWe and 200 MWe, respectively.⁴ (The former was rated by Western analysts at 50-200 MWth prior to the declaration.) These two reactors are scheduled for completion in 1995 and 1996, respectively.

North Korea's operating 5 MWe indigenous reactor at Yongbyon could produce enough plutonium annually (approximately eight kilograms) for one first generation nuclear device.⁵ U.S. estimates of the production capacity of the 50 MWe reactor scheduled for completion in 1995 range up to seven weapons' worth of plutonium each year. The 200 MWe reactor, also under construction, would add considerably to this production rate.

Of course, this plutonium would still need to be separated from spent fuel before it could be machined into pits for nuclear weapons. The reprocessing facility at Yongbyon -- declared as a radiochemistry laboratory -- contains only 40% of the equipment needed to reprocess on a large scale. It is not known at this time what the throughput of this facility would be. The North Koreans said that they had removed a small number of damaged fuel rods from the 5 MWe reactor to the radiochemistry laboratory where a "tiny amount" of plutonium was separated in 1990. Moreover, a recent report suggests that the North separated additional

³Previous indications suggested that the reactor became operational in 1987. The North Koreans, however, claimed that the reactor began operating in 1986.

Research reactors usually are not used to generate electricity and, instead, generate only heat, or thermal energy. Any reactor, if hooked into a power grid, would then be rated at a lower level due to energy lost in the process of converting heat into power. This differential will not, however, affect the internal workings of the reactor itself and, hence, the rate at which plutonium is produced.

A fundamental discrepancy exists as to whether the North Korean nuclear program is geared toward electricity generation, as claimed by Pyongyang or, rather, has been intended primarily as an infrastructure to support nuclear weapons development. During his May visit to North Korea, International Atomic Energy Agency (IAEA) Director General Hans Blix' report that he had seen power reactors -- one in operation and two under construction -- suggests that the necessary power hook-ups are in place. Because earlier intelligence reports did not indicate the presence of power grids and lines at the reactor sites, it must be considered whether these elements were added retroactively, in preparation for the Blix visit and subsequent IAEA inspections.

⁴At his news conference in Beijing, Blix indicated explicitly that, when visiting the 200 MWe reactor site at Taechon, he noted a switchyard and pylons, although no lines had yet been connected.

⁵Plutonium production, a result of the fission process, is generally higher in reactors that are fueled with natural uranium, as are those in North Korea.

amounts of plutonium in the 1970s -- still at a laboratory scale -- with Soviet technical assistance.⁶

The North Koreans have indicated that their interest in plutonium arises from the desire to use the material as a reactor fuel. Such technology -- if developed indigenously true to the notion of "Juche" -- would most likely be a long way off for North Korea. Such a claim is not surprising, however, given that it would provide the only legitimate cover for the acquisition of plutonium. One recent report suggests that the North has offered to abandon its reprocessing efforts if it is provided with enriched uranium and alternative technology for power plants.

The Institute of Atomic Energy in Pyongyang houses a cyclotron, built with the assistance of the IAEA, as well as with Russian/Soviet technical aid. It was publicly dedicated earlier this year. The unit likely is not intended for uranium enrichment, but for the production of isotopes for use in research. However, the experience gained with its construction and operation could provide the North with the general technical base for eventual indigenous production of larger versions of the cyclotrons (calutrons) that could be applied to the task of enriching uranium. The Iraqi experience suggests that such an effort could be undertaken in secret, even while safeguards are being implemented at declared facilities.

A number of unconfirmed reports did surface in 1991, however, suggesting that the North did, indeed, have a uranium enrichment capability. In his November 11, 1991 testimony before Congress, CIA Director Gates stated that the North Koreans were working on centrifuges, which provide one path to enriching uranium. It is, however, a difficult enrichment technology, and likely could not be mastered without significant foreign assistance.

Nuclear Warhead Development

In terms of translating the ability to produce nuclear materials into nuclear warheads, Pyongyang may have made some progress. A publicly disclosed KGB report, for example, indicates that the North has perfected the components for an implosion design. A high-explosive test site, moreover, has reportedly been spotted by U.S. satellites. Finally, North Korea possesses a range of weapon delivery options. It could ultimately deploy its nuclear warheads on a missile system, on aircraft, or rely on some other exotic means of delivery or insertion. Figure 2 provides an overview of the necessary milestones for nuclear warhead development and the probable extent of North Korea's accomplishment in this regard.

⁶Mark Hibbs, "North Korea Thought to Have Separated Pu in the 1970s with Soviet Help," Nuclear Fuel, June 22, 1992, p. 15.

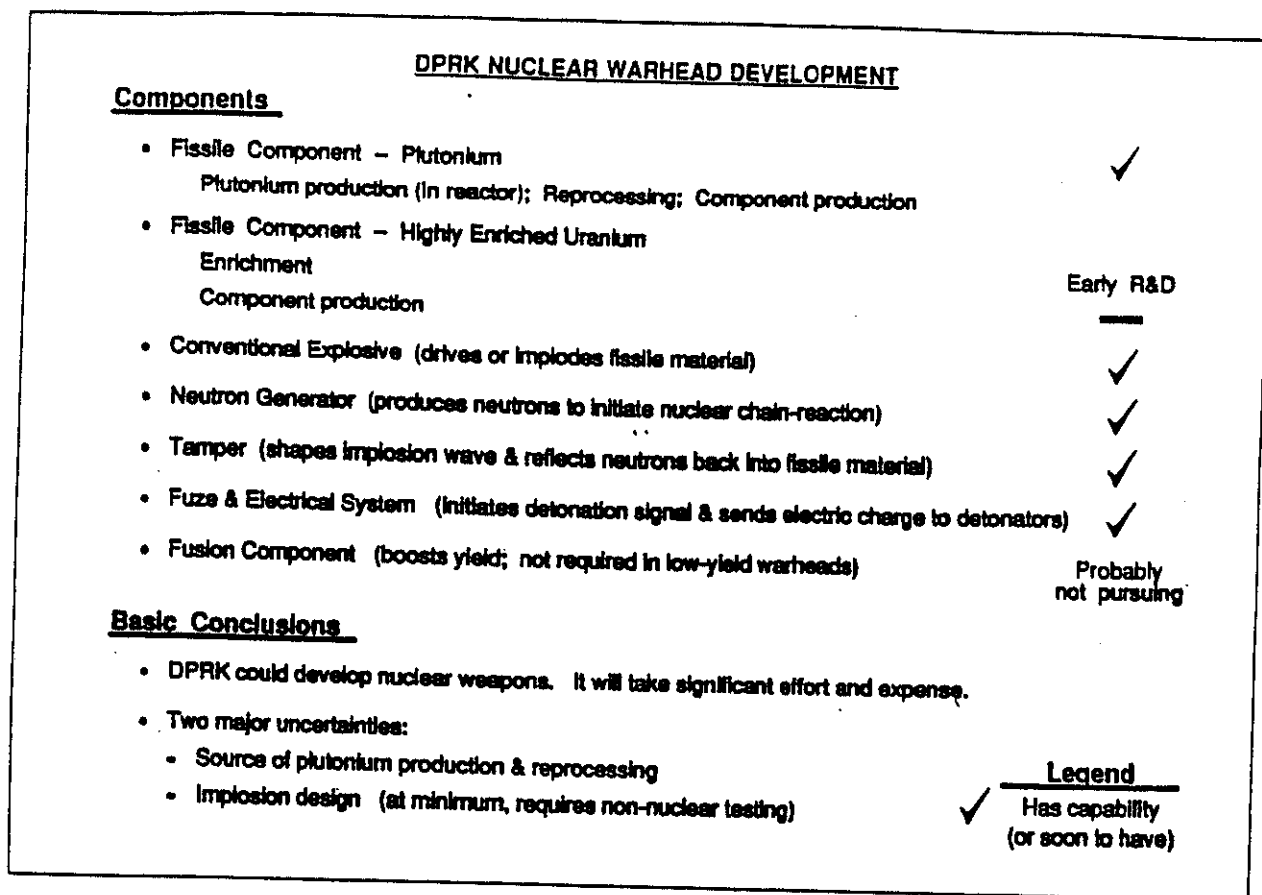


Figure 2

Technical Uncertainty

Uncertainties pertaining to North Korea's production of fissile materials will make it difficult, if not impossible, to rule out a future nuclear weapons capability even if Pyongyang complies with its IAEA and possible future bilateral inspections commitments. By the end of 1992, plutonium for approximately five or six bombs could be available from the 5 MWe reactor, provided that a reprocessing plant or a sufficient number of hot cells exist to separate it from the reactor's spent fuel.

The calculation of plutonium production rests on the assumption that the reactor has run at full power for a given number of days per year. The North Koreans, however, have recently indicated that this reactor experienced unspecified technical problems and has only run intermittently since 1986. Moreover, they claim that with the exception of a small number of damaged fuel rods, from which a "little bit" of plutonium was recovered at the radiochemistry laboratory in Yongbyon, all the original fuel is still in the reactor.⁷ This means that they will assert that the reactor has not generated sufficient spent-fuel for nuclear weapons and that virtually all the plutonium currently in existence in North Korea is still in the reactor. The IAEA will now monitor this reactor's future operations and all of its fuel will be safeguarded. This, according to Pyongyang, should end speculation that the North has access to fissile material for nuclear weapons.

⁷Preliminary Report: Carnegie Endowment Delegation Visit to Pyongyang," Carnegie Endowment for international Peace, May 6, 1992, p. 5.

To verify the North's claims about this reactor's operating history, the IAEA will have to take material samples from the reactor's core and subject them to analysis. It is by no means certain that the IAEA will request permission to take such samples (they have never done so before) or that the North will readily grant permission if requested. Unless these tests are conducted, uncertainty will remain regarding the amount of plutonium actually available to Pyongyang for weapons. It is also possible, but perhaps somewhat less likely, that one or more additional reactors have secretly operated to produce plutonium. (Neither the United States nor South Korea have publicly asserted that such a reactor(s) exists, however.)

Uncertainty will also persist over North Korea's reprocessing capabilities, even if the facility at Yongbyon is dismantled. Before undertaking the design and construction of such a large reprocessing plant, it seems reasonable to believe that the North would have constructed one or more smaller pilot reprocessing facilities and operated them to prove that they knew how to do this complicated and dangerous activity. If so, an unknown number of "hot cells," or small reprocessing laboratories, could exist almost anywhere in North Korea.

A report has also circulated that the North Koreans ran into difficulties with their nuclear weapons effort several years ago, suggesting that the primary utility of the weapons program now lies in the bargaining leverage it provides to Pyongyang and not in terms of any militarily significant weapon potential.⁸ As long as the North remains uncooperative in granting access to declared or potential nuclear sites, however, it would appear to be imprudent to accept this assessment at face value.

III. INTERNATIONAL ATOMIC ENERGY AGENCY INSPECTIONS

The IAEA Inspection Process

IAEA safeguards are to be applied to all nuclear materials in a non-nuclear weapon state signatory to the Nuclear Non-Proliferation Treaty, such as North Korea.⁹ An NPT-mandated agreement provides for the following:

- o the creation of a system of accountancy by the state,
- o the submission of reports to the IAEA based on that system, and
- o a process whereby the Agency verifies the country reports through on-site inspection to ensure that there has been no diversion of nuclear material from peaceful to weapons applications.

A safeguards agreement differentiates between three types of inspections, each to be made under different circumstances. The first, known as ad hoc inspections, are undertaken to verify the state's initial declaration of nuclear material to the Agency. With ad hoc inspections, inspectors are to be granted access to any location at a site that has been declared to the Agency.

⁸See, e.g., Don Oberdorfer, "N. Korea Is Far From A-Bomb, Video Indicates," The Washington Post, June 4, 1992.

⁹NPT safeguards include all material that can be manufactured into reactor fuel, the fuel itself, enriched uranium, spent (i.e., used) fuel, and plutonium, inter alia. Excluded are uranium ore and yellowcake. Small quantities of safeguarded material, however, may be temporarily exempted from safeguards by the Agency upon the request of a state.

Routine inspections can begin following the conclusion of so-called subsidiary arrangements.¹⁰ In implementing routine inspections, inspectors may only be granted access to strategic points – those points where the safeguarded material is considered most accessible and, thus, where a diversion may be most likely to occur -- and to records related to material accounting and facility operation. Primary verification procedures include the use of container seals, camera surveillance, sample analysis, and the examination of records.

The frequency and intensity of routine inspections vary from state to state, and are proportional to the amount and form of the nuclear material that is present in and/or produced by the state. Moreover, provision is made for linking frequency and intensity to the overall effectiveness of the accounting and control system in the state in question. Rarely do inspections take place more than once every six months.

Finally, in the event that the information available to the IAEA is insufficient to permit it to carry out its safeguarding responsibilities fully, the Agency has the right to call for a special inspection. Essentially, special inspections would grant inspectors access to information or locations additional to what has already been declared or made available to the Agency. Although provisions permitting this activity have always been present in the NPT-related safeguards agreement, they have never been implemented.¹¹ The Board of Governors of the IAEA recently reaffirmed the Agency's right to conduct such inspections, however, and much thought has gone into how to implement them.

The main shortcoming to routine inspections is that a state may undertake clandestine activity and not declare it to the IAEA. The framers of the IAEA's safeguard system intended that the prospect of special inspections would deter such activity. In order to be able to request a special inspection, however, the Agency must somehow gain an awareness of where such an inspection should take place, and why. Such information might be made available through shared intelligence or from open sources.

A state could refuse a special inspection request. Such a refusal could be deemed a violation of obligations under a safeguards agreement or, alternatively, could be seen as hindering the Agency's ability to verify that a violation has not taken place. As such, the IAEA could report the case to the United Nations Security Council and General Assembly.¹² Because the Security Council has stated its view that "the proliferation of all weapons of mass destruction constitutes a threat to international peace and security,"¹³ it could thus invoke its responsibilities under Chapter VII of the U.N. Charter to impose sanctions -- including the threat or use of force -- against the intransigent state. Moreover, the General Assembly could

¹⁰Subsidiary arrangements, the contents of which remain confidential between the state and the Agency, lay out the specific procedures by which inspections will be carried out in the state in question. Procedures necessarily vary from state to state, depending on the types of facilities and materials inspected.

¹¹A special inspection can also take place in the event that a state voluntarily reports (a) "any unusual incident or circumstances" related to potential loss of nuclear material, or (b) the unauthorized removal of nuclear material. A special inspection was conducted in Romania in May 1992 in response to a government request. The government had discovered evidence that small amounts of plutonium had been separated from spent reactor fuel in 1985, and that this activity had not been reported to the IAEA. See Ann MacLachlan, "Romania Produced Unsafeguarded Pu, Blix Tells IAEA Board of Governors," Nuclear Fuel, June 22, 1992, p. 16.

¹²Statute of the International Atomic Energy Agency, Article XII.C.

¹³Declaration issued at the U.N. Security Council summit as printed in The New York Times, February 1, 1992, p. 4.

recommend that the body suspend the state's rights of membership. In the case of North Korea, this act would leave South Korea as the sole Korean state represented in the organization and, thus, likely would be viewed as an outcome to be avoided by Pyongyang. While this process may provide some leverage for gaining access to suspect nuclear sites in North Korea, it could take months to do so. In the meantime, the North could have undertaken a sizeable deception effort to mask its activities at the site in question. Figure 3 provides an overview of the IAEA inspection process.

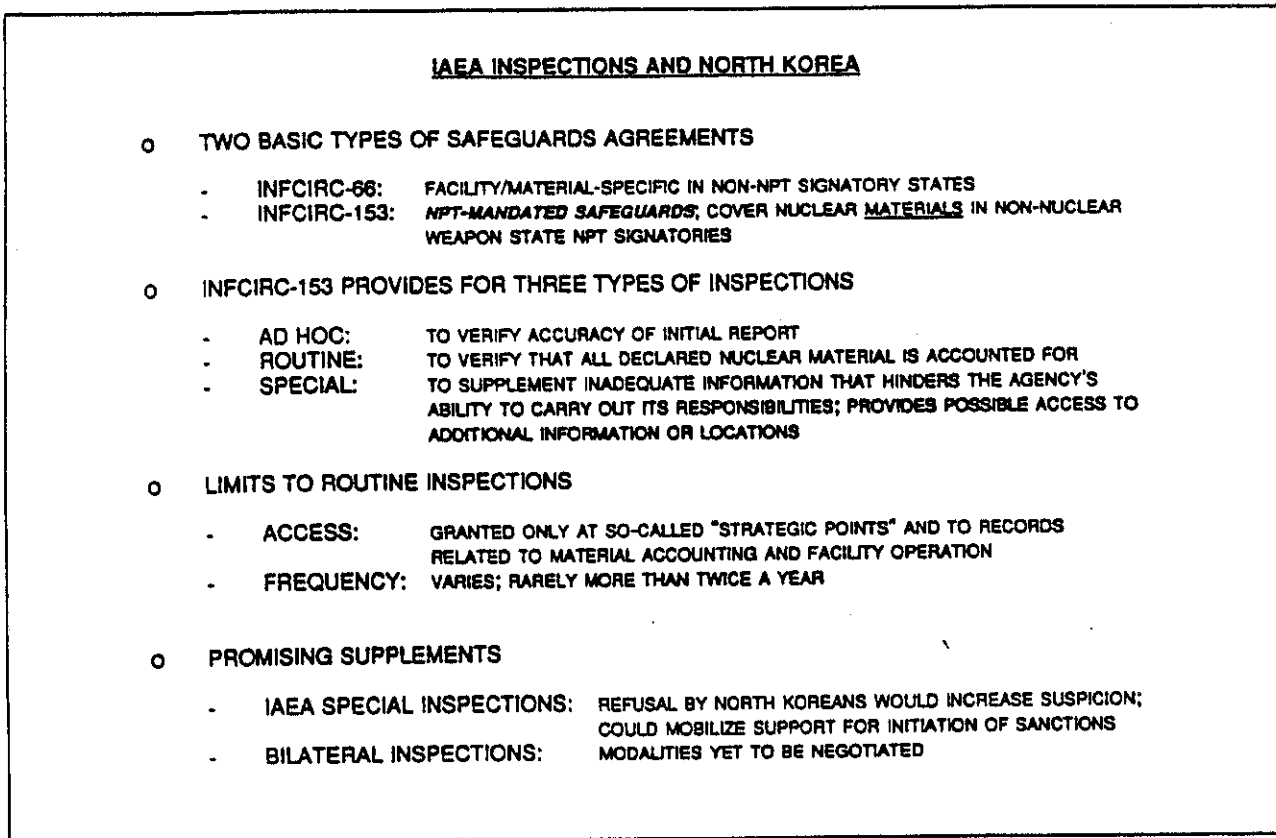


Figure 3

Status of IAEA Activity in North Korea

After a protracted delay, Pyongyang has concluded and begun to permit the implementation of a safeguards agreement with the International Atomic Energy Agency. IAEA Director General Hans Blix traveled to the North in May. His trip constituted an "official visit," and was not considered an inspection. The Agency has conducted its first inspection, however, an ad hoc inspection which began on May 25 and was completed the first week in June. The Agency has stated that it has found no evidence of a nuclear weapons program in the North as a result of its inspection. This judgment, of course, is based only on the evidence to which inspectors had access (they did not take material samples from the 5MWe reactor) and cannot be read as a definitive assessment of the North Korean program. A second ad hoc inspection reportedly will take place shortly.

The left-hand column in Figure 4 below, shows the deadlines, where applicable, for acting on the various requirements incurred by North Korea by virtue of signing both the NPT and a safeguards agreement. The right-hand column indicates actual, or expected, progress in this process. Because negotiation of the

subsidiary arrangements, which stipulate precisely how the inspections will be implemented, are a prerequisite to the conduct of routine inspections, such inspections likely will not take place until the latter half of July, at the earliest.

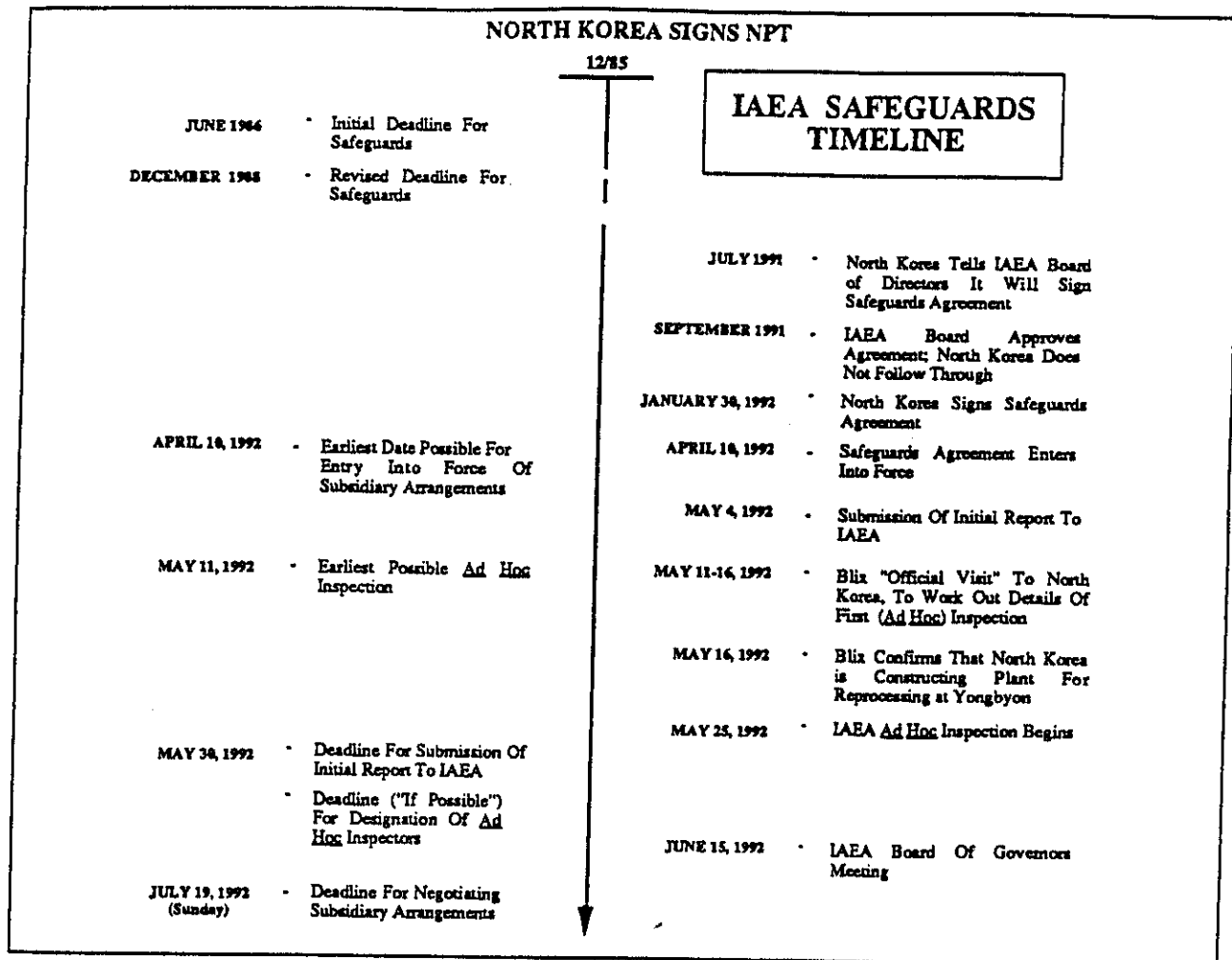


Figure 4

IV. CREATION OF A BILATERAL INSPECTION MECHANISM ON THE KOREAN PENINSULA

The bilateral inspection regime being negotiated by the Joint Nuclear Control Committee currently offers the most promise for back-stopping the IAEA process on the Korean Peninsula. This regime will be rooted in the "Joint Declaration for a Non-Nuclear Korean Peninsula," issued by the North and South on December 31, 1991. The Declaration stipulates that both countries agree not to "test, produce, receive, possess, store, deploy or use nuclear weapons." They also agreed that they "will not possess facilities for nuclear reprocessing and uranium enrichment." To verify the Declaration, Pyongyang and Seoul indicated that they "will conduct inspection of objects chosen by the other side and agreed to by both parties."¹⁴

¹⁴Joint Declaration for a Non-Nuclear Korean Peninsula, Korean Information Office, December 31, 1991.

The JNCC, co-chaired by one North Korean and one South Korean, was established to implement the Declaration. Among its tasks, the JNCC is to develop the modalities for the inspections contemplated in the Declaration. The two countries then entered negotiations to spell-out the JNCC's powers and obligations. The March 14, 1992 "Agreement on the Formation and Operation of the North-South Joint Nuclear Control Committee" charges the JNCC to:

- o Exchange information necessary for verifying the denuclearization of the peninsula;
- o Establish rules and procedures governing the formation and operation of inspection teams;
- o Select facilities for inspection, including those each side insists are suspicious, and the procedures and methods of inspections;
- o Approve equipment that can be used in inspections; and
- o Develop procedures to rectify issues resulting from inspections.¹⁵

Although such an outcome now is impossible, both governments initially indicated that they wanted to begin bilateral inspections sometime in mid-June.¹⁶ The JNCC has met a number of times since late March to draft a bilateral nuclear safeguards agreement. However, serious differences have emerged that, to date, have precluded agreement on inspection procedures. Indeed, negotiations reportedly "abruptly ended" at the JNCC's 27 May meeting after no progress was made.¹⁷ North Korea again blocked progress at the 30 June JNCC meeting. The two sides agreed to convene the JNCC again on July 21, 1992.¹⁸

Specifics related to the formation and operation of inspection teams and the equipment they could carry have not, apparently, been discussed in detail between the two sides. In order to induce Pyongyang to agree to its terms, Seoul has requested, and received, diplomatic support from Washington and Tokyo. Specifically, both the United States and Japan have firmly indicated to North Korea that neither the normalization of relations, nor economic assistance, nor investment can take place until North and South Korea have reached agreement on bilateral safeguards. The European Community has also indicated to the North that bilateral inspections are a precondition for improving relations with Pyongyang.¹⁹

¹⁵"Nuclear Control Committee Agreement," Pyongyang Korean Central Broadcasting Network, March 14, 1992. Cited in FBIS-EAS-92-051, March 16, 1992, pp. 14-15.

¹⁶"Secret Nuclear Site Can Be Inspected - North Korea," Reuter's, Tokyo, April 3, 1992.

¹⁷"U.S. Links Inspections to Better DPRK Ties," Tong-A Ilbo, Seoul, June 3, 1992. Cited in FBIS-EAS-92-108, June 4, 1992, p. 15.

¹⁸"Nuclear Inspection Talks End Without Progress," Seoul, Yonhap, June 30, 1992. Cited in FBIS-EAS-92-126, June 30, 1992, p. 22.

¹⁹"EC Links DPRK Ties Nuclear Inspections," Seoul, KBS-1 Radio Network, June 10, 1992. Cited in FBIS-EAS-92-112, June 10, 1992, p. 15.

The South Korean View

Mirroring somewhat the IAEA process, Seoul has proposed that two types of inspections be established -- regular and special inspections. Regular inspections would take place at sites previously agreed to by both sides. Special inspections would take place at sites deemed suspicious by the inspecting country on the territory of the inspected country. While the definition of what would constitute a suspect site should be agreed to by both sides in advance, specific locations would not be identified in the inspections agreement since suspicions could be raised as new information became available.²⁰

The South also wants the principle established that there could be many more special inspections than regular inspections each year, and that inspectors must be admitted on very short notice -- within approximately 24 hours of a unilateral notice requesting permission to inspect.²¹ All sites subject to inspections, in Seoul's view, whether by regular or special inspections, should be subject to principles of mutuality, symmetry and reciprocity.²² In practice, this would mean that South Korean inspectors could inspect North Korean military bases since Pyongyang has indicated that it wants to inspect military bases in the South.²³

Seoul also argues that the radiochemistry laboratory at Yongbyon must be closed in accordance with the Declaration provision whereby the North and South foreswore both reprocessing and enrichment activity.²⁴ Though consistent with the Declaration, it goes beyond the demands of the IAEA safeguards system alone, which would only oblige Pyongyang to place the facility and any fissile material recovered there under safeguards.

The North Korean View

North Korea rejects the idea that special inspections can take place at sites in the inspected country unilaterally chosen by the inspecting country; indeed, it is not clear that it accepts the concept of special inspections at all. Pyongyang points out that while the Declaration would allow for inspection of objects chosen by one side, inspection could only occur if agreed to by both parties.²⁵

The North rejects the notion that inspections should be ratted in reciprocal rights. Rather, Pyongyang argues, the principle of "simultaneously dissipating misgivings" -- which has not been clarified -- should be

²⁰"3d JNCC Contact Held; No Agreement Reached," Seoul, KBS-1 Radio Network, May 23, 1992. Cited in FBIS-EAS-92-101, May 26, 1992, pp. 17-18.

²¹"Nuclear Talks Deadlock Creates 'Dilemma'," The Korea Herald, May 29, 1992, p. 1.

²²"Policy Meeting With U.S. on Nuclear Issues Set," Seoul, Choson Ilbo, June 4, 1992. Cited in FBIS-EAS-92-108, June 4, 1992, p. 15.

²³"N. Korea Offers Trade-Off on Nukes," Washington Times, November 23, 1991, p. A16.

²⁴"No Agreement Reached in Mutual Nuclear Inspection," Seoul, Yonhap, May 20, 1992. Cited in FBIS-EAS-92-098, May 20, 1992, p. 16.

²⁵"U.S. Stance on Nuclear Issue Called 'Offensive'," Seoul, Choson Ilbo, May 28, 1992. Cited in FBIS-EAS-92-105, June 1, 1992, pp. 19-21.

followed.²⁶ Pyongyang suggests that an example of this principle at work would be the North Korean inspection of all U.S. military bases in the South in return for South Korean inspection of the Yongbyon complex and other sites in North Korea of "international concern."²⁷ Presumably, a site of international concern would be one already inspected by the IAEA, an international organization. Thus, if this interpretation is correct, only those sites on facility agreements with the IAEA or those already subject to IAEA special inspections could be inspected by the South.

In addition, the North suggests that only those bases, presumably military bases, associated with nuclear weapons could be subject to inspection.²⁸ Since neither Seoul nor Washington has ever asserted that nuclear weapons are stored at North Korean military bases, there is thus, the North could argue, no cause for North Korean military bases to be subjected to nuclear-related inspections now or in the future.

The U.S. View

Washington fully supports Seoul's negotiating positions regarding implementation of mutual nuclear inspections in South and North Korea. The United States also concurs that implementation of the Declaration means that the radiochemistry laboratory at Yongbyon must be closed since its operation would violate the no reprocessing commitment North Korea undertook in the Declaration.²⁹ Washington reiterated its position to Pyongyang shortly after the North-South nuclear negotiations were broken-off, and stated that an improvement in U.S.-North Korean relations was impossible so long as North Korea rejects mutual inspections -- including special inspections as generally formulated by the South.³⁰ To increase the chances that an agreement might be struck, however, the United States has indicated that it is willing to discuss opening U.S. bases in South Korea to North Korean inspectors.³¹

The Japanese View

For the time being, Japan has coordinated with South Korea and the U.S. over the issue of its diplomatic discussions with North Korea. Japan also supports mutual North-South inspections as a necessary complement to IAEA inspections.³² Moreover, Tokyo has taken a firm line that all reprocessing activity in the North must not only be stopped, but that all such facilities must be dismantled. Tokyo has told Pyongyang that it will not establish diplomatic relations, provide financial "reparations" for Japan's occupation

²⁶"3d JNCC Contact Held; No Agreement Reached," op.cit.

²⁷ibid.

²⁸"Compromise Draft on Nuclear Inspection Planned," Seoul, Yonhap, May 11, 1992. Cited in FBIS-EAS-92091, May 11, 1992.

²⁹"U.S. Reaffirms Stance on Negotiations," Seoul, Yonhap, June 1, 1992. Cited in FBIS-EAS-92-105, June 1, 1992, p. 19.

³⁰"U.S. Links Inspections to Better DPRK Ties," op.cit.

³¹"N. Korea Offers Trade-Off on Nukes," op.cit.

³²"Tokyo, Seoul Agree on Need for DPRK Inspection," Seoul Yonhap, June 2, 1992. Cited in FBIS-EAS-92-107, June 3, 1992, p. 16.

of Korea, or permit Japanese investment in North Korea until these conditions have been met.³³

Prospects

There is growing concern, in South Korea and elsewhere, that Pyongyang intends to stall on implementing the bilateral nuclear declaration until it becomes a dead letter. This view contends that Pyongyang will fully implement its safeguards agreement with the IAEA, including accepting Agency on-site inspections at Yongbyon and elsewhere, believing that international pressure to reach agreement on bilateral inspections will diminish over time. If this occurs, North Korea likely will reinvigorate pressure on Japan and others to provide aid and investment, citing their cooperation with the IAEA as proof that they have no nuclear weapons ambitions. Failure to reach agreement with the South will be blamed on the unprecedented and unnecessary demands of Seoul and Washington.

Indeed, after numerous IAEA inspections in the North, other countries may conclude that the proliferation issue has essentially been resolved. Continued insistence by South Korea, the United States, Japan and perhaps others, on the need for bilateral inspections could be seen as unnecessary -- possibly even as harassment -- since no other country subject to IAEA safeguards inspections has ever been required to accept the type of additional inspections envisioned by South Korea. If this is the case, future U.S. requests to exert international pressure on North Korea may fail to win needed support. Countries might thus begin to provide economic aid or to invest in the North, thereby generating pressure on Japan and South Korea to do the same.

To avoid this possible scenario, the United States may need to adopt a concerted two-track approach. In the international arena, Washington might usefully stress that bilateral inspections will make an invaluable contribution to the confidence-building process on the Peninsula. At the same time, it will be necessary to push the North Koreans hard over the short-term to accept comprehensive and intrusive bilateral inspections. To do so will require that Washington find the right mix of "carrots" and "sticks" in the policy arena. The North will need to be assured both of tangible benefits in exchange for the desired agreement and that its legitimate security concerns will be addressed. At the same time, Washington, needs to articulate that a lack of cooperation on this issue will jeopardize Pyongyang's overall security, by extending its diplomatic and economic isolation.

V. POTENTIAL NORTH-SOUTH NUCLEAR COOPERATION

The North Koreans have recently proposed to forego plutonium production in the event that alternate reactor technology and fuel sources (i.e., light water reactors fueled by enriched uranium) are made available to them.³⁴ South Korea has already indicated a willingness to engage in such cooperation with the North.³⁵

Particularly from a non-proliferation standpoint, but also possibly from a safety perspective, the use

³³See, for example, Larry A. Niksch, North Korea's Nuclear Weapons Program, Congressional Research Service, CRS Issue Brief IB1141, February 4, 1992.

³⁴"IAEA Director General Completes Official Visit to the Democratic People's Republic of Korea," IAEA Press Release 92/25, May 15, 1992.

³⁵"South Willing to Share Technology," Seoul, Yonhap, June 11, 1992. Cited in FBIS-EAS-92-113, June 10, 1992, p. 14.

of foreign light water reactor (LWR) technology by North Korea would be preferable to reliance on their own indigenously developed reactor. The indigenous reactor relies on natural uranium fuel to power the reactor. Natural uranium fuel consists of 99.3% of the isotope uranium-238 (U^{238}) and 0.7% of the isotope uranium-235 (U^{235}). When a reactor "goes critical," a controlled nuclear chain reaction produces heat; the U^{238} is then bombarded with neutrons and, as a result, will "breed" plutonium.

As is true with uranium, there is more than one isotope of plutonium. Of particular concern, for different reasons, are the isotopes plutonium-239 (Pu^{239}), plutonium-240 (Pu^{240}), and plutonium-242 (Pu^{242}). Pu^{239} is a fissile isotope that is used for nuclear weapons manufacture. Pu^{240} and Pu^{242} , on the other hand, are non-fissile isotopes. While their presence does not detract from the explosive potential of Pu^{239} , they do make weapon manufacture more difficult. However, the greater the presence of the non-fissile Pu^{242} , in particular, the greater the absolute mass of plutonium containing the desired Pu^{239} that is needed to be able to achieve criticality (in the case of weapons, a nuclear explosion).³⁶ The mix of plutonium isotopes can provide the maximal weapon fuel with minimum isotopes 240 and 242 present by limiting the amount of time that the fuel remains in the reactor. Natural-uranium-fueled, gas-cooled, graphite-moderated reactors generally permit frequent refuelling and hence, make ideal "plutonium producers."

By contrast, LWRs are built to run on a single load of fuel for several years. As a result, the amount of Pu^{240} and Pu^{242} that will build up in the spent fuel would greatly increase the difficulties for a state that would wish to use plutonium for weapons applications. This is due, in part, to the difficulties of separating different isotopes of plutonium from one another and, hence, to the consequent need to use larger quantities of plutonium for a single weapon to ensure the presence of sufficient weapons-grade material, as described above.

LWRs run on low-enriched uranium fuel. This means that the mix of uranium isotopes is different from that in natural uranium fuel. Specifically, the amount of the fissile isotope uranium-235 has been increased through the enrichment process to approximately 3%, leaving the fuel composed of approximately 97% U^{238} . The North Koreans have indicated that, in addition to the LWR technology, they would want to be provided with the actual fuel for the reactor. There are several potential implications of this request.

First, it is important to note that Pyongyang appears not to have requested the technology to manufacture its own enriched uranium fuel. The North presumably recognizes that such a request would only inflame international suspicions concerning its nuclear intentions, as such technology could be used both to make reactor fuel as well as to manufacture highly-enriched uranium, the other fissile nuclear material that can be used in nuclear weapons.

Second, while LWRs still produce plutonium, the difficulties related to diverting the spent fuel to weapons applications increase by virtue of the presence of higher levels of Pu^{240} and Pu^{242} .

Third, it is not considered unusual for countries which export reactor fuel to include in the contract a take-back provision for the spent fuel. Thus, while those countries that are the likeliest candidates for providing this fuel to the North (Russia, the United States, and South Korea) face various hurdles related to long-term domestic storage of spent reactor fuel, the possibility does exist that some provision could be made

³⁶Ronald Allen Knief, Nuclear Energy Technology: Theory and Practice of Commercial Nuclear Power. (New York: Hemisphere Publishing Corporation, 1981), p. 157.

to remove the spent fuel from North Korean possession once the reactor is refuelled. Such a provision would virtually eliminate the possibility of North Korean diversion of the plutonium-bearing spent fuel from the LWRs. Because the North now produces its own fuel for its indigenous reactors, instituting such arrangements at this time -- i.e., without the foreign provision of fuel -- would be infeasible.

Fourth, it is still possible that the North could divert some quantity of low-enriched uranium fuel to use in some domestically-engineered enrichment process. Specific factors would tend to discount this possibility, however. One of those factors includes IAEA and, possibly, bilateral inspections that could likely detect such a diversion. A second factor is related to quantity: a diversion of any amount of the material that could go undetected would be unlikely to permit the North to produce any militarily significant quantity of highly-enriched uranium. Thus, while a diversion could offer North Koreans important enrichment experience, it would have little practical effect in relation to the amount of risk it would entail. Diversion of a larger quantity of fresh fuel could hamper reactor operations and, hence, increase the risk of detection. The risks related to fresh fuel diversion for domestic enrichment efforts could be minimized by providing Pyongyang only with sufficient fuel for one load at one time, and by stipulating that refuelling activity be conducted, for example, by bilateral teams of North Korean and South Korean technicians and engineers.

Fifth, plutonium can directly substitute for approximately 25% of the fissile U^{235} in LWR reactor fuel. When IAEA Director General Hans Blix visited the North in May 1992, North Koreans indicated that their interest in plutonium was related to its future use as a reactor fuel. Indeed, if cooperation in LWR technology proceeds, it should do so only with the provision that, as they have pledged, North Korea would abandon completely its plutonium activities. This would be the absolute quid pro quo. Any attempt by the North to renege on such a bargain -- even if attributed to professed civil ambitions for the material -- should clearly raise the immediate specter of terminating LWR cooperation.

Finally, it is unlikely that the North Koreans could remove partially irradiated fuel from the reactor without detection. LWR refuelling is a major undertaking that could be observed by bilateral inspection teams, IAEA inspectors, or even, potentially, satellite imagery. It is possible that the fuel could simply be removed and the reactor left idle; however the abrupt and sustained halt to operations would likely be questioned, and inspections would readily reveal the absence of any fuel. The North could obtain a clandestine source of low-enriched uranium to provide for frequent refuelling activity. However, once again, this would be a major and detectable activity and, moreover, a very expensive one. Absent a total failure of their own indigenous reactor program, combined with a persistent determination to acquire plutonium for weapons purposes, reliance on foreign-supplied LWRs as plutonium producers would appear to involve much too high technical and political risks to be a viable option for Pyongyang nuclear weapon development.

VI. CONCLUSIONS AND RECOMMENDATIONS

For North Korea, the nuclear issue is now caught up in a broader dilemma about the future direction and survival of the regime. The current explicit linkage of most nations' economic assistance to IAEA and bilateral inspections highlights the dilemma that confronts Pyongyang. There are indications that the North may be reevaluating its nuclear program in light of its current political and economic isolation. Therefore, it is important to press North Korea on bilateral inspections, not only to halt further technical progress, but also to maintain the momentum of recent progress before questions related to political succession can further complicate the situation.

However, even with the full implementation of both international and bilateral inspections in North

a problem with

Korea, a fundamental uncertainty will remain with regard to the North's program. Specifically, will Pyongyang have succeeded in producing sufficient plutonium to manufacture -- now or at some future date -- a small stockpile of nuclear weapons? If the North's 5MWe reactor has operated continuously since 1986, and not intermittently as the North claims, Pyongyang could have generated sufficient plutonium for up to 5 or 6 weapons by the end of 1992.

Absent the ability to allay fully concerns to this end, future defense planning with the South will need to bear in mind this worst case option. In particular, Washington will need to continue to demonstrate its full commitment to the South's integrity. However, economic deterioration in the North, combined with an uncertain political future for the Kim Il Sung regime, have begun to color the South's views of the North. For the most part, Seoul no longer sees the North as an entity to be feared. Certainly, nuclear arming by the North would change this equation. However, the South also sees it as increasingly inevitable that reunification will take place on its own terms. From this perspective, regardless of the original intent underlying North Korea's nuclear weapons program, Pyongyang's immediate objective may be to use nuclear weapons as leverage in future reconciliation and reunification negotiations.

An awareness that economic aid, trade and financial investment would be available only with progress on the inspection issue may have encouraged North Korea to accept an IAEA safeguards agreement. As such, the continued promise of economic benefit and, perhaps more importantly, limited trade and capital investment, first from South Korea -- with clear limits on amounts -- in order to provide a "taste" of the benefits to come, may provide the most important incentive for eliciting continued progress on the nuclear issue. This measured approach may hold more promise than more publicized attempts to twist the economic levers even more tightly against Pyongyang. The North is already so economically isolated that such an approach may have very limited utility. However, in combination with limited trade and capital investment, the threat of a tighter embargo could be sufficient to elicit the desired response from Pyongyang.

Yet, attempting to trade economic security (via economic assistance, trade, etc.) for an agreement on bilateral inspections may have limited utility, given the fact that economic opening may be perceived by many in the North Korean regime as constituting a broader threat to the status quo, and may therefore be resisted despite potential benefits. The North's three overriding policy objectives at this juncture can be stated as (a) survival, (b) saving face and, like the South (c) reunification on its own terms. Thus, any and all policy instruments pursued by both Washington and Seoul may be able to minimize the North's predilection toward both nuclear arming and xenophobia if the North perceives that its objectives are being met (or at least not overtly challenged). Examples of the types of instruments that may hold promise in this regard include the creation of a clear U.S. policy "roadmap," involving specific steps to be taken by both the United States and North Korea, on the way to U.S. recognition of Pyongyang (as was done for Vietnam); offering the prospect of renewed U>S> troop reductions, contingent upon progress in the arms control and confidence-building arena between North and South; and extending the moratorium on Team Spirit, initially on a year-by-year basis, if the North is making a good-faith effort to implement the bilateral inspection regime. //

It may also be useful to consider whether incentives for North Korean compliance with inspection obligations may exist in the realm of civil nuclear cooperation. Specifically, the North Koreans have very recently indicated a willingness to forego plutonium production, not based on its bilateral declaration with the South but, rather, in the event that alternative reactor technology and fuel sources (i.e., light water reactors fueled by enriched uranium) are made available to them. Certainly, it can be readily argued that it is not desirable to reward Pyongyang's intransigence with assistance in the nuclear arena. At the same time, however, such assistance may be appropriate in the event that it is provided within the context of North-South

civil nuclear cooperation as an important confidence-building gesture. Such cooperation could provide the North with useful technical assistance on peaceful uses of nuclear energy while also promoting increased non-confrontational contacts between the nuclear specialists of both countries. Such an effort, then, might create a more positive environment within which the North would more readily agree to the types of nuclear inspections desired by the South.

The timing of the North's about-face on inspections -- dovetailing as it did with increased transparency by the South on the matter of U.S. nuclear weapons -- suggests that Pyongyang's continued concern about a nuclear threat was a major impediment to progress on this matter. It also suggests, however, that the North is not naturally inclined to relinquish its primary bargaining chip "merely" on the basis of an international legal commitment. Rather, it suggests that the North responds in real terms only to concrete benefits, and hence supports the notion that Washington and Seoul may need to be prepared to offer tangible quid-pro-quo gains to Pyongyang in exchange for added progress on inspections.

At the same time, however, it would be prudent to consider a number of more forceful steps in the event that the above enticements fail to achieve full North Korean compliance on inspections. In the military realm, such options could include upgrading U.S. forces still stationed in the South with the most modern systems, including the latest Patriot systems and possibly periodic deployments of the F-117, for example; or a resumption of Team Spirit or initiation of another similar joint reinforcement exercise. Diplomatically, the U.S. might raise ongoing proliferation concerns with the IAEA Board of Governors -- a course that may require the sharing of intelligence information with the Agency. In the event that resulting consultations led to a special inspection request that would be refused by the North, the Agency would then be able to refer the matter to the U.N., thus raising the specter of global sanctions mandated by the Security Council and/or a revocation of the North's membership rights by the General Assembly.

In the near-term -- between the recent refusal by the North Koreans at the June 30, 1992 JNCC meeting to seriously discuss North-South inspections and the next North-South Prime Ministers meeting in September -- U.S. policy planning might usefully focus on close consultations with the South Koreans on joint next steps if no inspection agreement is reached by September. In addition to the stated South Korean hold on intra-Korean relations development pending bilateral inspections, and the parallel U.S. and Japanese hold on economic and political ties, other policy decisions may be needed to encourage North Korean cooperation. A three-track approach to increase pressure on North Korea might focus U.S. and South Korean policy planners on: (1) planning for a special inspection request to the IAEA (which would require evidence supporting charges of North Korean violations); (2) planning for subsequent U.N. Security Council consideration; and (3) initiating bilateral U.S.-South Korean planning for a Team Spirit exercise in early 1993. ///

So long as North Korea remains an independent and hostile state, it will be difficult to confirm that it has, indeed, given up its nuclear weapons program. The issue becomes the level of uncertainty that the United States is willing to accept on this issue, and what reasonable measures the U.S. can take -- unilaterally and in conjunction with South Korea and the rest of the international community -- to reach the desired level of confidence. However, the U.S., in pressing on bilateral inspections, must be careful not to pressure Seoul to move more quickly than it perceives to be in its interest -- and in the process risk a setback in the reconciliation process. The North-South reconciliation process provides the greatest promise for creating an environment on the peninsula within which uncertainty about the North's nuclear program can be reduced. Therefore, the U.S. must continue to bear in mind how its actions might affect this process when devising its strategy on these issues.