CHINESE PERSPECTIVES ON THE NORTH KOREAN NUCLEAR ISSUE

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ABSTRACT: The current North Korean nuclear crisis poses a great challenge to the region security and the global non-proliferation regime. China has been playing a remarkably proactive role in the effort to resolve the nuclear crisis. China's approach trying to settle the North Korean nuclear issue would have an important impact on overcoming the current nuclear impasse. In this paper, I will discuss China's position on the North Korean nuclear issue; explore the roadmap to the resolution of the nuclear issue the Six-Party Talks should take in a Chinese view. Finally, I will examine what kind of the effective verification measures should be taken for each step for realizing the complete and irreversible dismantlement of North Korean nuclear programs.

China's Position on the North Korean Nuclear Issue

From the beginning of this nuclear crisis, China has made its position on North Korean nuclear issue clear: preserving peace and stability on the Korean Peninsula; keeping the peninsula nuclear-free; resolving the crisis through peaceful and diplomatic means; and addressing reasonable security concerns of North Korea.[1]

China has a number of major interests in a nuclear-free Korean Peninsula. Firstly, avoiding a war and preserving stability on the Korean Peninsula is a top priority of Chinese government. Since China is focusing on its economic development, it requires a stable surrounding environment. However, a nuclear North Korea will increases a risk of wars, since U.S. would not tolerate a nuclear-armed North Korea. Thus it would lead to an instable region and make the security landscape uncertain. Secondly, a nuclear North Korea would stimulate a regional nuclear proliferation or even nuclear exchanges. For instance, Japan would be encouraged to develop its nuclear arsenal. Then South Korea or Taiwan would surely follow the suite. Also it would lead to a conventional arms race in the region. Moreover, North Korea is the only country that withdrew from NPT and which has made nuclear weapons. An accept of nuclear North Korea would set a bad precedent for others and thus the NPT regime would be seriously damaged. Thirdly, China is concerned about the issue of refugees. There are already tens or hundreds thousands of illegal border crossers residing in China. If North Korea is determined to keep its nuclear weapons, it would face international isolation and even war, thus eventually political and social instability will be generated which would lead to thousands of North Korean refugees swarming into China, which would further increase the local economic and social burden and further complicate China's diplomatic effort. Finally, a nuclear-armed North Korea would increase difficulties for China to balance relations with U.S. and North Korea, and China's relations with the two Koreas.

China believes that the best option to pursue a nuclear-free North Korea is through peaceful and diplomatic means, since any coercion strategy would not work, only worsen problems. China is seeking a regime reform and economic reform, rather than a collapse of the DPRK regime. China,

shifting from its traditionally low-profile diplomacy in Korean peninsular affairs, is playing a proactive and irreplaceable role in defusing the nuclear crisis. Indeed, China has important economic and political leverage on the North Korean nuclear issue. China is a traditionally close ally of neighboring North Korea. Both have a "friendship cemented in blood" during the Korean war. Also China is supplying North Korea with about 70-90 % of its energy needs and 40% of its food, and China is current North Korean largest trading partner. Since April 2003, China has hosted one trilateral negotiation and three rounds of six-party talks. During the process, China acts as not only a host, but also as a mediator and a constructive participant as well.

However, China's playing more roles would be limited mainly by the fact that it is the U.S and North Korea who hold the key to resolving the crisis. China's influences would be dependent on both willingness to resolve the crisis. Many "If's would void China's efforts to a peaceful resolution of the crisis, such as, if North Korea has no intention to give up its nuclear program at any cost; if U.S. still keeps its inflexible position; or if US pursue an end game of "regime change".

A Step-by-step Approach toward a CVID

The six-party talks have been deadlocked since last June. In the last six-party talks, U.S required "complete, verifiable, and irreversible denuclearization"(CVID) first, and to consider "reward" later. However, North Korea demanded to take "words for words, actions for actions" approach starting from "reward for nuclear freeze proposal". Since this February, North Korea has declared it has made nuclear weapons and will continue to enhance its nuclear deterrence. Meanwhile, Pyongyang has preconditioned only further talk upon the U.S. ending "hostile policies". In May, North Korea said it had removed thousands of spent fuel rods (loaded in February 2003) from its 5MWe reactor. Recently North Korea is reported to conduct a nuclear test. Thus resolving this nuclear crisis is an urgent matter.

China believes that a resolution of the nuclear impasse had to address reasonable security concerns of North Korea. Its nuclear ambition as Pyongyang perceived is driven solely by the U.S threat.[2] In particular, Bush's "hostile" policy toward North Korea makes it feel insecure. Most Chinese people including the author believe that Pyongyang would most likely give up its nuclear program verifiably if it can get a reliable security, economic and political benefits. However, if Pyongyang gets nothing rather than more pressures, it would continue its nuclear brinkmanship.

China believes the six-party talks are the best way to resolving this nuclear crisis. To resume the talks and negotiate way out of this nuclear impasse, the U.S should take a more serious and flexible approach. Its current " take-it-or-leave-it" strategy is not feasible. If the U.S. cannot tolerate to a nuclear-armed North Korea, it should take the most realistic option "give-and-take" diplomacy for a negotiation solution. The North Korean nuclear issue should be resolved through a package deal—linking North Korean CVID with concrete benefits of security guarantee, normalization and economic aids. Given the deep mistrust between Washington and Pyongyang, a CVID could not be achieved overnight. It should take a step-by-step approach with the goal of a CVID. Based on "simultaneous action" principle, U.S. and other parties pledge to provide North Korea with some reasonable security guarantee, economic and political benefits in a step-by-step manner.

Here, I will focus on what specific steps North Korea should take for a CVID, which would depend on its nuclear status. As already known, North Korea has established a complete nuclear

fuel cycle for plutonium production at Yongbyon (see table1). The current major plutonium production facilities include the 5MWe gas-graphite reactor and the Radiochemical Laboratory (a reprocessing plant). It is estimated about 7-10 kg plutonium had been separated before the 1994 Agreed Framework (AF). As Pyongyang declared, it had reprocessed its 8000 fuel rods once frozen under 1994AF, which would produce about 25-30kg plutonium. The recently discharge rods once reprocessed could provide about 12kg or more plutonium. In addition, its IRT-2000 research reactor could produce no more than 2.8-3.6kg plutonium. Moreover, once the 50 MWe Yongbyon reactor and 200 MWe Taechon reactor are resumed construction and completed, they will provide about 280-230kg plutonium per year.

Table 1. DPRK Plutonium Production Facilities at Yongbyon

Facilities	Type/details	Comments
5 MWe Gas-graphite Reactor	NU fresh fuel; 6kg Pu/yr; Started operation in Jan.1985. Frozen since 1994 AF; Operating since Feb.2003.	Under 1994 AF, all these listed facilities (except IRT-2000 reactor) were subject to freeze and eventual dismantlement.
50 MWe Gas-graphite Reactor; 200 MWe Gas-graphite Reactor (Taechon)	NU fresh fuel; capacity of 180-230kg Pu/yr; Both reactors started construction since 1984 and suspend under AF.No evidence shows construction on this two reactors has been resumed after NK un-frozen AF in Dec.2002.	Under 1994 AF, this two larger reactors and the 5MWe reactor would be replaced by two LWRs via KEDO.
Reprocessing Plant (Radiochemical laboratory)	Operational capacity of 110 tHM/yr, to expand: 220-250 tHM/yr.	NK stated it had finished the 8017 spent fuel rods in 2003.
Fuel Rod Fabrication Plant	This plant became operational in early 1987; capacity of 100 tons fresh fuel/year for 5MWe reactor; since 1992,expanded reportedly up to 200-300t fuels. Also NK operated a pilot-scale fuel fabrication plant from 1983 to 1986.	The plant was frozen under the 1994 AF, but un-frozen since Dec.2002.
Two undeclared suspected waste storage sites	One near the reprocessing plant, the other near the IRT-2000 reactor.	Under AF, the two sites would be allowed special inspection after a significant portion of the LWR project is completed, but before the delivery of key nuclear components (supposed mid 2005).
IRT-2000 Research Reactor and hot cell	8MWth, 36%HEU, 1992 NK admitted 300mg Pu separated in 1975. But Albright, etc estimated less than 2.8-3.6kg separated Pu.	July 1977 signed INFCIR/66. Resumed inspection in 1996 after 1994 crisis. Except this facility, all above were covered by 1994 AF.

Source: see, e.g. David Albright, Frans Berkhout, and William Walker, *World Inventory of Plutonium and Highly Enriched Uranium 1992* (New York: Oxford University Press, 1993); David Albright and Kevin O'Neill, ed., *Solving the North Korean Nuclear Puzzle,* ISIS Press, 2000.

It is believed that even without a nuclear test, North Korea can make workable implosion-type fission bombs.[3] It is reported that about 1-2 weapons were already made from plutonium

produced pre-1994AF. Assuming about 6kg plutonium is needed for each of its first generation weapons, it would add about 4-5 bombs from plutonium reprocessed in 2003. If the new removed rods are reprocessed within a few months, it would have a stockpile of 7-9 bombs at the end of 2005. In addition, the two larger reactors would produce about 30-40 weapons per year once they are operational (the reactor constructions could be finished within 2-3 years if resumed now). Moreover, if North Korea conducts any nuclear tests, the plutonium needed in each bomb could be reduced to about 3--4 kg,[4] thus its nuclear arsenal would be even larger.

A nuclear device to mate to a missile system would be required reducing its weight and size. Based on nuclear design experience from other countries, it can be estimated that North Korea should be able to build its plutonium bomb less than 1000kg. For example, Sweden designed several implosion-type nuclear device as light as 600kg with a yield of 20kt in a nuclear program started around 1960 but terminated by 1965. South Africa built gun-type nuclear devices (using HEU) weighed about 900kg. A nuclear bomb weighting less than 1000 kg would be built small enough in size to mate to North Korean Nodong and Taepodong-1 missiles with a range covering whole Japan and U.S. military bases there.

Unlike the already-known plutonium production, the nature of North Korean HEU production is much less clear. The HEU issue is the key driver to incite the current crisis. While the First Deputy Foreign Minister Kang Sok Ju acknowledged the existence of such a program to respond James Kelly's HEU charge during his Pyang visit in October 2002, Kang and other officials denied it later.

What does U.S. say about the North Korean enrichment program? On November 19, 2002, a released CIA unclassified report to the Congress stated that, " North Korea was constructing a plant that could produce enough weapons-grade uranium for two or more nuclear weapons when fully operational – which could be as soon as mid-decade."[5] The main evidence shown about Pyongyang's HEU program includes:[6] (1) an attempt to buy two electrical-frequency converters from a Japanese firm in 1999 and again an effort for three frequency converters in 2003; (2) acquirement of centrifuge prototypes and blueprints provided by Abdul Qadeer Khan as he confessed; (3) obtained equipment suitable for use in uranium feed and withdrawal systems as Washington Times reported in November 2002; and (4) a 22-ton shipment of high-strength aluminum tubes (usable for vacuum casings for Urenco-type centrifuges) to North Korea ,which was blocked by French, German, and Egyptian authorities in April 2003. However, these public evidences can not show whether Pyongyang has ever made a successful effort to get significant material and equipment, in particular, the high-strength aluminum tubes—the key material for manufacturing centrifuges. Also, it seems there is no convincing evidence provided to the other parties (at least China) during the six-party talk. On June 7, 2004 Chinese Deputy Foreign Minister Zhou Wenzhong told a New York Times reporter, "So far, the United States has not presented convincing evidence of the uranium program. We don't know whether it exists."[7] Moreover, there are some arguments about the real purpose of HEU issue proposed by the Bush administration.[8]

It is estimated that producing 60 kg WgU for one gun-type fission bomb would need over 4000 centrifuges running for one year. Even if North Korea gets enough materials, it would take about 4-5 years to produce those centrifuges. Based on an analysis on the steps for a production-scale CEP (see table2), the status of HEU could be estimated as follows: if Pyongyang has a dedicated HEU program, its status could be somewhere between R&D level and pursuing a capacity

of a pilot experimental facility. Even if North Korea gets enough materials and equipment, it would be several years away from producing HEU enough for one or two bombs. However, it is highly doubtful that North Korea has bought enough materials for the thousands of centrifuges. At least, it had not by April 2003 as shown in the blocked shipment of high-strength aluminum tubes. Moreover, it would be much more difficult for Pyongyang to get those materials, considering the international focus on its nuclear program and much stricter control of those materials after the nuclear crisis.

Table 2 Major Steps for a Centrifuge Enrichment Plant

Major steps	Details	Comments
R&D program/ facilities	--Prototype centrifuge: design, construction, test; --Cascade R&D, etc.	If NK got centrifuge prototypes and blueprints from Khan, it would speed up this step.
Manufacturing centrifuge facilities	--Construction of plant; --Procurement of equipment, parts, and materials for centrifuge, etc	?
UF6 production facility	--Construction of UF6 production facility; --Provide some UF6 for Prototype centrifuge testing; and later feed for a CEP, etc.	There is no convincing evidence that NK produces UF6 while some arguments exists. But, there should be no difficulty for NK to have such a capacity.
A pilot centrifuge facility	--Build and test an experimental centrifuge cascade (could need a few hundreds of centrifuges), etc	If NK attempts to buy 2-3-frequency converters from Japan were succeeded, it could be only used for a pilot facility.
A production -scale CEP	--To produce 1-2 bomb worth HEU per year would need thousands of centrifuges; --Require procurement of a large amount of materials and equipments.	While NK tried to purchase a large quantities of materials (e.g. the aluminum tubes), there is no evidence any such efforts have been successed.

In short, North Korea is using its known plutonium production facilities to increase its plutonium stockpile and thus more bombs. However, the nature of centrifuge-enrichment program is still not clear. Moreover, a verification of a CEP will require more transparency and more intrusive measures. Given the deep distrust between both sides, it would be very difficult to verify a CEP without more confidence building measures. In addition, it should not let the dispute over HEU block a procedure of CVID. Given above facts, below I suggest three steps to arrive at the goal of "complete, verifiable, and irreversible denuclearization": the first step would focuses on a freeze of plutonium production;[9] the second step would dismantle plutonium production facilities, plutonium weapons and associated facilities; and the third step would dismantle the HEU program. Each step should be with adequate transparency and verification measures.

Verification Measures for Each Step

Step one: freezing plutonium production

From the beginning, North Korea should declare all its plutonium production facilities as shown in table 1 and others (if not yet declared). The major freeze facilities should cover: shutdown

of the 5 MW (e) reactor; monitoring of the new irradiated rods discharged this May (if not reprocessed by the start of this step) and the remaining (if still have) irradiated fuel discharged in 1994; closing of the Radiochemical Laboratory; freezing of the fuel fabrication complex; freezing of the construction of the 50 MW (e) and 200 MW (e) reactors; and freezing of the nuclear waste sites.

It should be easier to monitor and verify the status of these freeze facilities, as 1994AF did before. For example, monitoring the shutdown status of 5 MW (e) reactor includes on-site visits and putting tamper-proof sensors on the pressure vessel of the reactor. Also water vapor from the cooling tower of the reactor would be seen from satellite imagery.[10] The status of the closed reprocessing facility can be monitored by on-site means including tamper-proof seals and cameras. The freezing of the construction of two larger reactors can be monitored by satellite imagery and on-site visit. Thus, this first step would gradually enable some confidence building measures that lead to a CVID.

Step two: dismantlement of plutonium weapons and plutonium production facilities

At this step North Korea should pledge to dismantle all its plutonium weapons and plutonium production facilities. North Korea should first makes a declaration of the total amount of plutonium ever produced. Pyongyang could prefer to take the South African disarmament model, i.e. dismantling its bombs first, then submitting total plutonium of any form either from a pit or others, and accepting verifications confirming the termination of its nuclear weapons program.

Verifying correctness and completeness of total plutonium production would account for all plutonium forms including separated plutonium in stock, plutonium recovered from weapons, plutonium in high-level waste and plutonium lost during weapon's manufacture. Verification of the accuracy of fissile material production can be generally reached several percent (e.g. South Africa's HEU case is 1%). To get a higher accuracy of past plutonium production, Pyongyang should provide detailed records of operating history of the 5 MWe reactor, reprocessing plant and relevant activities. Also, it should keep all records of dismantlement of weapons; and allow interviewing of relevant personnel. Pyongyang may not keep or provide all those records. However, it could use other approaches to estimate a total amount of plutonium. For example, measurements of total radioactivity of Cs137 and Sr90 in HLW or the total volume of HLW (whether in liquid or sludge form) at two suspected waste storage sites would allow an estimation of total plutonium production. Moreover, sampling at the reprocessing plant or surroundings would derive the separation time of plutonium.[11] Another way to estimate the total plutonium production is to measure the concentrations of some radionuclides (e.g.C-14) in the graphite or steel components of the reactor core, which could achieve a figure with less than 10% "error margin".[12] Considering North Korean current small plutonium production, such an accuracy (i.e. less than 4-5kg difference) could be acceptable. However, if the plutonium program is not frozen soon, instead of waiting for another four years, without North Korean providing detailed records it would be very difficult to detect a mount of plutonium enough for least one bomb.

In addition, all facilities associated with weaponization program should be dismantled or decommissioned, and all facilities associated with plutonium production (e.g. 5MWe, 50MWe, 200MWe reactors, Radiochemical Laboratory) should be dismantled or decommissioned. Finally, all plutonium and irradiated fuels should be removed out of North Korea to a nuclear weapon state.

Step three: dismantlement of HEU program

From the beginning, North Korea should make a comprehensive declaration of its HEU program including centrifuge design, R&D, procurement, production and operation, and pledge all associated facilities or items are to be dismantled and decommissioned. The verification of HEU program is depending on status of the program, such as, whether it is producing HEU or not. It is estimated that it could be several years away to produce HEU for one or two bomb. Its status could be somewhere between R&D level and pursuing a capacity of a pilot experimental facility. If so, it should be relatively easy to verify the declared HEU activities. For example, North Korea should explain and destroy the centrifuge prototypes and blueprints provided by Abdul Qadeer Khan, and the obtained equipment suitable for use in uranium feed and withdrawal systems. In addition, other cooperative measures including interviews with related persons should be accepted.

The detection of an undeclared centrifuge enrichment program would be a challenge, since a small-scale CEP could be easily hidden. However, such a hidden facility would become more difficult by some measures. For example, the Additional Protocol is designed to make a clandestine nuclear program more difficult. At this step, North Korea should have ratified the Additional Protocol to allow more intrusive measures including complementary access and environmental sampling. Environmental sampling at a site or facilities would disclose the HEU presence and related activities as shown in the case at Iranian Natanz CEP site. Moreover, a CEP needs an electric power system requiring conversion of the line frequency to a much higher frequency. A distinct signal reflected from converters back into the line would be detected. Also the operating centrifuges would make distinct noise, which might be detected.[13]

Human source and intelligence could also uncover a secret nuclear program. If history tells us anything, it is that the more people involved and the more open the society, the more difficult it is to hide a secret for long. Indeed, there are several cases where clandestine nuclear programs were disclosed by defectors including Israel's Dimona complex and Iraq's nuclear program. Moreover, the high-resolution commercial satellite imagery is making the sky more open. For example, an Iranian opposition group first revealed publicly the existence of the Natanz CEP site in August 2002. Then based on this information, the Institute for Science and International Security (ISIS) released the first public commercial satellite images of the site in December 2002.[14] Furthermore, the verification provision itself would play a role of deterrence. From the beginning six-party talks should make clear that such a CVID resolution would be conditioned with the security, economic and political benefits. If North Korea is found to be in a violation of any of its pledges, it should be clear what costs it will pay at each step. At this step, it is assumed Pyongyang would have achieved most of its demands including a reasonable security guarantee, expanding economic aids and reform, and (or toward) a normalization with U.S. Thus, while it has already dismantled its larger plutonium program, Pyongyang would have no rationales to keep its HEU ambiguity to risk a high cost. If Pyongyang took such a risk, it could even have no more chance for its regime survival.

Finally, North Korea would not be willing to allow inspecting its each corner where locates sensitive and non-proscribed military or civilian facilities and activities. However, such disputes would be less severe, when both sides have given up mutual "hostile" policies and built more confidence measures. Most importantly, such sensitive sites would be in most cases verified through a managed access approach.[15] For example, the undeclared facilities and activities would be detected by sampling near the site through their signatures in the effluents such as HEU from

enrichment activities and fission products (e.g. Kr85 in air, Cs137 in river) from reprocessing. In some cases where it will be essential for inspectors to have access areas with classified activities, appropriated measures would have to employed to protect sensitive information, such as taking measures including shrouding and masking of sensitive equipments. If Pyongyang and Washington still suspect each other, China or Russia would help to settle down some disputable issues.

In short, a CVID should be achievable through the proposed three steps. The major obstacles of CVID implementation are political, not technical. It would depend on both the U.S. and the North Korean having the political will.

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