A Scientist's Perspective on the North Korean Nuclear Dilemma

Siegfried S. Hecker
Los Alamos National Laboratory

For presentation at Working Group 1 of the
Stanford University Five-nations Project
on South Asia Security
Bangkok, Thailand
July 27, 2004

Plutonium nuclear weapons in North Korea

- April 23-25, 2003 - at the margins of the trilateral talks in Beijing, DPRK officials told U.S. officials they have nuclear weapons, will not dismantle them, and might transfer or demonstrate them*
- February 2003 – CIA director G. Tenet stated "North Korea was likely to have been able to produce as many as two plutonium-based nuclear weapons"
- Early 2004 – A.Q. Khan allegedly told Pakistani investigators that he was shown three nuclear devices in a secret North Korean underground nuclear plant during a visit in 1999
- Since April 2003, DPRK has stated frequently that it has strengthened its "deterrent"

No one outside North Korea really knows. The best we can do is to bound our estimate based on its plutonium production.

*U.S. Assistant Secretary of State James Kelly: U.S. Senate testimony to Committee on Foreign Relations, July 15, 2004.

Plutonium production in DPRK reactors

Reactor	Range*	Mean best estimate*
• Soviet-supplied IRT research reactor	2 to 4 kg	2.4 kg
• 5 MWe Magnox reactor < 1992	6.9 to 10.7 kg	8.4 kg
• 5 MWe Magnox reactor – 8000 fuel rods unloaded in 1994	25 to 30 kg	28 kg
Best overall estimate (Low Pu-240 content makes it weapons-grade)	**34 to 39 kg**	**36 kg**

*Based on estimates by David Albright and Kevin O'Neill, editors, "Solving the North Korean Nuclear Puzzle," ISIS Reports (The Institute for Science and International Security), Washington, D.C., 2000.

Future plutonium production is limited

- Construction of the 50 and 200 MWe Magnox reactors that could have produced close to 300 kg plutonium per year and was frozen by the Agreed Framework cannot readily be restarted.
- The 5 MWe Magnox reactor was restarted in February 2003. It has produced roughly 9 kg plutonium in its fuel rods.* However, this plutonium is not suitable for weapons until it is reprocessed.
- The 5 MWe reactor will produce 6 kg plutonium annually. DPRK has sufficient supply of uranium fuel to continue to reload the reactor if so desired.

* As of July 2004.

Plutonium metal production useful for nuclear weapons

- DPRK Radiochemical Lab is an industrial-scale reprocessing facility in operation since 1989
- DPRK has the technical expertise, proper facilities, and sufficient capacity to have extracted the entire 36 kg of plutonium metal
- In January 2004,DPRK officials showed us (Lewis delegation) an alleged 200-gram scrap piece from a plutonium metal casting
- We are still uncertain if DPRK extracted all 36 kg of plutonium from spent fuel rods

But DRPK has demonstrated that it can do so and, hence, we must assume it has weapons-usable plutonium metal

Uranium nuclear weapons in North Korea

- DPRK possesses plentiful uranium ore and production facilities to make uranium fuel elements or feed stock for centrifuge enrichment. There are no declared facilities for making uranium hexafluoride.

- In October 2002, U.S. officials confronted DPRK with alleged covert program to enrich uranium

- DPRK officials now deny having a uranium enrichment program – they told us "no program, no facilities, no equipment, and no experts trained in uranium."

- A.Q. Kahn allegedly told Pakistani investigators that he sold enrichment designs, material, and equipment to DPRK, along with Iran and Libya.

It is very probable that DPRK has some form of uranium enrichment. However, there is much uncertainty about how far away it is from producing enough material for weapons.

Overall assessment of DPRK nuclear program

- No one outside DPRK really knows the status of its program. Building a plutonium implosion device is not a trivial task.
- However, given the sophistication of the rest of the DPRK nuclear program, we must assume they can and have built at least a crude nuclear device.
- Congressional Research Service* estimates plutonium is sufficient for 5 to 8 nuclear devices.
- No one outside DPRK knows if it can build a sophisticated device for a warhead for missile delivery.
- It appears DPRK is pursuing a second, uranium, route to nuclear weapons. No one outside DPRK knows how close it is to success.

* L.A. Niksch, CRS Brief IB91141, June 9, 2003.

Motivation for DPRK's nuclear weapons program

- Until 2002 the DPRK did not admit to having a nuclear weapons program.
- However, in their private remarks to J. Kelly in April 2003, they clearly put the U.S. on notice of its nuclear weapons program.
- In contrast to the private statements, the official DPRK statements were intentionally vague – referring only the necessity to strengthen its deterrent because of the hostile actions of the United States.
- The DPRK nuclear center also went to great lengths to hide evidence of reprocessing activities in spite of public statements claiming such.
- The DPRK apparently used our visit in January 2004 to reinforce its private statements with evidence of a nuclear weapons program.

The DPRK's actions in 2003 make it clear that it had a covert nuclear weapons program for years – in direct violation of its NPT obligations, the Agreed Framework and the North-South Joint Declaration on the Denuclearization of the Korean Peninsula

Why does North Korea want nuclear weapons?
A Russian perspective

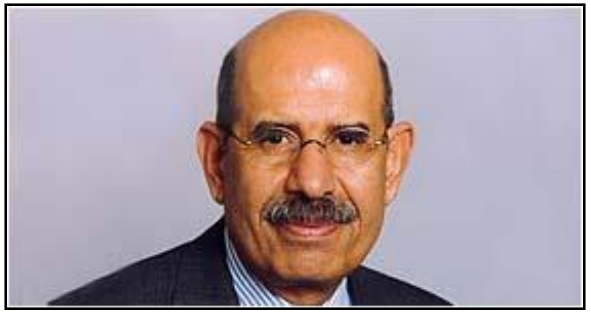
- Could serve as the most powerful and cheapest deterrent against open aggression.
- Domestic consumption – increase tensions in area and distract people's attention from daily grievances. Make people more scared and more submissive.
- International statement - Demonstrate that DPRK won't bend under pressure and defy all forms of control.
- Raise international status – demonstrate technological achievement.
- Use them as a diplomatic card to bring U.S. to bargaining table
  - Gain concessions – desire to negotiate a compromise based on mutual concessions, equality, and reciprocity (deemed most likely).

Natalia Bazhanova in
Moltz and Mansourov (2000)

What are the greatest DPRK nuclear threats?

- Sale or diversion of fissile materials or weapon components
  - In my opinion, sale of an entire weapon is not credible
- Act of desperation or miscalculation leading to nuclear use
  - "Last act" as a result of perceived or real attack
- Accidental detonation of nuclear device
  - Or major disaster at one of its nuclear facilities may lead to health and/or environmental problems in neighbor states
- Using nuclear weapons to threaten or blackmail its neighbors
  - May cause Japan or ROK to go nuclear
  - Lead to instability in Northeast Asia (potential domino effect)
  - Situation would be exacerbated by a DPRK nuclear test
- Undermining the international nonproliferation regime
  - Could cause or contribute to unraveling of regime and result in widespread nuclear proliferation

North Korea is the No. 1 national and international security concern – Mohamed ElBaradai – Director General, IAEA



- North Korea has decided to walk out of the NPT. The Security Council did not even respond with a "we are concerned."
- North Korea is the worst precedent that ever existed. It has been in noncompliance since 1992. We tried to buy them off in the 1994 agreement, but it did not work.
- It made use of loopholes in the agreement and in the export control system. It developed a second track of HEU for nuclear weapons.
- It sends the worst signal to would-be-proliferators: if you want to protect yourself, accelerate your program, because then you are immune in a way.

If this is not a threat to international peace – what is?

M. ElBaradai, Council on Foreign Affairs, New York, May 14, 2004

Most important threat reduction actions

- Reduce weapon-usable plutonium inventory – remove from DPRK
- Prevent nuclear component and materials export or trafficking
- Dismantle any existing nuclear weapons and eliminate all plutonium
- Stop production and processing of additional plutonium
- Stop and eliminate uranium enrichment activities
- Eliminate infrastructure for nuclear weapons and nuclear materials
- Have DPRK rejoin NPT, allow IAEA inspections, and adopt IAEA additional protocol provisions for monitoring and inspection
- Assist DPRK nuclear workers make transition to non-weapons work

Working toward a diplomatic solution

- All parties have stated a common objective: a nuclear-weapons free Korean Peninsula
- All parties agree that diplomacy is the best way to resolve the crisis
- U.S. chose Six-Party talk format for resolving the current nuclear crisis
- North Korea agreed to participate – but has pushed for bilateral discussions with U.S.

Is the DPRK willing to give up its nuclear weapons program in return for real peace and prosperity through trade, aid, and economic development?

U.S. proposal tabled at June Six-Party Talks

- DPRK takes first step to commit to dismantle all nuclear programs

- Next, parties agree on detailed plan that, at a minimum, requires:
  - Supervised disabling, dismantlement and elimination of all nuclear-related facilities and materials
  - Removal of all nuclear weapons and components, centrifuge and other nuclear parts, fissile materials, and fuel rods
  - Long-term monitoring program

- During initial period (perhaps 3 months), prepare for dismantlement and removal of DPRK nuclear program. DPRK would:
  - Provide complete listing of all nuclear activities and cease all nuclear operations
  - Permit securing of all fissile material and monitoring of all fuel rods
  - Permit publicly disclosed and observable disablement of all nuclear weapons, weapons components, and key centrifuge parts

U.S. proposal tabled at June Six-Party Talks (cont.)

- As DPRK carried out its commitments, the other parties would take some corresponding provisional and temporary steps. Lasting benefits from these steps would only accrue after dismantlement of DPRK's nuclear program is complete.

- These steps would include:
  - Upon agreement of overall approach, non-U.S. parties would provide heavy fuel oil to DPRK.
- Upon acceptance of DPRK declaration, parties would:
  - Provide provisional multilateral security assurances, which would become more enduring as process proceeds.
  - Begin study to determine energy needs and how to meet them with non-nuclear energy programs.
  - Begin to discuss steps necessary to lift remaining economic sanctions and on steps necessary for removal from list of state sponsors of terrorism.

DPRK position – reiterated at June Six-Party Talks

- Agree to re-freeze its nuclear program as first step on path to nuclear disarmament.

- Freeze includes:
  - All facilities related to nuclear weapons and the products that resulted from their operation.
  - Refrain from producing more nuclear weapons, transferring them, and testing them.

- Freeze must be accompanied by security assurances from U.S.

- Freeze must be matched by rewards – energy assistance, lifting of sanctions, and removal from list of countries sponsoring terrorism.

Response of DPRK and U.S. to each other's proposals was encouraging, although each acknowledged they are still far from agreement.
All parties agreed for fourth round of talks before end of September.

Response from other four parties

Japan: Mitoji Yabunaka (Director-General of Asian and Oceanian Affairs, Ministry of Foreign Affairs
24 June 2004, *as reported in Tokyo Kyodo World Service:* "[Mitoji Yabunaka offers] to respond to North Korea's request for energy [worth 2,000,000kw of electricity] if Pyongyang meets three conditions -- disclosure on all nuclear programs, freezing the programs, and ensuring the freeze is inspected and verified."

ROK: Delegation headed by Deputy Minister of Foreign Affairs and Trade, Lee Soo-hyuck
23 June 2004 *as reported in Reuters:* South Korea's Lee [Soo-hyuck] said Seoul offered to provide heavy fuel oil aid to North Korea as part of compensation for a freeze and then quick dismantlement.

China: Delegation headed by Vice Foreign Minister Wang Yi
26 June 2004, *(Press spokeswoman Zhang Qiyue)* "The freeze is the first step of the settlement of this issue…."
Lanfranco, Edward. 2004. *United Press International.* 18 June 2004. *"*In accordance with existing consensuses, any oral commitment or action should be made by the six parties simultaneously."

Russia: Delegation headed by Ambassador At Large, Alexander Alexeyev
24 June 2004. "We see our principal role as probing coincidences and differences in the U.S. and North Korea's positions and offering options for compromise by the end of the third round."
FBIS Document (ID CEP20040624000115), transcribed from Moscow Interfax. 24 June 2004.
(As reported in Itar-Tass) "Russia is ready to participate both in security guarantees for North Korea and in providing economic and energy assistance to it, Russia's ambassador-at-large A. Alexeyev.

Barriers to resolution of DPRK nuclear crisis

- Lack of trust between DPRK and United States – who goes first?
- DPRK's security concerns and its conviction of impending U.S. attack.
- Closed, secretive nature of DPRK makes verification difficult without on-site inspection presence and DPRK cooperation.
  - True for plutonium if it has been reprocessed and/or if nuclear weapons have been built.
  - True for any level of uranium centrifuge enrichment program.
- United States feels betrayed by DPRK uranium path to nuclear weapons in violation of Agreed Framework – will not reward DRPK for illegal actions.
- DRPK claims the United States violated Agreed Framework first.
- Nature of energy assistance – future of civilian nuclear program.

Necessary steps to reach agreement

- DPRK must decide to give up its nuclear weapons program in return for real peace and prosperity. Other nations must help to achieve this through trade, aid and economic development.
- U.S. and other parties must provide provisional security assurances that grow stronger as steps are taken to reduce risks.
- Six-party framework is necessary for lasting solution.
- Direct U.S – DPRK talks necessary to explore positions and options.
- Simultaneous step-by-step process necessary to build trust and confidence.
- Simultaneous steps must provide immediate risk reduction.

Risk reduction actions must be scientifically sound

- Reduce weapon-usable plutonium inventory – remove from DPRK
- Prevent nuclear component and materials export or trafficking
- Dismantle any existing nuclear weapons and eliminate all plutonium
- Stop production and processing of additional plutonium
- Stop and eliminate uranium enrichment activities
- Eliminate infrastructure for nuclear weapons and nuclear materials
- Have DPRK rejoin NPT, allow IAEA inspections, and adopt IAEA additional protocol provisions for monitoring and inspection
- Assist DPRK nuclear workers make transition to non-weapons work

Scientific challenges of eliminating the nuclear weapons program in a safe, secure, and verifiable manner are immense. Actions taken now at North Korea's nuclear facilities are important to future success.