The North Korean Nuclear Crisis

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For presentation at
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Visit to Pyongyang and Yongbyon
Jan. 6 to 10, 2004

Lewis delegation visit to Yongbyon – 8 January 2004

Key nuclear issues as of January 2004

- What is the status of the nuclear reactors?
  - 5 MWe (previously operating – generates ~6kg Pu/year)
  - 50 MWe – under construction (56 kg Pu/year)
  - 200 MWe – under construction (220 kg Pu/year)

- What happened to the spent fuel rods from 5 MWe reactor?
  - Placed in safe storage (25 – 30 kg Pu) with U.S. help
  - Monitored by IEAE until December 2002

- Does the DPRK have a uranium enrichment program?

- Does the DPRK have nuclear weapons?

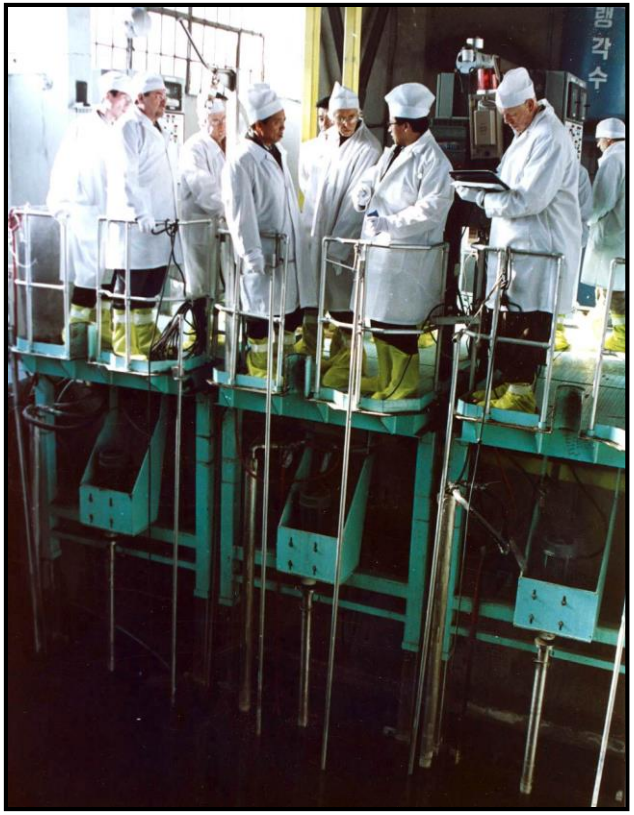
Vice Minister Kim Gye Gwan
"This visit can have great symbolic significance."

"We view the delegation's visit to Yongbyon as a way to help contribute to breaking the stalemate and opening up a bright future."

"We will not play games with you. We have invited you to go to Yongbyon. The primary reason for this is to ensure transparency. This will reduce the assumptions and errors."

"Hecker's presence will allow us to tell you everything. This is an extraordinary approval by us."

North Korea made a credible case for having extracted plutonium



The 8000 spent fuel rods were gone

5 MWe reactor was operating

Industrial-scale reprocessing facility

Given the sophistication of the DPRK plutonium program,
we must assume they can and have built at least a crude nuclear device

What is the status of the DPRK nuclear weapons program?

- No one outside DPRK really knows

- Crude upper limit best estimate of current inventory of weapons-grade plutonium (D. Albright/ISIS)
  - 36 kg Pu metal (90% of estimates between 34 and 39 kg)
  - CRS and other estimates – sufficient for 7 to 9 nuclear devices

- DPRK has limited ability to make more plutonium
  - 6 kg/year in 5MWe reactor (~10 kg in reactor as of 11/1/2004)

- We must assume DPRK has at least one crude nuclear device and the ability to make 6 or 8 more. We do not know how sophisticated a device – if it can be delivered by missiles

- Although DPRK is almost surely pursuing the uranium path to weapons, it is highly unlikely they have enough for a bomb now

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

Plutonium production in DPRK reactors

Reactor	Range*	Best mean 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**

• **Additional 9 kg currently in operating reactor**

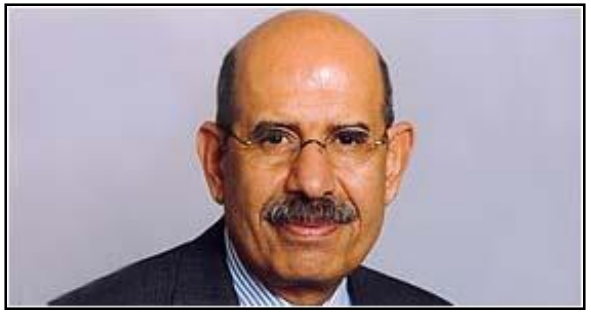
*Based on estimates by David Albright and Kevin O'Neill, editors, "Solving the North Korean Nuclear Puzzle," ISIS Reports (The Institute for Science and International Security), Washington, D.C., 2000.

Why does the DPRK want nuclear weapons?
A Russian perspective

- 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
- Most powerful and cheapest deterrent against 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

Natalia Bazhanova in
Moltz and Mansourov (2000)

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

Vitaly Naumkin – Pres. Intern. Center for Strategic and Policy Studies, Moscow (7/2004)

- Surprising how little we know about DPRK nuclear program
- Important to identify the immediate threat from DPRK nuclear program
- DPRK nuclear weapons are not a threat for Russia
- For some countries, priorities other than nonproliferation are more important
    - For Russia, economic cooperation with India and Iran is more important
- U.S. actions in Iraq don't help – regime change leads some to desire nukes
- What to do?
    - Six-party talks must lead to security for DPRK. No resolution otherwise.
    - Need several projects with Russia and China
    - Need economic assistance for DPRK

China: CAEP estimate of nuclear weapons capability

- **Nuclear material ≠ Nuclear weapon**
  - NK wants a nuclear weapon so as to defend the threat from US. A nuclear weapon must be armed in missiles.
- **NK is capable of nuclear design.** 50MWe reactor is designed by NK itself. So it has strong nuclear design capability. Furthermore, its computers are much better than what the nuclear weapon states used to design their first atomic bomb.
- **Performed many high explosive tests.** It is said more than 70 tests have been performed,so there is great possibility for NK to take related weapon components' test.
- **Capable of producing neutron source**
- **We don't know to what extent NK grasps technologies required for integration of nuclear device into a missile.**

(Liu Gongliang, Xie Dong and Shi Xueming)

IN CONFIDENCE

Brigadeer Naeem Ahmad Salik – Pakistan (7/2004)

Comments on the A.Q. Khan DPRK connection

- U.S. knows everything there is to know about Khan connection (from Pakistani briefings)
- He gave them designs for P1 and P2 and a few components, including some parts they had difficulty getting.
- He did not give them plans for the entire plant
- He does not believe that he gave them designs for nuclear weapon. He doubts that even for Libya. Those drawings could come from anywhere.
- Claims that U.S. and IAEA know this but is using this information to put pressure on China to increase its pressure on DPRK.
- Khan did not see a uranium enrichment facility in the DPRK. Salik believes that DPRK has small, perhaps pilot plant-scale, capability.
- Does not believe that Khan took 13 trips to DPRK (Indian article claim).
- Believes he visited Yongbyon nuclear center only once. Salik does not believe that Khan was shown real weapons. Besides, how could he tell.
- Khan visited DPRK for other reasons – conventional arms (shoulder-fired rockets, for example).
- Khan said that DPRK nuclear program may be more advanced than Pak program. They started earlier than Pak. DPRK scientists were trained in Soviet Union.
- Trade for missiles – in 1998-99, Pak did not need DPRK missile technology. They already had a solid-fuel rocket system.

What are the greatest nuclear threats from DPRK?

- Sale or diversion of fissile materials or weapon components
  - In my opinion, sale of an entire weapon is highly unlikely
- 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

Six-party talks – Feb. 25 to 28, 2004

The U.S. is insisting on complete, verifiable, irreversible dismantlement

U.S. offered new approach at third six-party talks

U.S. delegates J. DeTrani and J. Kelly

June 23 - 25, 2004

U.S. proposed 3-month timeframe

- Agree to give up all nuclear programs
- Suspend all nuclear operations
- Seal nuclear facilities and materials
- Permit open measures of verification
- Subsequently, U.S. resumes energy assistance

North Korea proposed to "re-freeze" its nuclear program

North Korean delegation spokesman Hyun Hak-bong

Unfortunately, beginning in summer 2004, North Korea withdrew from additional dialog

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 NPT and 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.

Time is not on the American side

"Time is not on the American side"
Vice Minister Kim Gye Gwan – during our visit, Jan. 9, 2004

"Time is not necessarily on our side"
Vice President during April 2004 visit to Asia

The greatest nuclear threats today

1) Pakistan

2) North Korea

3) HEU-fueled research reactors around the world

4) Nuclear materials security in Russia

5) What's left in Kazakhstan

6) Iran

What are the most urgent nuclear threats today?

- **Pakistan**
  - Theft or diversion of nuclear materials or nuclear weapon components
  - Continued leakage of nuclear weapons technologies
  - Regime change – radical Islam takeover or period of turmoil and loss of control
  - Miscalculation with respect to India
- **North Korea**
  - Theft, diversion, or export of nuclear materials or weapon components
  - Act of desperation or miscalculation
  - Using nukes as threat or blackmail of neighbors
  - Testing a device and consequent nuclear arming of Japan and South Korea
- **Global HEU inventories**
  - Unsecured HEU inventories must be secured or eliminated
  - Research reactors and other nuclear facilities need urgent action

These priorities are driven by the fact that nuclear or radiological terrorism is the most probable threat today

What are the greatest nuclear threats today? – cont.

- **Nuclear materials in Kazakhstan and other states of FSU**
  - Nuclear weapons were returned from Kazakhstan, Ukraine and Belarus to Russia – nuclear materials were not!
  - Must improve materials security and eliminate all weapons-usable materials
- **Nuclear security in Russia**
  - Tactical nuclear weapons security and elimination
  - Nuclear materials security must be improved – by the Russians
  - Nuclear complex must be downsized dramatically to achieve adequate security
- **Iran**
  - Hardliners persist and finish nuclear weapons development
  - Subsequent concerns over nuclear weapons and nuclear materials security
  - Threat or actual use of nuclear weapon in Middle East confrontation
- **Radiological terrorism (RDDs, RDEs, or sabotage)**
  - Significant improvements are required in securing radiological materials in Russia and much of rest of world
  - Much more must be done to prepare for a radiological event

Spring 2004: A glimmer of hope as North Korea stayed engaged

May 22, 2004

Japanese Premier Koizumi in Pyonyang and children of abductees returning to Japan

April 2004

Kim with Chinese President Hu Jintao and outside Beijing restaurant

North Korea requested international relief help after train explosion in April 22, 2004

A glimmer of hope – North Korea opens up just a bit

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.

Meetings in Pyongyang, DPRK

Jong Hun Il and Ri Mun Ho
Academy of Sciences, DPRK

Ri Hak Gwan – Vice President CPIT

With Ministry of
Foreign Affairs

Col. Gen Li Chang Bok - KPA

DPRK nuclear program – Valery Denisov (Moltz & Mansourov, 2000)

- mid-1950s Began theoretical studies at Dubna
  - Soviet – DPRK agreement on peaceful uses of atomic energy
  - Some training in Japan, East & West Germany, China

- Soviet assistance in construction of Yongbyon nuclear center
  - 2 MWth research reactor (LW moderated and cooled)
  - Enriched U fueled
  - Later upgraded by DPRK to 8 MWe
  - Small radiochemical laboratory built by Soviets

- DPRK focus on nuclear power stations (1970 and 1980 WPK Congress)
  - Decision on gas-graphite reactors (26 million tonnes of U ore)

DPRK nuclear program – Valery Denisov (Moltz & Mansourov, 2000)

- 1970s Kim il Sung decision to build nuclear weapons capability to ensure the regime's survival
  - Feeling of having lost economic competition with ROK
  - Policies of Soviet Union and China viewed with greater suspicion
- Enhance the Yongbyon nuclear center
- Nuclear Energy Research Institute
- Radiological Institute
- Establish Department of Nuclear Physics at Pyongyang State Univ.
- Nuclear reactor technology chair at Kimch'aek Polytechnic Univ.
- Soviet research cyclotron installed at Kim il Sung University
- Industrial cyclotron installed in Pyongyang's suburb

- Moved most of the nuclear institutes from Pyongyang to Pyonsong (50 km away) and combined into scientific center (part of Korean Academy of Sciences)
  - Now houses 17 institutes and one experimental test facility
- Funding from State Committee on S&T and Ministry of Finance

KAS institutes involved in nuclear research

- Institute of Physics (est. 1952) – 250 persons
  - Director Cho Chen Nam (laser physics)
  - Deputy Ryo Yin Gan (signeto-electric materials)
  - Lasers & optics, solid state, extreme conditions, acoustics & surface waves
  - Nam Hong Woo (nuclear and particle physics)

- Institute of Mathematics
  - Director Prof. Ho Gon
  - Academician Lee Cha Gon
  - Academic Computing Center

- Institute of Electronic Control Machines – flexible manuf. systems
  - Contols, servers, math support, digital program controls, robotics, and sensors

- Institute of Electronics
  - Production of large integrated circuits for computers

Nuclear program controls

- Ministry of Atomic Energy for nuclear-energy sector
  - Minister Choe Hak Kyun (alternate member of Central Committee of WPK and Supreme Assembly Deputy)
- Ministry of People's Armed Forces – must have controlled military effort
- Nuclear institutes controlled by State Committee on S&T
  - SCS&T chaired by Choi Hee Cheng (same connections as Choe H K)
  - Guidance and oversight by Chon Byon Ho – member of Politburo of the WPK Central Committee and secretary
- Both energy and military nuclear programs "personally" controlled by General Kim Jong Il

Chinese Academy of Engineering Physics view of North Korea nuclear program (Liu Gongliang, Xie Dong and Shi Xueming)

NK has a rich uranium resources

- The known 16 uranium mines, 4 uranium milling facilities, the most important one is "Mt. Chonma Power Plant" which is a suspected uranium enrichment facility.
- Uranium conversion and fuel fabrication facilities built in 1980's.

There are several suspected Uranium Enrichment facilities while they are not confirmed

- However it is certain that NK plans to use the centrifuge technique.
- It also reported that NK imported duralumin and frequency converters from outside world. However, it needs at least 2000 centrifuge's cascade connection to form a so called "pilot plant" and this would take several years.
- Exception. It could import thousands of centrifuges from other countries or buy relatively HEU from outside. However, the possibility is very small.

CAEP estimate of plutonium production

- The 5MWe reactor is far away from a "medium test plant". So, an average burnup of 150-200MWd/t U is more reasonable, in which case, there are 0.15-0.2kg plutonium/ton uranium. So, 4-9kg plutonium have possibly been extracted.

- There are at most 14kg plutonium contained in the 8000 spent fuel rods.

- There are at most 30kg plutonium contained in all spent fuel rods.

- There are 2kg plutonium contained in the IRT-2000 reactor.

- No other sources of plutonium such as smuggling is of concern.

(Liu Gongliang, Xie Dong and Shi Xueming)

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- **Capable of producing neutron source**
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(Liu Gongliang, Xie Dong and Shi Xueming)

China: CAEP report conclusions (Liu Gongliang, Xie Dong and Shi Xueming)

- NK spent several decades in its nuclear weapons program. What they want is not a nuclear device but a nuclear weapon which can be armed in a missile so as to defend the threat from US.

- NK has the ability to produce a crude atomic bomb, however we are not sure about whether it can produce a nuclear warhead armed in missiles now.

- If NK has 4-9kg plutonium, it can produce 1-2 nuclear bomb. Under this circumstance, the possibility to have a nuclear test is very small. However, if it has 15kg plutonium, the possibility to have a nuclear test will be bigger.

(S.S. Hecker note: This report was made before evidence of reprocessing of 8000 spent fuel rods)

IN CONFIDENCE

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Brigadeer Naeem Ahmad Salik – Pakistan (7/2004)

Comments on A.Q. Khan "network"

- Product of a covert program in 1970s. Very few people in the loop, no outside inspection of program. Kahn had absolute power and control. Exposure would have threatened U.S. sanctions.
- Security by a few military, who could be influenced by pay. Khan turned autonomy to his advantage. Oversight people were handpicked.
- Some inside who expressed concern were muzzled. In 1998 when concerns brought to Army's attention, they were dismissed because they had such faith in Khan's ability to deliver for Pak nuclear program.
- Government was focused externally – concern about strikes by India and Israel
- No one could open the books on imports/exports of the KAL. Everything was kept secret. Lots of traffic in and out of KAL – easy to slip in a few extras.
- Khan had nothing to do with weapons design. Cannot say he gave away design. (Drawings with Chinese characters can have many origins).
- In 1998, the program went into the open. Institutions were established for nuclear security control. They now have personnel reliability program. Sharing best practices with U.S.
- Let's not put all blame for "proliferation" rings on Khan. There were other rings before (France-Israel, Israel-South Africa, Soviet-India, US-UK&France)
- Let's expand diameter of ring – Israel, India. Did Khan tap into an existing ring? Was he a chief cog in an existing ring?

Arms Control and Disarmament Affairs, Strategic Plans Division, JSHQ
Islamabad, Pakistan

Brigadeer Naeem Ahmad Salik – Pakistan (7/2004)

DPRK continued:

- In early 1990s, DPRK asked for several things (economic assistance, etc.)
- Problem mishandled by U.S.
- DPRK is blamed for breech of Agreed Framework by U.S., but DPRK says that U.S. did not meet its obligations.
- Bush's unwillingness to negotiate with DPRK pushed it to the wall.
- James Kelly mishandled the Oct. 2002 incident – he was combatative.
- The 1994 AF has broad international implications – DPRK rewarded for bad behavior.
- DPRK learned from Iraq invasion – if you have nukes, you are immune from regime change. This is a bad message.
- Before 2003, estimate was 8.4 kg of Pu – that's a max of two nukes, but Khan said he saw three. So we have a problem with the estimate.
- Who will determine the exact amount of Pu?
- Have 8000 rods been reprocessed?
- Will DPRK sell nuclear weapons? Does not make sense to non-state actors. Need to think about Pu or weapons components.
- Claimed there has been no sale of HEU by DPRK.

Arms Control and Disarmament Affairs, Strategic Plans Division, JSHQ
Islamabad, Pakistan

Loss of Communist allies, natural disasters devastate North Korea

- End of Cold War bring Russian aid to abrupt halt in 1992
- China backs off as well while it gets its economy going

- Floods of 1995
  - Struck 75 % of country
  - 5.2 million people affected. 1/2 million people lost homes or displaced (100,000 households)
  - 1.9 million tons of harvest lost
  - One fifth of arable land covered with sand, lost for 1996 planting
  - Estimated $ 15 billion disaster

- Floods of 1996
  - Torrential rains in July and August devastate 117 cities and counties
  - 200 people died, 3.27 million people homeless

- Drought of 1997 led to crop failure and added to food crisis

- Floods of 1998
  - Heavy summer rains destroyed 4,250 houses
  - 74,000 hectares of arable land inundated

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.

Vice Minister Kim Gye Gwan reiterated DPRK "freeze" offer

- DPRK will freeze nuclear program – which means:
  - no manufacturing,
  - no testing,and
  - no transferring (export) of nuclear weapons

- In return for:
  - Security assurance from the United States
  - Removal of DPRK from terrorist-sponsoring countries list and lifting of political, economic, and military sanctions
  - Supply of energy, including shipments of heavy fuel oil (with other neighboring states)

- When confronted with the HEU issue - Kim responded: "We can be very serious when we talk about this. We are fully open to technical talks"

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.

Timetable of nuclear crises in North Korea

- 1950s–91 DPRK gets research reactor from Soviet Union
  Builds and operates its own Magnox 5 MWe reactor
- 1992 IAEA inspectors allowed into Yongbyon nuclear complex
- 1993-94 DPRK steps back as inspectors find discrepancies
  President Clinton considers bombing DPRK nuclear facilities
  President Carter brokers a nuclear freeze
  U.S. and DPRK adopt the "Agreed Framework" for freeze
- 1994-2002 U.S. helps to can reactor fuel for safe storage
  IAEA monitors and verifies plutonium program freeze
  Constant tensions over DPRK missile exports and tests
  Secretary Albright visit marks high point of relations
  "Axis of evil" speech rankles DPRK
- Oct.-Dec. 2002 U.S. concerns over clandestine HEU program brings Agreed Framework to halt. DPRK expels IAEA and withdraws from Nonproliferation Treaty (Jan. 10, 2003)

Nuclear timeline for North Korea

- 1960s Soviet Union supplies IRT research reactor (HEU metal fuel) and isotope production lab (IAEA safeguards in 1977)
- Dec. 12, 1985 North Korea accedes to the NPT
- Sept. 27, 1991 President Bush announces unilateral withdrawal of all naval and land-based nuclear weapons from abroad (leads to withdrawal of U.S. nukes from ROK)
- Dec. 31, 1991 Two Koreas sign South-North Joint Declaration on Denuclearization of Korean Peninsula
- April 9, 1992 DPRK ratifies the safeguards pact with IAEA
- May 4, 1992 DPRK submits nuclear material declaration to IAEA. Hans Blix and IAEA inspectors at Yongbyon

Nuclear timeline: The first nuclear crisis

- Feb. 9, 1993 IAEA demands special inspection after finding discrepancies in DRPK declarations
- March 12, 1993 DPRK announces intention to withdraw from NPT
- June 1993 U.S. – DPRK talks defuse nuclear crisis
- January 1994 CIA director estimates DPRK may have produced one or two nuclear weapons
- June 13, 1994 DPRK announces withdrawal from NPT
- June 15, 1994 Pres. Carter negotiates nuclear "freeze"
- Oct. 21, 1994 U.S. and DPRK adopt "Agreed Framework" and IAEA inspectors return to Yongbyon

The Agreed Framework resolves first nuclear crisis

- Replace DPRK reactors with 2 LWR reactors – 2000 MWe by 2003 (U.S. to lead international consortium - KEDO)
- U.S. (on behalf of KEDO) will offset lost energy from DPRK reactors with 500,000 tonnes annually of heavy fuel oil
- DPRK will freeze reactors and related facilities and eventually dismantle (U.S. agrees to help DPRK store spent fuel safely). IAEA to be allowed to monitor the freeze
- Both sides move towards full normalization of relations
- Both sides work for peace and security on a nuclear-free Korean Peninsula
- Both sides will work toward strengthening international nonproliferation regime

The Agreed Framework – constantly challenged

- 1996 U.S. and DPRK hold bilateral missile talks. U.S. imposes sanctions on DPRK for missile-related technology transfers
- 1997 More missile talks and more sanctions
- 1998 South Korean "sunshine" policy announced.
  More U.S. sanctions because of transfers to Pakistan Khan Lab
- Aug. 31, 1998 DPRK launches 3-stage rocket over Japan
- 1999 Bill Perry recommends new integrated approach for DPRK.
  Construction of first LWR reactor begins
- 2000 Secretary Albright concludes 2-day visit to Pyongyang.
  Kim Jong il shows missile restraint. Relations best in some time

Heading toward the second nuclear crisis

- March 2001 DPRK claims to remain "fully prepared for dialogue or war"
- Jan. 29, 2002 President Bush labels DPRK part of "axis of evil"
- Summer 2002 Bilateral discussions postponed because of U.S. intelligence of DPRK uranium enrichment program
- Oct. 3-5, 2002 James Kelly, Asst. Sec. State, confronts DPRK officials in Pyongyang with HEU concerns
- Oct. 16, 2002 U.S. announces that DPRK admitted clandestine HEU program
- KEDO announces suspension of heavy-fuel oil shipments
- Dec. 2002 DPRK announces end of freeze and expels IAEA
- Jan. 10, 2003 DPRK announces withdrawal from NPT

The second nuclear crisis - unresolved

- April 23-25, 2003 U.S., China and DPRK hold trilateral talks in Beijing

- U.S. chooses six-party framework for further talks. Rejects bilateral talks directly with DPRK

- August 27-29, 2003 Six-party talks held in Beijing. Not much progress reported

- DPRK stated that it:
  - Restarted the 5 MWe reactor
  - Reprocessed all 8000 spent fuel rods to extract plutonium
  - Strengthened its nuclear deterrent

- Dec. 7, 2003 and Jan. 6, 2004 DPRK offers another "freeze"

- Feb. 25-28, Second round of six-party talks in Beijing

DPRK nuclear program – Valery Denisov (Moltz & Mansourov, 2000)

- mid-1950s Began theoretical studies at Dubna
  - Soviet – DPRK agreement on peaceful uses of atomic energy
  - Some training in Japan, East & West Germany, China

- Soviet assistance in construction of Yongbyon nuclear center
  - 2 MWe research reactor (LW moderated and cooled)
  - Enriched U fueled
  - Later upgraded by DPRK to 8 MWe
  - Small radiochemical laboratory built by Soviets

- DPRK focus on nuclear power stations (1970 and 1980 WPK Congress)
  - Decision on gas-graphite reactors (26 million tonnes of U ore)

DPRK nuclear program – Valery Denisov (Moltz & Mansourov, 2000)

- 1970s Kim il Sung decision to build nuclear weapons capability to ensure the regime's survival
  - Feeling of having lost economic competition with ROK
  - Policies of Soviet Union and China viewed with greater suspicion
- Enhance the Yongbyon nuclear center
- Nuclear Energy Research Institute
- Radiological Institute
- Establish Department of Nuclear Physics at Pyongyang State Univ.
- Nuclear reactor technology chair at Kimch'aek Polytechnic Univ.
- Soviet research cyclotron installed at Kim il Sung University
- Industrial cyclotron installed in Pyongyang's suburb

- Moved most of the nuclear institutes from Pyongyang to Pyonsong (50 km away) and combined into scientific center (part of Korean Academy of Sciences)
  - Now houses 17 institutes and one experimental test facility
- Funding from State Committee on S&T and Ministry of Finance

KAS institutes involved in nuclear research

- Institute of Physics (est. 1952) – 250 persons
  - Director Cho Chen Nam (laser physics)
  - Deputy Ryo Yin Gan (signeto-electric materials)
  - Lasers & optics, solid state, extreme conditions, acoustics & surface waves
  - Nam Hong Woo (nuclear and particle physics)

- Institute of Mathematics
  - Director Prof. Ho Gon
  - Academician Lee Cha Gon
  - Academic Computing Center

- Institute of Electronic Control Machines – flexible manuf. systems
  - Contols, servers, math support, digital program controls, robotics, and sensors

- Institute of Electronics
  - Production of large integrated circuits for computers

Nuclear program controls

- Ministry of Atomic Energy for nuclear-energy sector
  - Minister Choe Hak Kyun (alternate member of Central Committee of WPK and Supreme Assembly Deputy)
- Ministry of People's Armed Forces – must have controlled military effort
- Nuclear institutes controlled by State Committee on S&T
  - SCS&T chaired by Choi Hee Cheng (same connections as Choe H K)
  - Guidance and oversight by Chon Byon Ho – member of Politburo of the WPK Central Committee and secretary
- Both energy and military nuclear programs "personally" controlled by General Kim Jong Il

The "market" is no longer a "dirty word" in North Korea

"…market is a legal private economic activity that has been officially sanctioned, it cannot be considered as being completely autonomous from state control."

"…market complements deficiencies present in the planned economy, …and has become a source of additional income for residents."

Chong Ch'ang-hyon, Professor of Culture and Government Kungmin University, Seoul, ROK, Minjok21, Jan. 1, 2004

5 MWe reactor restarted and operating smoothly

Reactor is providing heat and electricity for town …

Lewis delegation in reactor control room

… and producing 6 kg of plutonium annually.

But, the 50MWe reactor will not be completed any time soon

We concluded the 8000 spent fuel rods were no longer in pool

Lewis delegation at pool observation platform

Randomly chosen empty canister convinced us

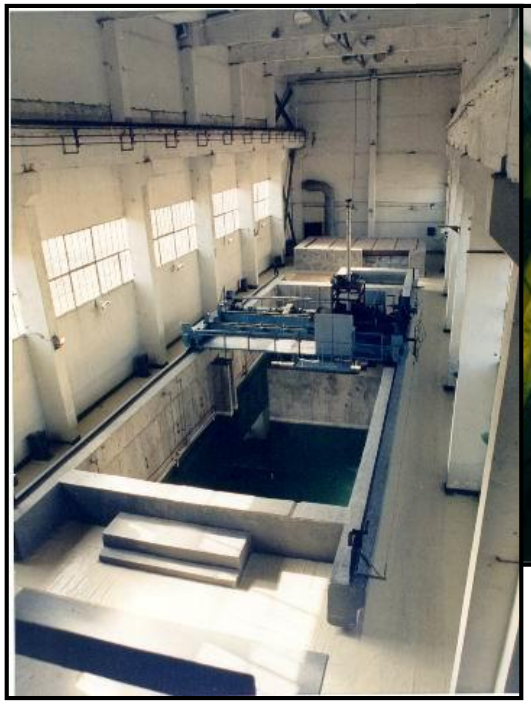
Courtesy U.S. Canning Team

DPRK officials stated all fuel rods were reprocessed between mid-January and end of June, 2003

8000 spent fuel rods contained an estimated 25 – 30 kg of plutonium

Lewis delegation at Radiochemical Laboratory

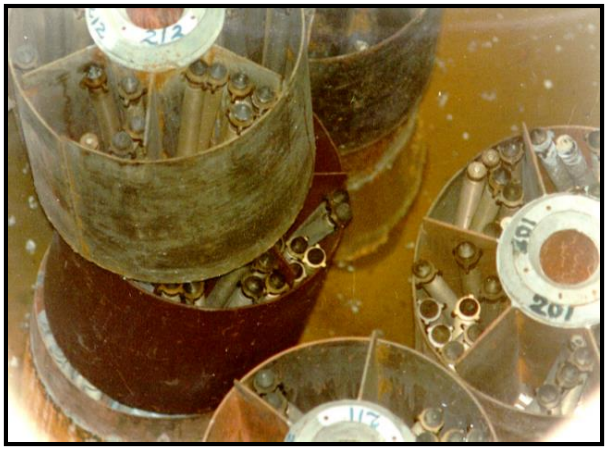
Spent fuel pool held 8000 spent fuel rods from reactor operations prior to 1994



Spent fuel pool building (before)

DPRK spent fuel rod storage - before

Spent fuel building (during canning team effort)



DPRK fuel baskets

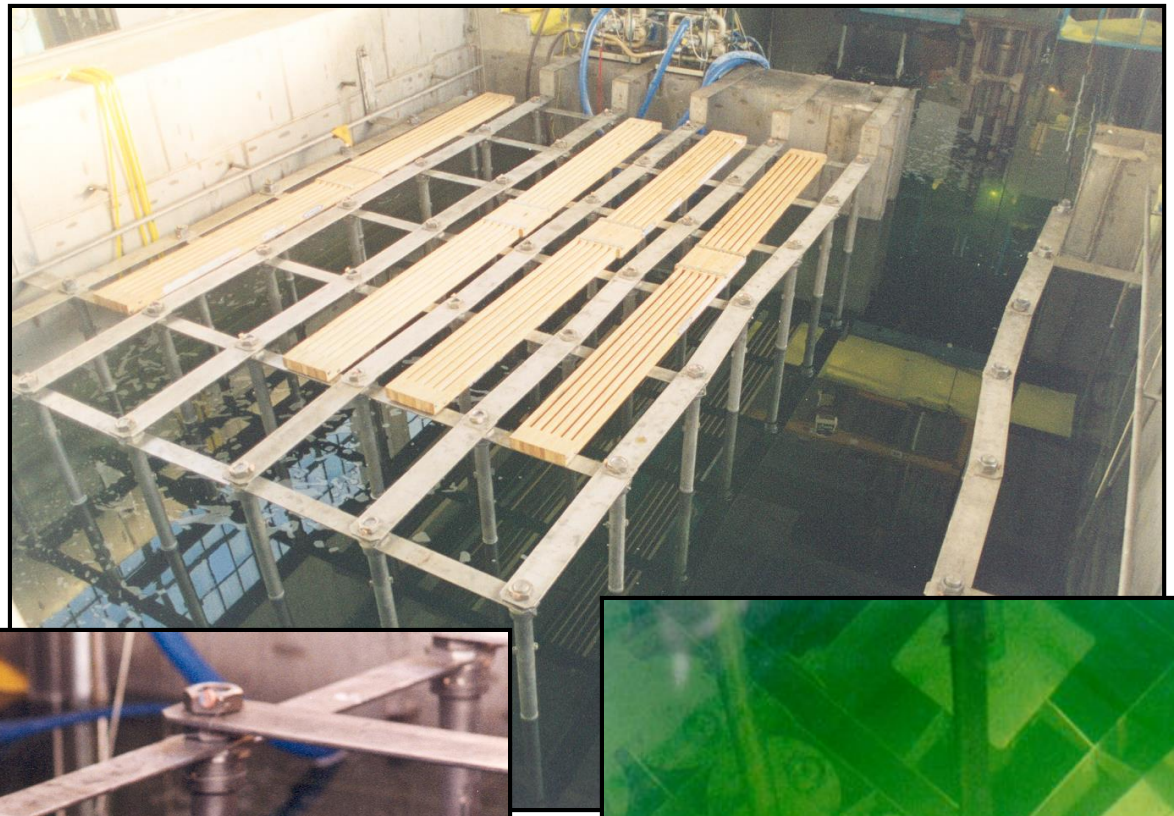
Courtesy U.S. Canning Team

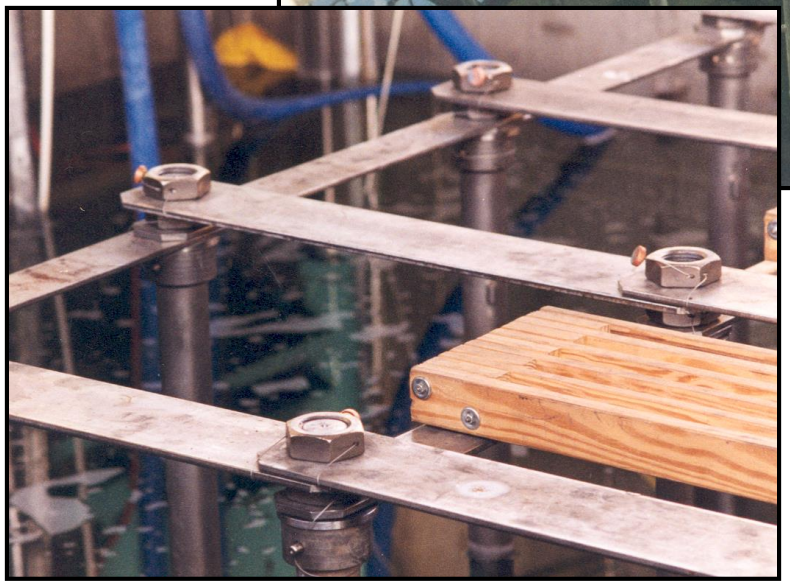
Remote possibility that 8000 fuel rods are stored somewhere, such as in the dry pit in the pool building…

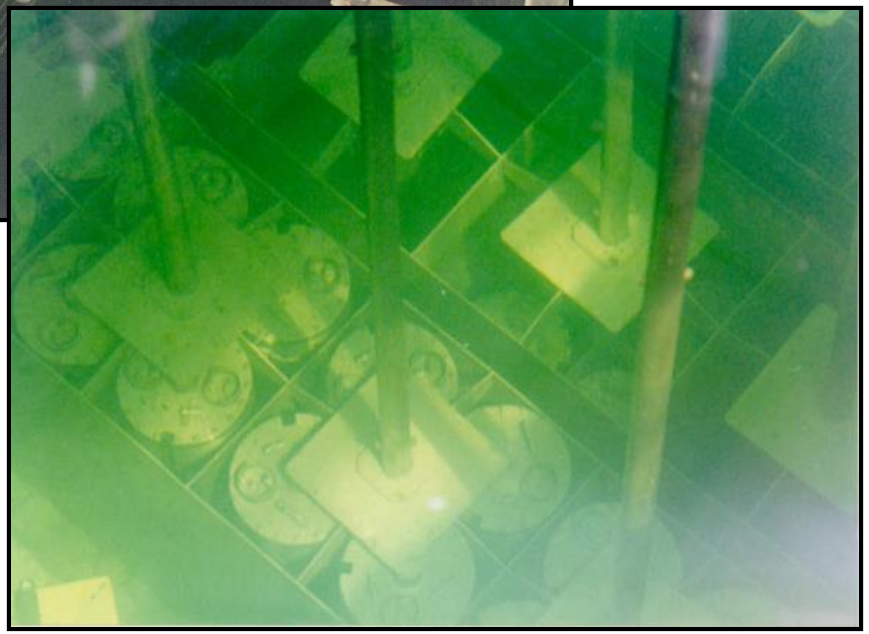
… but such storage would be dangerous and foolish.

Courtesy U.S. Canning Team

IAEA monitored the U.S. safeguarding mechanisms

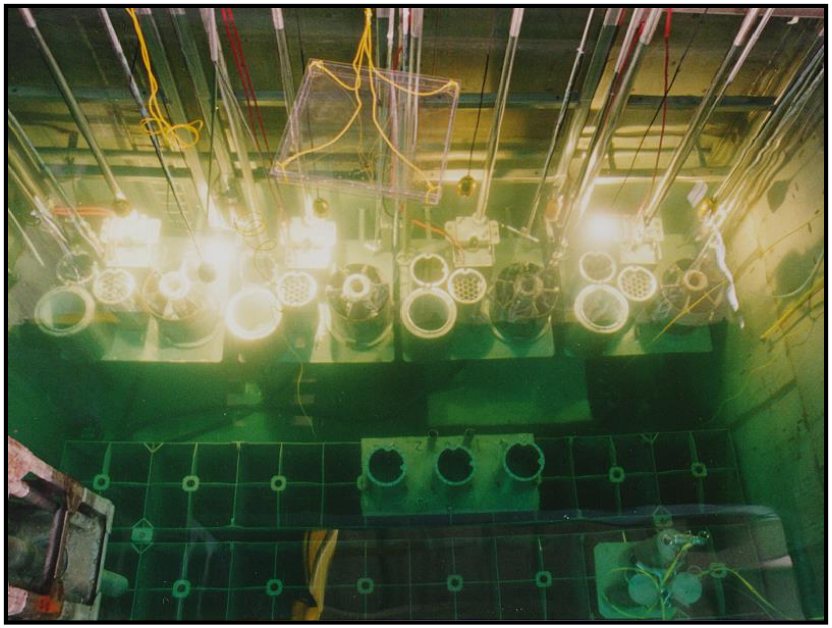


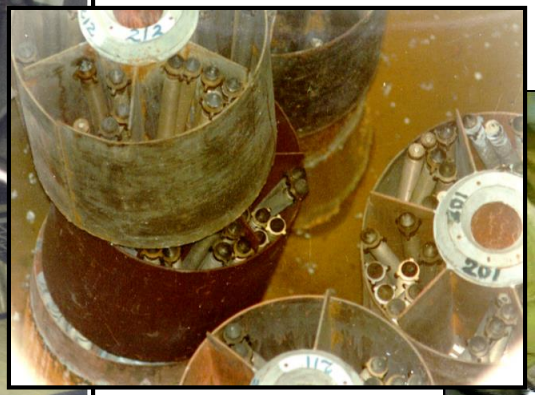


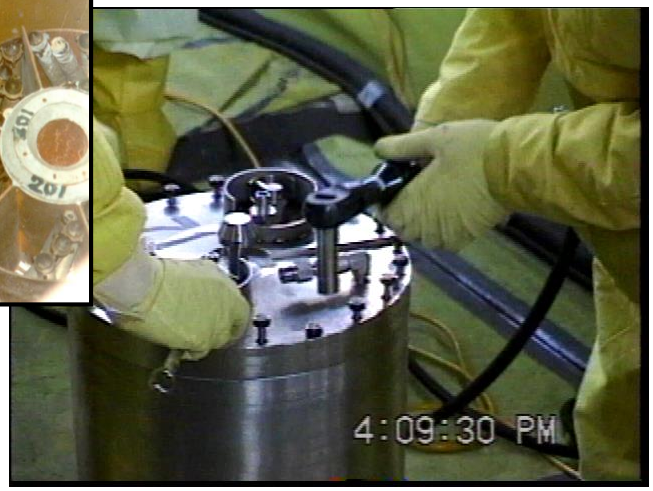


Courtesy U.S. Canning Team

U.S. Canning Team repackaged rods for safe storage







Courtesy U.S. Canning Team

Assessment of reprocessing activities

- We could not definitively conclude that 8000 rods were reprocessed

- However, the capability and the capacity clearly exists
  - Facilities are adequate and had been used
  - Level of technical competence is very good
  - Reprocessing capacity is consistent with a < 6-month campaign

- They showed us their reprocessed product – plutonium metal
  - This is first time DPRK has shown Pu metal
  - 200 g of Pu is significant, but not sufficient for a nuclear device
  - All we saw was consistent with Pu metal and Pu oxalate powder as claimed by very knowledgeable DPRK technical hosts

- With tools at hand, we could not definitively conclude that what we saw was Pu metal. Moreover, we would not have been able to tell if it was "new" plutonium

What to do about the nuclear threats?

- Threat to civilization
  - U.S. – Russian efforts to reduce risk of accidental, inadvertent, or unauthorized nuclear launches
  - Accelerate deep reductions of U.S. and Russian nuclear arsenals
  - Re-engineer the NPT and future civilian nuclear power options

- Threat to democracies
  - Mutual security arrangements
  - Crisis management, confidence building measures, transparency
  - Reduce the "appeal" of nuclear weapons
  - Destroy nuclear trafficking rings, stronger NPT enforcement

- Threat to civil liberties and economic well-being
  - Deterrence will not work, must keep materials out of wrong hands
  - Defense in depth – secure or eliminate at source, monitor trafficking and interdict, multinational policing actions
  - Must better prepare for eventual radiological event