



# Redirecting North Korean Nuclear Weapons Scientists: An Initial Program Model



**Joel Wit and Anne  
Harrington**

# Presentation Outline

- Background on Cooperative Threat Reduction
- CTR and North Korea
- North Korea and Scientist Redirection
- A Redirection Program for North Korea

# What is Cooperative Threat Reduction?

- Cooperative Threat Reduction: Programs where one or more partners work with a host state to eliminate, secure or convert WMD programs for civilian purposes. Has also been used to include joint action by one more states to help another country meet its arms control obligations.

# Key Motives for CTR

- Reduce risk that nuclear weapons end up in other states or in sub-national hands
- Prevent spread of weapons, materials, technology or know-how to new countries
- Supplement verification regimes by bolstering transparency
- Build beachheads of cooperation that can spillover into other issues
- Help reinforce international peace and stability

# Examples of CTR programs

- Joint work to secure or eliminate weapons and the materials used to make them (Russian nuclear and chemical weapons arsenals)
- Cooperation to shut down or convert weapons facilities to civilian uses (chemical and biological weapons facilities)
- Collective action to redirect weapons scientists, engineers and technicians to non-military work (Russia and FSU countries, Libya, Iraq)

# Some CTR History

- Oldest running program is in Russia and former Soviet Union
- Began in 1991 when US Congress enacted Nunn-Lugar Cooperative Threat Reduction program in response to collapse of Soviet Union
- Over a first ten years, US spent billions of dollars to help Russia destroy nuclear, chemical and other WMD, secure weapons to prevent their theft and proliferation and prevent the diversion of scientific expertise abroad
- 2002—G-8 summit pledged to commit \$20 billion over next decade for CTR assistance under “Global Partnership.” Agreed at 2008 G8 Summit to expand beyond former Soviet Union

# CTR in North Korea

- Definite Threat—Nuclear weapons, CW/BW and ballistic missile programs
- Been engaged in WMD and missile programs for decades. Extensive infrastructure much of which is hidden. Larger and more challenging than Iraq or Libya, but much smaller than Russia.
- Nuclear program probably includes weapons, plutonium, spent fuel, tens of facilities and thousands of personnel

# Is CTR Possible with DPRK?

- Skeptics say no
  - North Korea secretive and closed
  - Relationship with potential partners has been hostile for decades
  - Pyongyang has not decided to give up WMD
  - Without fundamental transformation of regime, rapprochement between US and North and clear decision to get rid of WMD, CTR impossible. is is likely.
  - Historical examples. South Africa, Libya, and Ukraine, Kazakhstan, Belarus.

# History Says Maybe

- Extensive government, international organization and non-governmental experience over the past decade working with the North Koreans.
  - Implementation of 1994 Agreed Framework (joint spent fuel storage, KEDO)
  - International food assistance
  - Private energy and humanitarian assistance
  - North-South joint efforts
  - Don't forget recent efforts to disable Yongbyon. Paid for by U.S. and conducted in cooperation with US government experts on the ground at the nuclear facility.

# Lessons for the Future

- Cooperative programs with North Korea will not be easy but are possible in the context of negotiated diplomatic agreements and improving political and economic relations
- CTR programs can serve a number of important policy objectives for all members of Six Party Talks
  - For US and others: enhance chances for peaceful settlement, reduce uncertainty and increase transparency, ensure lasting solution to problem of WMD in DPRK, promote more normal relations with DPRK through spillover effect, hopefully encourage DPRK to shift resources away from military sector
  - For DPRK: help with achieving arms elimination at little cost and use important national resources for modernization of civilian economy.

# What about Scientist Redirection?

- Extensive history of using these programs to achieve national security objectives since 1991.
- Established because of concern that thousands of weapons scientists would leave Russia causing breakdown of global non-proliferation regime
- U.S. and others have spent hundreds of millions of dollars since then on redirection in Russia/FSU for scientists working on peaceful research programs. Tens of thousands of scientists provided with assistance
- Redirection effort broadened to include Libya and Iraq based on lessons from this experience
  - Iraq redirection program established to prevent emigration (about 500 scientists and technicians) and to use skills to assist in national reconstruction.
  - Program established in Libya in 2004 after decision to give up WMD efforts. Covers some 700 scientists and focuses on providing new research opportunities and helping with economic development (water management, nuclear medicine/isotopes production, precision manufacturing and environmental monitoring)

# North Korean Nuclear Work Force

- Little known about size and capabilities of work force, but given long standing DPRK nuclear program and current capabilities, we assume it is much larger than either Iraq or Libya
- Assume fairly extensive infrastructure -- Yongbyon for plutonium production and other unknown facilities engaged in weapons fabrication and assembly. Also civilian nuclear research program at institutes and universities.
- Core workers (knowledge of nuclear weapons) probably a few hundreds or less). Maybe additional 3,000 - 15,000 engaged in different aspects of program. Including families could increase number to 30,000.
- Long-term isolation from international scientific community. Example of Institute for Atomic Energy
- Hard to comment on quality. Anecdotal evidence provided by foreigners who have worked with nuclear experts suggests well educated but not up to date, able to adopt and learn quickly, creative and flexible when required

# Political Context for Redirection in North Korea

- Serious hurdles remain before denuclearization of North Korea can move forward. Negotiations may be able to get the process back on track, but recent DPRK pronouncements not encouraging
- Not clear when it will be possible to move to phase three of talks with main tasks dismantling facilities, destroying North Korean nuclear weapons and shipping out nuclear material
- Redirection should be embedded in a denuclearization agreement, particularly the next phase of talks, since it would serve the interests of all parties to the talks
- Objectives of NAS project on redirection are to formulate a redirection program for DPRK and provide that program to countries participating in Six Party Talks so it can be used as a basis for reaching agreement.
  - Another Objective: build regional knowledge of how other redirection programs worked so all countries can benefit from lessons learned

# Background

- North Korea has announced that it will suspend Six Party Talks and restart its nuclear facilities
- Disablement of Yongbyon nuclear facility suspended; status of heavy oil and other assistance will be evaluated in light of the DPRK missile test
- Not clear when talks will resume. Still need to finalize verification measures for DPRK plutonium production program.
- If that problem is resolved, negotiations will move on to the next phase of denuclearization, which includes technically challenging, costly steps such as dismantlement and decontamination of nuclear facilities, dismantling nuclear weapons, shipping out spent fuel, as well as plutonium and other steps.
- All of this will require extensive financial and technical outside assistance and working together on-the-ground to achieve objectives of a denuclearization agreement. Drawing on past experiences DPRK cooperation will be essential.
- Redirection is an important issue that must be addressed in the future. At the end of the Bush Administration, U.S. negotiators preparing to put ideas on the table for North Koreans.
- North Koreans have long history of interest in redirection of military workers dating back to the mid-1990s
  - As Pyongyang began to consider a missile limitation agreement with US, asked for assistance in retraining employees of production facilities
  - In late 1990s, North Korea's General Bureau of Atomic Energy agreed to hold regular meetings with US Department of Energy to develop common agenda on topics such as environmental remediation at Yongbyon

# Background (cont)

- With recent steps to disable Yongbyon, North Korean nuclear managers began to focus on redirection of its work force at that facility.
- Became clear during February 12-16, 2008 visit to Yongbyon by US delegation
  - North Korean General Department of Atomic Energy raised the possibility of restraining some employees to participate in an LWR project and of turning Yongbyon into a scientific research center.
  - American team raised other possibilities including cooperative work on dismantlement and decontamination, radiation health physics and the production of isotopes with the IRT research reactor.
  - Bottom Line: North Koreans are clearly at the beginning of putting together game plan. Interested in general concept of CTR and are now looking for concrete ideas even from foreign experts.
  - Redirection possible topic again for upcoming visit by American delegation in next few months.

# Objectives and Interests

- CTR is in the interest of all members of Six Party Talks, including North Korea. Many of the same reasons apply to scientist redirection.
- “Win, Win” proposition for everyone involved
  - For North Korea: enable it to use valuable resources—highly skilled scientists, engineers and technicians—to develop scientific and technological base. Contribute to national economy.
  - For United States and others: help facilitate reaching agreement, enhance transparency and another layer of verification, help ensure DPRK remains denuclearized, gradually diminish potential to proliferate, safety measure in case of instability in DPRK

# Phase 3 Negotiations and Redirection

- How should redirection programs be integrated into a phase 3 roadmap for denuclearization?
- Already mentioned the steps in phase 3 that theoretically would lead to denuclearization. Likely to stretch out over 5-10 years and linked to the provision of incentives (political, security, energy) by US and other participants
- Given complexity and agreement on North Korean principle of “action for action” easiest solution is to chart a detailed roadmap with steps taken by each side
- Embedding redirection in the denuclearization roadmap will not be difficult. A large number of the work force will be required to help with the dismantlement and decontamination of nuclear facilities for example.
- But redirection program must also provide future oriented work other than dismantlement and decontamination of facilities where workers spent much of their adult lives.
- Overall objective is to structure a program that provides a process of transition for the North Korean nuclear work force away from weapons activities while also assisting in phase 3 denuclearization

# Opportunities

- Specific project ideas will be developed under NAS project will follow, but want to emphasize that redirection programs will be gradually phased in as denuclearization accelerates.
- Each program will have a ‘pyramid’ of activities and sub-activities that will build interaction between DPRK and international experts.
  - Research and development projects
  - Travel grants
  - Training, seminars and workshops
  - Facility upgrades and communications support (internet)

# Challenges

- “Pyramid” approach adopted because extensive experience shows establishing redirection programs in DPRK will have to overcome many on-the-ground hurdles
  - Long-term isolation of North Koreans from international scientific community
  - Straight-line command management means there will be little creativity at least at the outset. Need for clear, top down instruction to North Korean personnel to participate (initial experience will help guide next steps)
  - No idea about job opportunities, if any, outside closed nuclear facilities and don’t know about limitations on mobility. (In Russia, took years to change laws that allowed individuals to move from one city to another. Are North Koreans similar? Other reasons they wouldn’t move, ie family ties?)
  - Absence of modern equipment for use in civilian projects will be factor; should expect that they will request new equipment (IAE example). Careful that equipment not help maintain or enhance nuclear weapons capabilities.

# NAS Redirection Project

- Two year project to formulate redirection options for DPRK nuclear work force that could form the basis of government efforts.
- Working closely with experts from China, Russia, South Korea, Europe and Japan to increase awareness of issue and provide technical advice to Six Parties. (International working group and bilateral meetings)
- Will continue to develop and refine ideas through 2009 - seminars planned for all countries. Held two workshops in Seoul late 2008 because of South Korea's important role.
- Preliminary program covers up to 5,000 nuclear workers if decision made to dismantle Yongbyon. Initial cost estimate difficult to reach but probably in the tens of millions of dollars. Could escalate dramatically if Six Parties move forward with dismantlement.
- One key unknown: number of workers and costs involved in redirection to non-nuclear tasks designed to modernize North Korean economy.
- Worth noting that conversion of IRT reactor from HEU to LEU and modernization to produce isotopes could result in significant foreign currency earnings.

# Four Projects Identified

- The **Conversion of North Korea's IRT reactor** and operation for the production of radioactive isotopes for medical, industrial and agricultural purposes
  - Extensive technical paper written on this subject
  - Cost of modernization and conversion about \$15 million and could take up to three years
  - During initial conversion process, up to 35 North Koreans may participate. Eventually, some 200-500 DPRK personnel may be employed at the IRT 2000 in the production of isotopes and other activities.
  - Of special note is existence of an expanding export market for medical isotopes, particularly Mo-99, that could be produced by the IRT on the Korean peninsula, China, Japan and Asia.
  - Difficult to estimate the exact size of export market but earnings could run into the tens of millions of dollars

# Radiation Safety, Site Characterization and Dismantlement

- Initial two year effort would focus on upgrading radiation safety for nuclear workers and site characterization at Yongbyon in preparation for much more extensive effort to dismantle nuclear facilities. Conducted in collaboration with scientists from US and other countries.
- Initial program would cost about \$5.9 million and employ about 75 North Koreans in its operations.
- Costs and numbers of DPRK personnel would escalate dramatically in case of dismantlement. Initial phase would require some 500 personnel and full dismantlement over 3000 North Koreans.
- Activities could prepare the way for eventually converting Yongbyon into a center of scientific excellence, an idea floated by the North Koreans in February 2008.

# Light Water Reactor Program

- Depends on whether Six Parties will agree to provide the North with new reactors.
- If they do, will require establishing nuclear regulatory authority as well as involving North Koreans in operation of the reactors.
- Detailed plans already exist for both drawn up by KEDO. Can be used as the basis for restarting programs.
- Estimated that 125 North Korean experts will be needed to staff regulatory authority and about 500 others to help operate new reactors.
- Costs unclear but are unlikely to exceed millions of dollars since they focus largely on intensive training programs for prospective candidates at home and abroad.

# Non-Nuclear Opportunities

- Needs further study. Difficult to estimate extent of opportunities or costs.
- Based on experiences in other redirection programs, number of interesting possibilities that could contribute to modernization of key sectors of North's economy.
  - Reactor control system specialists could be retrained to work on electric power stations, grids and power generating stations (including hydropower, wind power and fossil fuel), water, oil or gas pipelines or gas distribution systems
  - Machinists and similar industrial specialists could be employed in vehicle production, civil support infrastructure projects (once again power stations and pipelines) and steel/metal products
  - Chemical specials have skills useful for processing plastic and electronic waste and quality assurance/quality control in the production of pharmaceuticals, synthetic materials etc.