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North Korea's Nuclear Weapons Development and Diplomacy

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Abstract. The six parties to the North Korean nuclear negotiations concluded an agreement on February 13, 2007, that specifies two Phases of implementation. The phases provided for a freeze of North Korean nuclear installations at the Yongbyon site, a subsequent disablement of all North Korean nuclear facilities, and a North Korean declaration of "all nuclear programs." The Agreement also establishes working groups of the six parties on subjects such as U.S.-North Korean normalization of relations, denuclearization of the Korean peninsula, energy and economic cooperation, Japan-North Korea normalization of relations, and a North Korean peace and security mechanism. The Six Party Agreement was negotiated following a North Korean nuclear test in October 2006, the imposition of sanctions against North Korea by the United Nations Security Council, and mounting congressional criticism of Administration policy. The nuclear test signaled progress by North Korean in reprocessing plutonium since 2002 for six to eight atomic bombs.

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Summary

In 1994, an Agreed Framework was negotiated between the Clinton Administration and North Korea, specifying measures to limit and eventually eliminate North Korea's nuclear programs. In late 2002, the Agreed Framework broke down over U.S. evidence that North Korea was operating a secret nuclear program. North Korea restarted nuclear installations that had been frozen under the Agreed Framework. Negotiations ensued in 2003 involving six governments: the United States, North Korea, China, South Korea, Japan, and Russia.

The six parties to the North Korean nuclear negotiations concluded an agreement on February 13, 2007, that specifies two phases of implementation. The phases provided for a freeze of North Korean nuclear installations at the Yongbyon site, a subsequent disablement of all North Korean nuclear facilities, and a North Korean declaration of "all nuclear programs." The Six Party Agreement was negotiated following a North Korean nuclear test in October 2006. The nuclear test signaled progress by North Korea in reprocessing plutonium since 2002 for six to eight atomic bombs. The agreement also came about because of changes in Bush Administration policy. Tactically, the Administration ended its unwillingness to negotiate bilaterally with North Korea and actively sought bilateral meetings; the details of the Agreement were negotiated at these meetings.

The Bush Administration negotiated three subsequent agreements with North Korea. They produced the initiation of a disablement of North Korean nuclear installations at Yongbyon, inside North Korea, including a nuclear reactor and plutonium reprocessing plant; Bush Administration lifting of Trading With the Enemy Act sanctions against North Korea and removal of North Korea from the U.S. list of state sponsors of terrorism; and a North Korean declaration of nuclear programs limited to known nuclear installations at Yongbyon and reportedly a plutonium stockpile of 30 kilograms. The third of these agreements, negotiated in October 2008, established a system of verification and inspections but limited to the declared facilities at Yongbyon and not including the taking of samples by inspectors. At a six party meeting in December 2008, the Bush Administration failed to get North Korea to agree to include sampling in a written agreement.

These agreements did not cover important components of North Korea's nuclear programs: the apparent production of a few atomic bombs; a highly enriched uranium program known to the United States since the late 1990s; and alleged nuclear collaboration with Iran and Syria. According to U.S. officials, collaboration with Syria involved the construction of a nuclear reactor, which Israel bombed in September 2007. Collaboration with Iran reportedly involves development of high enriched uranium, development of a nuclear warhead that could be mounted on a jointly developed intermediate range ballistic missile (North Korean Nodong, Iranian Shahab missile), and North Korean assistance in constructing deep underground installations to house part of Iran's nuclear program.

This report will be updated periodically.

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U.S.-North Korea Nuclear Agreement

In December 2008, the Bush Administration failed to secure North Korean agreement for the issuance of a statement by the governments of the six party negotiations on North Korean nuclear programs. North Korea rejected U.S. proposals that the statement include a provision that would allow six party inspectors to take samples of nuclear materials from North Korea's declared nuclear facilities. The failure to resolve this dispute over a verification system, especially the right of inspectors to take samples, cast into doubt the completion of implementation of a U.S.-North Korean nuclear agreement that had been negotiated in stages since January 2007.¹

On June 26, 2008, the North Korean government and the Bush Administration took measures to implement a nuclear agreement that they had negotiated in 2007 into 2008. The details of the agreement were finalized details in April 2008 at a meeting of the chief U.S. and North Korean negotiators in Singapore.² The agreement, if fully implemented, would complete the second phase of an accord reached by the six party conference on North Korean nuclear issues in February 2007 and detailed more fully in a six party statement of October 2007. (The six parties are the United States, China, North Korea, South Korea, Russia, and Japan).

The agreement created two obligations each for North Korea and the Bush Administration to fulfill. North Korea is to allow a process of disablement of its plutonium nuclear facilities at Yongbyon, a site 60 miles from the capital of Pyongyang. The shutting down of Yongbyon was a key provision of the 1994 Agreed Framework negotiated by the Clinton Administration and North Korea. Yongbyon ceased to operate between 1994 and the end of 2002. In late 2002, the Bush Administration suspended U.S. obligations under the Agreed Framework because of U.S. intelligence estimates that North Korea was operating a secret nuclear weapons program based on highly enriched uranium. North Korea responded by re-starting the Yongbyon facilities. Between early 2003 and the summer of 2007, the Yongbyon reactor and the plutonium reprocessing plant produced enough weapons grade plutonium for the production of several atomic bombs. North Korea tested an atomic device in October 2006.

The disablement process began in October 2007. The Bush Administration said in June 2008 that eight of eleven components of the disablement process have been completed and that close to 50% of nuclear fuel rods (the source of plutonium) in the Yongbyon nuclear reactor have been removed.³ Administration officials have stated that a completed disablement of the Yongbyon installations would be extensive enough so that it would take North Korea about a year to re-start them,⁴ but subsequent developments indicated that North Korea could restart the plutonium reprocessing plant within three to four months.

North Korea's second obligation was to provide the United States and other members of the six party talks with a "complete and correct" declaration of nuclear programs. The declaration

¹ Glenn Kessler, "N. Korea doesn't agree to written nuclear pact," *Washington Post*, December 12, 2008.

² "Bush OKs Singapore Agreement: WH [White House]," Yonhap News Agency (Seoul), April 14, 2008. Melanie Lee and Daryl Loo, "Nuclear talks with N. Korea make progress, US says," Reuters, April 8, 2008.

³ White House Press Spokesman, Press Fact Sheet: Presidential Action on State Sponsor of Terrorism (SST) and the Trading with the Enemy Act (TWEA), June 26, 2008.

⁴ "Restoring disabled N. Korea nukes would need year—US," Reuters, November 22, 2007.

negotiated and reportedly finalized in Singapore and delivered to China on June 26, 2008, contains a declaration of the amount of plutonium that North Korea claims to possess. Reports asserted that North Korea declared 30.8 kilograms of plutonium.⁵ U.S. intelligence estimates reportedly conclude that North Korea has accumulated 50 to 60 kilograms of plutonium.⁶ However, other components of North Korea's nuclear programs reportedly are omitted from the declaration, apparently based on concessions the Bush Administration made to North Korea in the Singapore agreement. These include the number of atomic bombs North Korea possesses, information about the facilities where North Korea produces and tests atomic bombs, and the locations where North Korea stores plutonium and atomic bombs. The declaration also reportedly contains no information about North Korea's reported highly enriched uranium program or North Korea's reported nuclear collaboration activities with Iran and Syria. According to Bush Administration officials, the uranium enrichment and Syria issues are addressed in a "confidential minute."⁷ (They have said nothing about Iran.) However, in the confidential minute, North Korea reportedly does not admit to uranium enrichment or proliferation activities with Syria. It merely "acknowledges" U.S. concerns that North Korea has engaged in these activities in the past.⁸

The United States' two obligations under the agreement are to remove North Korea from the U.S. Trading with the Enemy Act and from the U.S. list of state sponsors of terrorism. Removal from the Trading with the Enemy Act will allow U.S. companies to import North Korean goods and sell non-strategic goods to North Korea. It opens up possibilities for U.S. companies to invest in North Korea. However, given North Korea's communist economic system and its suspicions of foreign intrusions, there appears to be little likelihood of any meaningful trade or investment relations developing between the United States and North Korea.⁹ Removal from the Trading with the Enemy Act could give North Korea in the future access to \$31.7 million in North Korean assets in the United States that have been frozen since the Korean War.¹⁰

Removal from the U.S. list of state sponsors of terrorism will end the requirement that U.S. presidents oppose North Korean membership in international financial agencies like the World Bank and the International Monetary Fund. Because of North Korea's economic system and secretive economic activities, its prospects for near term membership in or aid from the World Bank and the IMF appear to be remote. However, in likely nuclear negotiations in 2009 under the Obama Administration, it is probable that North Korea will demand that the incoming Obama Administration "complete" North Korea's removal from the terrorism support with an "affirmative act" of initiating proposals for North Korea to receive financial aid from the World Bank and the International Monetary Fund.

North Korea may have three additional motives for its pressure on the Bush Administration to remove it from the list of state sponsors of terrorism. One is to reduce U.S. support for Japan on

⁵ "North Korea tells China 30.8 kg of plutonium extracted," Agence France Presse, October 24, 2008.

⁶ Glenn Kessler, "U.S. increases estimate of N.Korean plutonium," *Washington Post*, May 14, 2008.

⁷ Anne Gearan, "U.S. official: North Korea has agreed to intensive US verification of its plutonium production," Associated Press, June 26, 2008. Helene Cooper, "Past deals by N.Korea may face less study," *New York Times*, April 18, 2008. p. A5.

⁸ Anne Gearan, "U.S. official: North Korea has agreed to intensive US verification of its plutonium production," Associated Press, June 26, 2008.

⁹ Missy Ryan, "Slim trade impact seen in US move on N.Korea sanctions," Reuters, June 26, 2008.

¹⁰ U.S. Treasury Department, *Calendar Year 2006 Fifteenth Annual Report to the Congress on Assets in the United States of Terrorist Countries and International Terrorism Program Designees*, September 2007.

the issue of Japanese citizens kidnapped by North Korea. The Clinton and Bush administrations previously had cited a resolving of the Japanese kidnapping issue as linked to removal of North Korea from the terrorism support list. A second motive apparently is to improve the prospects for normalization of diplomatic relations with the United States, which North Korea says it wants.¹¹ A possible third motive may be to remove any U.S. incentive to examine the issue of North Korea's activities in the Middle East and deny to the United States a potential negotiating lever over North Korea's activities in the Middle East. Numerous reports indicate that North Korea's activities include providing training and weapons to Hezbollah and cooperation with the Iranian Revolutionary Guards in the development of both missiles and nuclear weapons. (See subsequent section on "Nuclear Collaboration with Iran and Syria." See also CRS Report RL30613, *North Korea: Terrorism List Removal?*)

The Implementation Process

On June 26, 2008, North Korea submitted its declaration of nuclear programs to China, the chairman of the six party talks. Simultaneously, President Bush announced that he had removed North Korea from the Trading with the Enemy Act. The President has full authority to renew annually Trading with the Enemy Act sanctions on North Korea or to lift those sanctions from North Korea.

President Bush also announced that he had sent to Congress notification of his intent to remove North Korea from the list of state sponsors of terrorism after 45 calendar days, on August 11, 2008. Under U.S. law, the President is required to notify Congress 45 days before removing a country from the list. The White House said that North Korea would be removed on August 11, 2008, unless Congress acted legislatively to block removal.¹² However, the White House also said on June 26, 2008, that removal of North Korea was conditioned on North Korean acceptance of provisions for U.S. verification of the North Korean declaration of nuclear programs.

On June 27, 2008, North Korea blew up the cooling tower of its nuclear reactor at Yongbyon as a symbol of the continuing disablement process. China, as chairman of the six party talks, called a six party meeting on July 10-12, 2008. A six party press communique announced that North Korea had agreed to complete the disablement of Yongbyon by the end of October 2008. Also, by that date, the United States, China, South Korea and Russia are to complete the provision to North Korea of one million tons of heavy fuel oil and other forms of energy assistance that had been promised under the February 2007 six party agreement.

Verification Issue

However, the Bush Administration did not remove North Korea from the list of state sponsors of terrorism on August 11, 2008. In July, the Administration presented North Korea with a draft protocol on verification of North Korea's nuclear programs. The draft protocol would have given U.S. and other six party inspectors the right to conduct inspections at sites throughout North Korea. North Korea rejected the U.S. proposal, arguing that inspections should cover only those facilities at Yongbyon that it had listed in its declaration of June 26, 2008. North Korea retaliated

¹¹ "N Korea wants normalized relations with the US," *Dong-A Ilbo* (Seoul, internet), June 6, 2008.

¹² White House Press Spokesman, Fact Sheet: Presidential Action on State Sponsor of Terrorism (SST) and the Trading with the Enemy Act (TWEA), June 26, 2008.

by halting the disablement process at Yongbyon and announcing that it would restart the plutonium reprocessing plant at Yongbyon.¹³

Neither the February 2007 nor the October 2007 nuclear agreements (which was put in the form of a six party statement) mentioned a system of verifying the implementation of the agreements. There is no evidence that the Singapore agreement of April 2008 detailed any system of verification. However, following the U.S.-North Korean meeting at Singapore, the Bush Administration began to seek supplemental agreements with North Korea regarding the establishment of verification mechanisms to examine North Korea's declaration of its plutonium stockpile. In early May 2008, the Bush Administration and North Korea negotiated an accord for North Korea to turn over to the United States over 18,000 documents related to its plutonium program, dating back to 1986. U.S. experts currently are examining these documents. The White House announcement of June 26, 2008, of submission to Congress of notification of intent to remove North Korea from the terrorism support list stated that removal after 45 days would be carried out "only after the six parties reach agreement on acceptable verification principles and an acceptable verification protocol; the six parties have established an acceptable monitoring mechanism; and verification activities have begun."

The six party meeting of July 10-12, 2008, reached agreement on verification principles, including inspection of Yongbyon facilities, review of documents, and interviews of North Korean nuclear scientists and technicians. Verification would be carried out by experts of the six parties. The International Atomic Energy Agency would have only an advisory role. However, the Bush Administration also gave North Korea a draft protocol on verification, which proposed an inspection system that would have access to any site in North Korea, including military facilities, and to all materials at these sites.¹⁴ North Korea rejected the U.S. proposal. The Bush Administration decided not to remove North Korea from the terrorism support list on August 11, 2008. North Korea immediately announced a suspension of the disablement of Yongbyon and on August 26, 2008, an intention to restart the plutonium reprocessing plant.

The Bush Administration reacted to North Korea's announcement of a restarting of the plutonium reprocessing by scaling back the scope of its verification proposals. Assistant Secretary of State Christopher Hill went to Pyongyang in early October and negotiated a verification deal, which would concentrate inspections only on Yongbyon.¹⁵ North Korea agreed and announced a resumption of disablement. The Bush Administration followed on October 11, 2008, by the announcement of Secretary of State Condoleezza Rice that North Korea was removed from the U.S. list of state sponsors of terrorism.

The State Department's description of the verification agreement included the following points. Inspectors would have access only to the sites at Yongbyon in North Korea's June 16, 2008 declaration. Access to non-declared sites would be by "mutual consent." The inspection organization would be composed of the five non-North Korean members of the six party talks—the United States, China, South Korea, Japan, and Russia. The organization would make decisions

¹³ Glenn Kessler, "Far-reaching U.S. plan impaired N.Korea deal; demands began to undo nuclear accord," *Washington Post*, September 26, 2008, p. A20.

¹⁴ Glenn Kessler, "Far-reaching U.S. plan impaired N. Korea deal; demands began to undo nuclear accord," *Washington Post*, September 26, 2008, p. A20.

¹⁵ Special briefing by State Department spokesman, Sean McCormack, M2 Presswire, October 11, 2008.

on the basis of unanimous consent. The terms of the verification agreement were contained in a U.S.-North Korean document and in “certain other understandings.”¹⁶

The Bush Administration and the State Department give few details on two other aspects of Hill’s talks in Pyongyang and the verification agreement. One was the issue of inspectors being able to take samples of nuclear materials at the Yongbyon installations for laboratory analysis. A North Korean Foreign Ministry statement of November 11, 2008, and subsequent statements asserted that the written verification agreement said nothing about sampling and that North Korea only had to abide by the written agreement and nothing else. The State Department then acknowledged that Hill’s discussion with North Koreans about sampling was only a verbal understanding.¹⁷ This issue was not resolved in the December 2008 six party meeting.

The second aspect of Hill’s talks was his meeting with North Korean Lt. General Lee Chan-bok. This was the first time that a North Korean military leader had participated in the nuclear talks. General Lee reportedly called for bilateral U.S.-North Korean military talks and may have linked U.S. acceptance of bilateral military talks to further progress on the nuclear issue.¹⁸ Hill and the State Department have been silent on the content of this meeting, including whether or not Hill committed the United States to bilateral military talks in the near future.

North Korea’s Nuclear Programs

Plutonium Program

Most of North Korea’s plutonium-based nuclear installations are located at Yongbyon, 60 miles from the North Korean capital of Pyongyang. They are the facilities covered by the 1994 U.S.-North Korean Agreed Framework and by the freeze and disablement provisions in Phases One and Two of the February 2007 Six Party Nuclear Agreement. The key installations are as follows:¹⁹

- *An atomic reactor, with a capacity of about 5 electrical megawatts that began operating by 1987.* It is capable of expending enough reactor fuel to produce about 6 kilograms of plutonium annually—enough for the manufacture of a single atomic bomb annually. North Korea in 1989 shut down the reactor or about 70 days; U.S. intelligence agencies believe that North Korea removed fuel rods from the reactor at that time for reprocessing into plutonium suitable for nuclear weapons. In May 1994, North Korea shut down the reactor and removed about 8,000 fuel rods, which could be reprocessed into enough plutonium (25-30 kilograms) for 4-6 nuclear weapons. North Korea started operating the reactor again in February 2003, shut it down in April 2005, and said it had removed another 8,000 fuel rods.

¹⁶ Ibid.

¹⁷ “N. Korea rejects contentions it is delaying denuclearization,” *Kyodo News*, November 12, 2008. “NKorea will not let nuclear samples out of country,” Reuters, November 12, 2008.

¹⁸ “N. Korea proposes military talks with U.S.,” *Kyodo News*, October 5, 2008. “Jin Dae-woong: N.K. delivered U.S. Ultimatum on Nuke Dispute,” *Korea Herald* (internet), October 7, 2008.

¹⁹ Albright, David and O’Neill, Kevin. *Solving the North Korean nuclear puzzle*. Washington, DC, Institute for Science and International Security Press, 2000. pp. 57-82.

- Two larger (estimated 50 megawatts and 200 electrical megawatts) reactors under construction at Yongbyon and Taechon since 1984. According to U.S. Ambassador Robert Gallucci, these plants, if completed, would be capable of producing enough spent fuel annually for 200 kilograms of plutonium, sufficient to manufacture nearly 30 atomic bombs per year. However, when North Korea re-opened the plutonium program in early 2003, reports indicate that construction on the larger reactors was not resumed.
- *A plutonium reprocessing plant about 600 feet long and several stories high.* The plant would separate weapons grade plutonium-239 from spent nuclear fuel rods for insertion into the structure of atomic bombs or warheads. U.S. intelligence agencies reportedly detected North Korean preparations to restart the plutonium reprocessing plant in February and March 2003. According to press reports, the CIA estimated in late 2003 that North Korea had reprocessed some of the 8,000 fuel rods. In January 2004, North Korean officials showed a U.S. nuclear expert, Dr. Sigfried Hecker, samples of what they claimed were plutonium oxalate powder and plutonium metal. Dr. Hecker later said in testimony before the Senate Foreign Relations Committee (January 21, 2004) that, without testing, he could not confirm whether the sample was metallic plutonium “but all observations I was able to make are consistent with the sample being plutonium metal.” IAEA monitors in July 2007 stated that the reprocessing plant was not in operation.

Satellite photographs reportedly also show that the five megawatt reactor has no attached power lines, which it would have if used for electric power generation.

Persons interviewed for this study believe that North Korea developed the five megawatt reactor and the reprocessing plant with its own resources and technology. It is believed that Kim Jong-il, the son and successor of President Kim Il-sung who died in July 1994, directs the program, and that the military and the Ministry of Public Security implement it. North Korea reportedly has about 3,000 scientists and research personnel devoted to the Yongbyon program. Many have studied nuclear technology (though not necessarily nuclear weapons production) in the Soviet Union and China and reportedly Pakistan.

Highly Enriched Uranium (HEU) Program

North Korea's secret highly enriched uranium (HEU) program appears to date from at least 1996. Hwang Jang-yop, a Communist Party secretary who defected in 1997, has stated that North Korea and Pakistan agreed in the summer of 1996 to trade North Korean long-range missile technology for Pakistani HEU technology.²⁰ Other information dates North Korea-Pakistan cooperation to 1993. The Clinton Administration reportedly learned of it in 1998 or 1999, and a Department of Energy report of 1999 cited evidence of the program. In March 2000, President Clinton notified Congress that he was waiving certification that “North Korea is not seeking to develop or acquire the capability to enrich uranium.” The Japanese newspaper *Sankei Shimbun* reported on June 9, 2000, the contents of a “detailed report” from Chinese government sources on a secret North Korean uranium enrichment facility inside North Korea's Mount Chonma. Reportedly, according

²⁰ Kim Min-cheol. “Hwang tells of secret nuke program.” *Choson Ilbo* (Seoul, internet version), July 5, 2003.

to a CIA report to Congress, North Korea attempted in late 2001 to acquire “centrifuge-related materials in large quantities to support a uranium enrichment program.”²¹

The CIA estimated publicly in November 2002 that North Korea could produce two atomic bombs annually through HEU beginning in 2005;²² other intelligence estimates reportedly project a bomb producing capability between 2005 and 2007. Ambassador Robert Gallucci, who negotiated the 1994 U.S.-North Korean Agreed Framework, and Mitchell Reiss, head of the State Department’s Policy Planning Bureau until 2004, have stated that a functioning North Korean HEU infrastructure could produce enough HEU for “two or more nuclear weapons per year.” The *Washington Post* of April 28, 2004, quoted an U.S. intelligence official saying that a North Korean HEU infrastructure could produce as many as six atomic bombs annually. Administration officials have stated that they do not know the locations of North Korea’s uranium enrichment program or whether North Korea has assembled the infrastructure to produce uranium-based atomic bombs.²³

International Assistance

Knowledgeable individuals believe that the Soviet Union did not assist directly in the development of Yongbyon in the 1980s. The U.S.S.R. provided North Korea with a small research reactor in the 1960s, which also is at Yongbyon. However, North Korean nuclear scientists continued to receive training in the U.S.S.R. up to the demise of the Soviet Union in December 1991. East German and Russian nuclear and missile scientists reportedly were in North Korea throughout the 1990s. Since 1999, reports have appeared that U.S. intelligence agencies had information that Chinese enterprises were supplying important components and raw materials for North Korea’s missile program.²⁴

Nuclear Collaboration with Iran and Syria

In April 2008, the Bush Administration disclosed that a facility at Al Kibar in northeast Syria bombed by Israel on September 6, 2007, was a plutonium nuclear reactor under construction with the apparent aim of producing nuclear fuel rods that could be converted into nuclear weapons-grade plutonium. For months after the Israeli bombing, press reports had cited information and evidence that the facility was a nuclear reactor and that North Korea was assisting Syria in its construction. This nuclear collaboration reportedly was ongoing since 1997.²⁵ U.S. intelligence officials on April 24, 2008, privately briefed Members of Congress on North Korea’s role, and they provided a background news briefing to the media.²⁶ (See CRS Report RL33487, *Syria: Background and U.S. Relations*.)

²¹ Pincus, Walter. “N. Korea’s nuclear plans were no secret.” *Washington Post*, February 1, 2003. p. A1.

²² CIA unclassified point paper distributed to Congress, November 19, 2002.

²³ Kessler, Glenn. “New doubts on nuclear efforts by North Korea.” *Washington Post*, March 1, 2007. p. A1.

²⁴ “ROK source views CIA report on DPRK production of plutonium.” *Chungang Ilbo* (internet version), February 25, 2001. Gertz, Bill. “Pyongyang’s launch met by indifference.” *Washington Times*, May 16, 1999. p. C1.

²⁵ Sara A. Carter and Bill Gertz, “Intelligence on Syria delayed to avoid fight,” *Washington Times*, April 25, 2008, p. A1.

²⁶ David E. Sanger, “Bush Administration released images to bolster its claims about Syrian reactor,” *New York Times*, April 25, 2008, p. A1.

U.S. officials presented several forms of evidence for North Korean involvement in the Syrian reactor. A U.S. photograph showed a top North Korean nuclear official visiting Syrian nuclear experts. U.S. intelligence officials released photographs of the outside and inside of the reactor showing marked similarities with the North Korean nuclear reactor at Yongbyon. The photos of the interior of the reactor reportedly showed North Koreans inside the reactor.²⁷ A leading South Korean newspaper had reported that U.S. intelligence agencies had obtained a list of North Korean officials involved in the Syrian reactor project and that chief U.S. negotiator, Christopher Hill, had confronted North Korean nuclear negotiators with the list.²⁸

At the time of the Bush Administration's disclosures, South Korean intelligence officials stated that they had information that the Israeli bombing had killed ten North Koreans.²⁹

U.S. officials said that the Al Kibar reactor was nearly operational at the time of the Israeli bombing. However, non-government nuclear experts questioned that assertion, asserting that there was no evidence of a plutonium reprocessing plant and a facility to produce nuclear fuel for the reactor in Syria.³⁰

One potential answer to the question of the absence of other reactor-related plutonium facilities in Syria came in reports later in 2008 that Iran also was involved in the Syrian reactor with North Korea and that a plutonium reprocessing plant was in Iran. The online service of the German news publication *Der Spiegel* cited "intelligence reports seen by *Der Spiegel*" that North Korean and Iranian scientists were working together at the reactor site at the time of the Israeli bombing. Some of the plutonium fuel rod production from the reactor was to have gone to Iran, which viewed the reactor as a "reserve site" to produce weapons-grade plutonium as a supplement to Iran's own highly enriched uranium program.³¹ A similar description of North Korean-Iranian cooperation in the Syrian reactor came in two reports from Washington in the Japanese newspaper, *Sankei Shimbun*. The newspaper reported in September 2008 information from "a source familiar with the Syrian nuclear issue" that "a secret Iranian Revolutionary Guards base" in Iran housed a plutonium reprocessing facility designed to reprocess nuclear fuel rods from the Syrian reactor.³² *Sankei Shimbun* reported from Washington in July 2008 several visits of Iranian officials to the Syrian reactor in 2005 and 2006.³³

Additional information pointing to North Korean-Iranian collaboration in plutonium nuclear development came from European and Israeli defense officials in early 2007. They stated that North Korea and Iran had concluded a new agreement for North Korea to share data from its October 2006 nuclear test with Iran.³⁴

²⁷ Robin Wright, "N. Koreans taped at Syrian reactor," *Washington Post*, April 24, 2008, p. A.1.

²⁸ "U.S. called N. Korea's bluff over Syria," *Chosun Ilbo* (internet), April 1, 2008.

²⁹ "N.Koreans killed in Syria during Israeli raid," *Chosun Ilbo* (internet), April 29, 2008. "N. Koreans may have died in Israel raid in Syria—NHK," Reuters, April 28, 2008.

³⁰ Nicholas Kravev and Sara A. Carter, "Syria's nuke facility was nearly finished," *Washington Times*, April 24, 2008, p. A.1. Robin Wright, "N. Koreans taped at Syrian reactor," *Washington Post*, April 24, 2008, p. A1.

³¹ "Asad's risky nuclear game," *Spiegel Online*, June 23, 2008.

³² Takashi Arimoto, "Reprocessing facility of bombed nuclear base in Iran; intimate ties between Syria and North Korea," *Sankei Shimbun* (internet), September 12, 2008.

³³ Takashi Arimoto, "Iran involved in nuclear program: trilateral cooperation of Syria, Iran, North Korea," *Sankei Shimbun* (internet), July 12, 2008.

³⁴ Jin Dae-woong, "Concerns grow over missile links between N. Korea, Iran," *Korea Herald* (internet), January 28, (continued...)

These reports describe a direct collaborative relationship between North Korea and Iran in developing nuclear weapons. Additionally, since the early 1990s, a body of reports has accumulated pointing to a significant collaborative North Korean-Iranian nuclear relationship inside Iran, with North Korea's principle interlocutor being the Iranian Revolutionary Guards (IRGC). Some of these reports cite the Central Intelligence Agency or Western intelligence sources as sources of information. Other reports seem to be based, at least in part, on Israeli intelligence sources. Specific events or factors in the alleged North Korean-Iranian nuclear collaboration are described in multiple reports.

Numerous reports have asserted that the IRGC occupies a leadership role in Iran's nuclear program. A State Department's 2007 Fact Sheet asserted that "the IRGC attempted, as recently as 2006, to procure sophisticated and costly equipment that could be used to support Iran's ballistic missile and nuclear program."³⁵

Nuclear collaboration reportedly began at the same time North Korea negotiated with the IRGC for cooperation in developing and manufacturing Nodong missiles. The first reports, in 1993 and 1994, said that North Korea and Iran had signed an initial agreement for nuclear cooperation. An *Economist Foreign Report* cited "CIA sources" that Iran was helping to finance North Korea's nuclear program and that North Korea would supply Iran with nuclear technology and equipment.³⁶ A report of the U.S. House of Representatives Republican Research Committee claimed that Iran would provide \$500 million to North Korea for the joint development of nuclear weapons.³⁷ The "CIA sources" cited by the *Economist Foreign Report* mentioned the development of enriched uranium as a goal of the new North Korean-Iranian agreements.

The next reported stage in nuclear collaboration, in 2003 and afterwards, appears to have been connected to the reported joint advancement of the program to produce a model of North Korea's Nodong intermediate ballistic missile in Iran. Production of the Nodong in Iran was a main element of the reported North Korean-Iranian agreements of 1993. By 1997, North Korean missile experts were working in Iran with the IRGC to produce the Shahab 3 and Shahab 4 missiles, the Iranian name for the Nodong.³⁸ Success in developing and testing the Shahab missile reportedly led to a North Korean-Iranian agreement, probably in 2003, to either initiate or accelerate work to develop nuclear warheads that could be fitted on the Shahab missile. Iran was reported to have offered shipments of oil and natural gas to North Korea to secure this joint development of nuclear warheads.³⁹ North Koreans reportedly were seen at Iranian nuclear

(...continued)

2007. "UK press: North Korea aids Iran in nuclear testing," *Dow Jones International News*, January 24, 2007. "Israel PM to charge NKorea link with Iran, Syria," *Agence France Presse*, February 26, 2008.

³⁵ U.S. Department of State, Fact Sheet: Designation of Iranian Entities and Individuals for Proliferation Activities and Support for Terrorism, October 25, 2007.

³⁶ "An Israeli lesson for North Korea?" *Economist Foreign Report*, April 22, 1993, p. 2. See also: "DPRK reportedly aids Iranian nuclear project," *Yonhap News Agency*, January 26, 1993. "DPRK military delegation's Iran visit reported," *Seoul KBS-1 Radio Network*, February 24, 1994.

³⁷ "U.S. report on DPRK-Iran missile deal cited," *Yonhap News Agency*, July 16, 1993. The \$500 million figure also was cited in: "Iran funds North Korea's drive to build nuclear bombs," *U.S. News and World Report*, March 29, 1993, p. 18.

³⁸ Con Coughlin, "China, N. Korea send experts to hone Iran's long-range missiles," *London Daily Telegraph*, November 23, 1997, p. A5. Bill Gertz, "North Korea send missile parts technology to Iran," *Washington Times*, April 18, 2001, p. A3.

³⁹ Douglas Frantz, "Iran closes in on ability to build a nuclear bomb; Tehran's reactor program masks strides toward a weapons capability, a Times investigation finds," *Los Angeles Times*, August 4, 2003, p. A1. "Military source: DPRK, (continued...)"

facilities in 2003. By this time, a large number of North Korean nuclear and missile specialists reportedly were in Iran.⁴⁰ *Der Spiegel* quoted “western intelligence service circles” as describing Iran in 2005 as offering North Korea economic aid if Pyongyang “continues to cooperate actively in developing nuclear missiles for Tehran.”⁴¹

In 2006 and 2008, U.S. intelligence officials, the International Atomic Energy Agency, and other diplomatic sources disclosed that Iran was trying to modify the Shahab missile, especially the nose cone, so that it could carry a nuclear warhead. U.S. intelligence officials described this work as part of an Iranian Project 111—“a nuclear research effort that includes work on missile development.”⁴² In March 2006, Reuters reported “an intelligence report given to Reuters by a non-U.S. diplomat” that described Iran’s plans to develop nuclear warheads for the Shahab 3 missile.⁴³ Two years later, the International Atomic Energy Agency confronted Iran at several 2008 meetings with documents and photographs showing Iranian work in redesigning the nose cone of the Shahab-3 missile in order for it to carry a nuclear warhead.⁴⁴

The National Council of Resistance of Iran is an exiled opposition group that in 2002 had revealed correctly the existence of secret Iranian nuclear facilities at Natanz and Irak. It issued a report in February 2008 that gave reputed details of North Korean-Iranian collaboration in nuclear warhead development. It alleged that the Iranian Defense Ministry has a secret facility at Khojir on the edge of Tehran, code-named B1-Nori-8500, that is engaged in the development of nuclear warheads for intermediate range ballistic missiles. North Korean specialists are at this facility, according to the National Council.⁴⁵

Another form of North Korean-Iranian nuclear collaboration reportedly involved a huge Iranian project to develop underground bunkers and tunnels for elements of Iran’s nuclear program. The project, estimated to have cost hundreds of millions of dollars, included the construction of 10,000 meters of underground halls for nuclear equipment connected by tunnels measuring hundreds of meters branching off from each hall. Specifications reportedly called for reinforced concrete tunnel ceilings, walls, and doors resistant to explosions and penetrating munitions.⁴⁶

The IRGC implemented the project. North Korea reportedly participated in the design and construction of the bunkers and tunnels. In early 2005, Myong Lyu-do, a leading North Korean expert on underground facilities, traveled to Tehran to run the program of North Korean

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Iran planning joint development of nuclear warheads,” *Sankei Shimbun* (internet version), August 6, 2003.

⁴⁰ “Iranian nuke experts visited N. Korea this year,” Kyodo World Service, June 10, 2003. Douglas Frantz, “Iran closes in on ability to build a nuclear bomb,” *Los Angeles Times*, August 4, 2003, p. A1. “Military source: DPRK, Iran planning joint development of nuclear warheads,” *Sankei Shimbun* (internet), August 6, 2003.

⁴¹ “Mullahs helping Stalinists,” *Der Spiegel* (internet), November 28, 2005.

⁴² Dafna Linzer, “Strong leads and dead ends in nuclear case against Iran,” *Washington Post*, February 8, 2006, p. AO1.

⁴³ Louis Charbonneau, “Iran said to step up plans for Shahab missiles,” Reuters, March 6, 2006.

⁴⁴ David E. Sanger, “Nuclear agency says Iran has used new technology,” *New York Times*, February 23, 2008, p. A3. Mark Heinrich, “IAEA shows photos alleging Iran nuclear missile work,” Reuters, September 16, 2008.

⁴⁵ “Iran still developing nuclear warheads: exiled opposition group,” Agence France Presse, February 20, 2008. Marc Champion, “Iran arms claim is lodged—Tehran is developing nuclear warheads, exile group tells U.N.,” *Wall Street Journal Asia*, February 21, 2008, p. 9. Koki Mirua, “Anti-Iranian government organ points to ‘DPRK’s cooperation in Iran’s nuclear development,’” *Tokyo Shimbun* (internet), September 24, 2008.

⁴⁶ “Nukes too deep to hit.” *Newsweek*, November 3, 2008, p. 8, 10.

assistance.⁴⁷ North Korea is believed to have extensive underground military installations inside North Korea. Its collaboration with the IRGC reportedly has involved extensive aid to Hezbollah in constructing underground military installations in Lebanon. (See CRS Report RL30613, *North Korea: Terrorism List Removal?*)

The Japanese newspaper, *Sankei Shimbun*, reported two visits of high level Iranian officials to North Korea in February and May 2008. The Iranian delegation included officials of Iran's Atomic Energy Organization and National Security Council. The apparent purpose of these visits, according to the reports, was to ensure that North Korea would maintain secrecy about its nuclear collaboration with Iran in its negotiations with U.S. Assistant Secretary of State Christopher Hill.⁴⁸

North Korea's Delivery Systems

North Korea's missile launchings of July 4, 2006, re-focused U.S. attention on North Korea's missile program and Pyongyang's apparent attempts to develop long-range missiles that could strike U.S. territories. North Korea succeeded by 1998 in developing a "Nodong" missile with a range estimated at up to 900 miles, capable of covering South Korea and most of Japan. North Korea reportedly deployed nearly 100 Nodong missiles by 2003 and also had jointly developed with Iran the Shahab version of the Nodong. On August 31, 1998, North Korea test fired a three-stage rocket, apparently the prototype of the Taepodong I missile; the third stage apparently was an attempt to launch a satellite. U.S. intelligence estimates reportedly concluded that such a missile would have the range to reach Alaska, Guam, and the Northern Marianas Commonwealth. Media reports in early 2000 cited U.S. intelligence findings that without further flight tests, North Korea could deploy an intercontinental ballistic missile that would be capable of striking Alaska, Hawaii, and the U.S. west coast. U.S. officials claimed in September 2003 that North Korea had developed a more accurate, longer-range intermediate ballistic missile that could reach Okinawa and Guam (site of major U.S. military bases) and that there was evidence that North Korea had produced the Taepodong II, which could reach Alaska, Hawaii, and the U.S. west coast.

However, the apparent failure of the Taepodong missile launched July 4, 2006, indicated that North Korea had not succeeded in developing such a long-range missile. However, evaluations of all seven of the missiles launched on July 4, 2006, by intelligence agencies of the United States and other governments reportedly have concluded that North Korea has increased the accuracy of its Scud and Nodong missiles and that the launches displayed the ability of North Korea's command and control apparatus to coordinate multiple launchings of missiles at diverse targets.⁴⁹ (For additional information, see CRS Report RS21473, *North Korean Ballistic Missile Threat to the United States*, by Steven A. Hildreth.)

The Clinton Administration pressed North Korea for new talks over North Korea's missile program. In talks held in 1999 and 2000, North Korea demanded \$1 billion annually in exchange for a promise not to export missiles. U.S. negotiators rejected North Korea's demand for \$1

⁴⁷ Robin Hughes, "Tehran takes steps to protect nuclear facilities," *Jane's Defence Weekly*, January 25, 2006, p. 4-5.

⁴⁸ Takashi Arimoto, "Iranian delegation makes top secret visit to North Korea in late February; for discussions on nuclear issue?" *Sankei Shimbun* (internet), March 20, 2008. "Iran involved in nuclear program: trilateral cooperation of Syria, Iran, North Korea," *Sankei Shimbun* (internet), July 12, 2008.

⁴⁹ "An expert is amazed by the targeting accuracy: an exclusive report based on complete data on the landing points of North Korean missiles," *Yomiuri Weekly* (Tokyo) in Japanese, August 6, 2006. p. 22-23.

billion but offered a lifting of U.S. economic sanctions. This laid the ground for the Berlin agreement of September 1999, in which North Korea agreed to defer further missile tests in return for the lifting of major U.S. economic sanctions. President Clinton formalized the lifting of key economic sanctions against North Korea in June 2000. North Korea continued the moratorium, but it appears to have used Pakistan and Iran as surrogates in testing intermediate-range missiles based on North Korean technology.⁵⁰

State of Nuclear Weapons Development

A CIA statement of August 18, 2003, reportedly estimated that North Korea had produced one or two simple fission-type nuclear weapons and had validated the designs without conducting yield-producing nuclear tests.⁵¹ The initial estimate of one or two nuclear weapons is derived primarily from North Korea's approximately 70-day shutdown of the five megawatt reactor in 1989, which would have given it the opportunity to remove nuclear fuel rods, from which plutonium is reprocessed. The U.S. Central Intelligence Agency (CIA) and the Defense Intelligence Agency (DIA) reportedly estimated in late 1993 that North Korea extracted enough fuel rods for about 12 kilograms of plutonium—sufficient for one or two atomic bombs. The CIA and DIA apparently based their estimate on the 1989 shutdown of the five megawatt reactor.⁵²

South Korean and Japanese intelligence estimates reportedly were higher: 16-24 kilograms (Japan) and 7-22 kilograms (South Korea). These estimates reportedly are based on the view that North Korea could have acquired a higher volume of plutonium from the 1989 reactor shutdown and the view of a higher possibility that North Korea removed fuel rods during the 1990 and 1991 reactor slowdowns. Russian Defense Ministry analyses of late 1993 reportedly came to a similar estimate of about 20 kilograms of plutonium, enough for two or three atomic bombs. General Leon LaPorte, former U.S. Commander in Korea, stated in an interview in April 2006 that North Korea possessed three to six nuclear weapons before the 1994 U.S.-North Korean Agreed Framework.⁵³

Russian intelligence agencies also reportedly have learned of significant technological advances by North Korea toward nuclear weapons production. On March 10, 1992, the Russian newspaper *Argumenty I Fakty* (Arguments and Facts) published the text of a 1990 Soviet KGB report to the Soviet Central Committee on North Korea's nuclear program. It was published again by *Izvestiya* on June 24, 1994. The KGB report asserted that "According to available data, development of the first nuclear device has been completed at the DPRK nuclear research center in Yongbyon." The North Korean government, the report stated, had decided not to test the device in order to avoid international detection.

⁵⁰ Gertz, Bill. "Pakistan's missile program aided by North Korea." *Washington Times*, September 14, 1998. p. A1. Alon, Ben-David. "Iran successfully tests Shahab 3," *Janes Defence Weekly* (internet version), July 9, 2003. Coughlin, Con. "China, N. Korea send experts to hone Iran's long-range missiles," *New York Times*, November 23, 1997. p. A5.

⁵¹ Sanger, David E. "North Korea's bomb: untested but ready, C.I.A. concludes," *New York Times*, November 9, 2003. p. 4.

⁵² Edith M. Lederer, "Fuel for speculation; reactor shutdown seen as N. Korean nuke source," *Washington Times*, January 10, 1994, p. 1. David Albright, "North Korean Plutonium Production." *ISIS Paper*, 1994, p. 10-13.

⁵³ Kang Chan-ho. "Former USFK commander: transfer of wartime control should not be carried out overnight," *Joong Ang Ilbo* (Seoul), April 3, 2006. p. 13.

Additionally, a number of reports and evidence point to at least a middle-range likelihood that North Korea may have smuggled plutonium from Russia. In June 1994, the head of Russia's Counterintelligence Service (successor to the KGB) said at a press conference that North Korea's attempts to smuggle "components of nuclear arms production" from Russia caused his agency "special anxiety." U.S. executive branch officials have expressed concern in background briefings over the possibility that North Korea has smuggled plutonium from Russia. One U.S. official, quoted in the *Washington Times*, July 5, 1994, asserted that "There is the possibility that things having gotten over the [Russia-North Korea] border without anybody being aware of it." The most specific claim came in the German news magazine *Stern* in March 1993, which cited Russian Counterintelligence Service reports that North Korea had smuggled 56 kilograms of plutonium (enough for 7-9 atomic bombs) from Russia.

If, as it claims, North Korea reprocessed the 8,000 nuclear fuel rods in 2003 that it had moved from storage at the beginning of that year, North Korea gained an additional 25-30 kilograms of plutonium, according to Dr. Sigfried Hecker in his testimony before the Senate Foreign Relations Committee on January 21, 2004. Dr. Hecker, former director of the Los Alamos Laboratories, had visited North Korea's Yongbyon nuclear complex in January 2004. U.S. officials and nuclear experts have stated that this amount of plutonium would give North Korea the potential to produce between four to eight atomic bombs.⁵⁴ Nuclear expert David Albright estimated in February 2007 that North Korea had a stockpile of reprocessed plutonium of 28-50 kilograms, enough for between 5 and 12 nuclear weapons.⁵⁵ These estimates appear to be based on projections that a country like North Korea would need 6-8 kilograms of plutonium to produce one atomic bomb. The IAEA has had a standard that a non-nuclear state would need about eight kilograms of plutonium to produce an atomic bomb.

The question of whether North Korea produced additional nuclear weapons with the plutonium that it apparently acquired after 2003 may depend on the degree of success/failure of North Korea's nuclear test of October 2006 and whether North Korea is able to develop a nuclear warhead that could be fitted onto its missiles. Experts believe that any atomic bombs developed likely are similar to the plutonium bomb dropped by the United States on Nagasaki in August 1945. However, North Korea has few delivery systems that could deliver such a bomb to a U.S. or Japanese target. Thus, Pyongyang probably would not produce additional Nagasaki-type bombs but would retain its weapons-grade plutonium until it could use it to produce a nuclear warhead. Statements by U.S. officials reflect an apparent uncertainty over whether North Korea has achieved a warheading capability,⁵⁶ and they have not addressed publicly the reports of North Korean-Iranian collaboration in nuclear warhead development.

According to press reports in late 2002, the CIA concluded that North Korea accelerated its uranium enrichment program in the 1999, 2000, and 2001. According to *U.S. News and World Report*, September 1, 2003, the CIA estimated that North Korea could produce a uranium-based atomic weapon by the second half of 2004. Another report, in the *Washington Post*, April 28, 2004, stated that U.S. intelligence officials had "broadly concluded" that a North Korean uranium

⁵⁴ Kessler, Glenn. "N. Korea nuclear estimate to rise," *Washington Post*, April 28, 2004. p. A1. "U.S. Expert says N. Korea has plutonium to make 8 bombs," *Yonhap News Agency*, January 2, 2006.

⁵⁵ David Albright and Paul Brannan, "The North Korean Plutonium Stock," Institute for Science and International Security, February 20, 2007.

⁵⁶ Cloud, David S. and Sanger, David E. "U.S. aide sees arms advance by North Korea," *New York Times*, April 29, 2005. p. A1. Morgan, David. "U.S. not certain North Korea has nuclear weapons," Reuters, February 28, 2005.

enrichment program would be operational by 2007, producing enough material for as many as six atomic bombs.⁵⁷ However, U.S. officials have stated that they know less about the secret uranium enrichment program (HEU) than they know about the plutonium program. North Korea received designs for uranium enrichment centrifuges from Pakistan nuclear “czar,” A.Q. Khan, and has attempted to purchase overseas key components for uranium enrichment centrifuges; but some of these purchases have been blocked.⁵⁸ Assistant Secretary of State Christopher Hill stated on September 28, 2005, that “where there is not a consensus is how far they [North Korea] have gone with this [the HEU program].”⁵⁹

Select Chronology

10/9/06—North Korea announced that it has carried out an underground nuclear test.

2/13/07—The six party governments negotiating over North Korea’s nuclear programs announced an agreement for a freeze and disablement of North Korea’s nuclear facilities accompanied by energy and diplomatic benefits to North Korea.

6/25/07—A diplomatic deadlock involving \$24 million in frozen North Korean funds in a Macau bank, Banco Delta Asia, was ended when U.S.-initiated measures to unfreeze the money and transfer it to North Korea.

7/18/07—The International Atomic Energy Agency announced that nuclear facilities at Yongbyon are shut down in accordance with the freeze provisions of the February 2007 six party nuclear agreement.

10/3/07—The six parties issued a statement to implement the second phase of the February 2007 nuclear agreement, focusing on the disablement of Yongbyon, a North Korean declaration of its nuclear programs, and a U.S. promise to lift economic sanctions on North Korea and remove North Korea from the U.S. list of state sponsors of terrorism.

4/8/08—Assistant Secretary of State Christopher Hill and North Korea’s Kim Kye-gwan negotiated an agreement reportedly limiting the information that North Korea would have to provide in a declaration of nuclear programs.

6/26/08—North Korea transmitted a declaration of nuclear programs to China, the chairman of the six party talks. President Bush announced a lifting of economic sanctions on North Korea and an intention to remove North Korea from the U.S. list of state sponsors of terrorism by August 11, 2008.

8/11/08—The Bush Administration announced that it would not remove North Korea from the list of state sponsors of terrorism because Pyongyang rejected U.S. proposals for a verification system of inspections inside North Korea.

⁵⁷ Kessler, “N. Korea nuclear estimate to rise,” *Washington Post*, April 28, 2004. p. A1.

⁵⁸ Albright and Hinderstein, *Dismantling the DPRK’s nuclear weapons program*, pp. 35-36.

⁵⁹ “Parties concur N.K. has HEU material, but disagree on program’s progress: Hill,” Yonhap News Agency, September 29, 2005.

10/3/08—Assistant Secretary of State Hill and North Korean officials negotiate an agreement in Pyongyang for a verification system.

For Additional Reading

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