



North Korea's Nuclear Weapons Development and Diplomacy

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Summary

Since August 2003, negotiations over North Korea's nuclear weapons programs have involved six governments: the United States, North Korea, China, South Korea, Japan, and Russia. Since the talks began, North Korea has operated nuclear facilities at Yongbyon and apparently has produced weapons-grade plutonium estimated as sufficient for five to eight atomic weapons. North Korea tested a plutonium nuclear device in October 2006 and apparently a second device in May 2009. North Korea admitted in June 2009 that it has a program to enrich uranium; the United States had cited evidence of such a program since 2002. There also is substantial information that North Korea has engaged in collaborative programs with Iran and Syria aimed at producing nuclear weapons.

On May 25, 2009, North Korea announced that it had conducted a second nuclear test. On April 14, 2009, North Korea terminated its participation in six party talks and said it would not be bound by agreements between it and the Bush Administration, ratified by the six parties, which would have disabled the Yongbyon facilities. North Korea also announced that it would reverse the ongoing disablement process under these agreements and restart the Yongbyon nuclear facilities. Three developments since August 2008 appear to have influenced the situation leading to North Korea's announcement: the failure to complete implementation of the Bush Administration-North Korean agreement, including the Yongbyon disablement, because of a dispute over whether inspectors could take samples of nuclear materials at Yongbyon; the stroke suffered by North Korean leader, Kim Jong-il, in August 2008; and the issuance by North Korea after January 1, 2009, of a tough set of negotiating positions, including an assertion that the United States must extend normal diplomatic relations prior to any final denuclearization agreement rather than in such an agreement; and that U.S. reciprocity for North Korean denuclearization must be an end of the "U.S. nuclear threat," meaning major reductions of and restrictions on U.S. military forces in and around the Korean peninsula.

The Obama Administration reacted to the missile and nuclear tests by seeking United Nations sanctions against North Korea. It secured U.N. Security Council approval of Resolution 1874 in June 2009. The resolution calls on U.N. members to restrict financial transactions in their territories related to North Korean sales of weapons of mass destruction (WMD) to other countries. It also calls on U.N. members to prevent the use of their territories by North Korea for the shipment of WMD to other countries. In December 2009, the Administration sent a special envoy to North Korea in an attempt to secure North Korean agreement to return to the six party talks. North Korea gave a general positive statement regarding six party talks; but it raised other issues, including its proposal for negotiation of a U.S.-North Korean peace treaty, and appeared to seek a continuation of bilateral meetings with the United States.

North Korea seemed to moderate its provocative policies in August 2009. It invited former President Bill Clinton to North Korea, where he secured the release of two female American reporters who were taken prisoner by the North Koreans along the China-North Korea border. It also released a South Korean worker at the Kaesong industrial complex in North Korea, whom the North Koreans had arrested in March 2009. A North Korean delegation came to Seoul for the funeral of former South Korean President Kim Dae-jung and met with President Lee Myung-bak. This raised the prospect of renewed U.S.-North Korean negotiations over the nuclear issue, but any future negotiations appear to face daunting obstacles.

This report will be updated periodically.

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Recent Developments: The Bosworth Mission to North Korea

The Obama Administration sent its special envoy on North Korea, Ambassador Stephen Bosworth, to Pyongyang on December 8-10, 2009. The Administration set two objectives for the mission: (1) to secure a North Korean commitment to resume participation in the six party nuclear negotiations, which North Korea had boycotted since April 2009; and (2) to secure a North Korean commitment to implement a September 2005 six party statement in which North Korea had pledged to work toward “denuclearization of the Korean peninsula.” Bosworth failed to get specific commitments on either during his two days of negotiations. According to Bosworth, he and his North Korean counterparts reached “some common understandings on the need for and the role of the six party talks and the importance of implementation of the 2005 joint statement.”¹ A North Korean Foreign Ministry statement of December 11, 2009, also referred to “common understandings” regarding the six party talks and implementing the September 2005 statement.

However, North Korea made no commitment to attend a six party meeting in the near future.² Tony Namkung, an aide to Governor Bill Richardson of New Mexico who maintains close contacts with North Korea, believes that North Korea would accept a renewal of six party talks but not as a forum for actual negotiations but “an umbrella kind of organization” under which the United States and North Korea would negotiate bilaterally.³ Before the Bosworth mission and in its Foreign Ministry statement, North Korea indicated that it seeks a number of bilateral meetings with the United States before it would agree to participate in a six party meeting.⁴

The North Korean Foreign Ministry statement said that Bosworth and North Korean officials had a “long exhaustive and candid discussion” of a Korean peace agreement, normalization of diplomatic relations, economic and energy aid, and “denuclearization of the Korean peninsula.” Moreover, the North Korean Foreign Ministry statement and other reports indicated that North Korean negotiators had emphasized the part of the September 2005 statement referring to opening negotiations on a Korean peace treaty to replace the 1953 Korean armistice agreement. The North Koreans reportedly told Bosworth that a peace treaty was more important than the establishment of U.S.-North Korean diplomatic relations and that a peace treaty was necessary to demonstrate that the United States had reversed its “hostile policies” toward North Korea.⁵ Jack Pritchard, Director of the Korean Economic Institute, was in Pyongyang a few days earlier than Bosworth; he testified that North Korean Foreign Ministry official, Lee Gun, stated that a peace agreement

¹ “N. Korea agrees on need for six-way nuke talks: Bosworth,” Yonhap News Agency, December 10, 2009.

² Blaine Harden, “U.S. envoy’s N. Korea trip brings no commitment on nuclear talks,” *Washington Post*, December 11, 2009, p. A13.

³ Yeh Young-june and Yoo Jee-ho, “US-DPRK ‘unofficial liaison’ offers mixed views on DPRK talks,” JoongAng Daily Online, December 8, 2009. The Clinton Administration sent Bill Richardson to North Korea several times on missions. Since then, North Korean officials have held several meetings with him, including dispatching a delegation from the North Korean U.N. mission to Santa Fe in 2009.

⁴ “N.Korea’s Kim [Jong-il] says U.S. key to nuclear talks return,” Reuters News, October 5, 2009. Donald S. Zagoria, Summary Report of a conference organized by the National Committee on American Foreign Policy (NCAFP) and The Korea Society, October 30, 2009. The summary cited statements by North Korean participants.

⁵ “Kim Ji-hyun, N. Korea puts peace treaty before normal ties: sources,” Korea Herald Online, December 30, 2009.

“is the only way to resolve everything” between North Korea and the United States.⁶ According to South Korea’s Foreign Minister, North Korean negotiators told Bosworth that U.S. and United Nations sanctions against North Korea should end.⁷

North Korea’s position on a Korean peace treaty (an old North Korean proposal going back to 1974) contrasted sharply in three respects with positions of the Obama Administration, which Bosworth reiterated and reportedly were contained in a letter from President Obama to North Korean leader, Kim Jong-il, delivered by Bosworth.⁸ First, as reportedly stated by Bosworth, the Obama Administration would engage in a negotiation of a peace treaty when North Korea “takes irreversible steps toward denuclearization.”⁹ North Korea appears to seek the denuclearization issue merged into a U.S.-North Korean peace treaty negotiation. Second, Bosworth repeated the position of the Obama Administration (and the Bush Administration) that U.S. normalization of diplomatic relations with North Korea would be a main element of U.S. reciprocity in return for North Korean denuclearization. North Korea rejects diplomatic relations as a quid pro quo for denuclearization (a position that North Korea set out in January 2009). Third, North Korea’s long-standing agenda for a peace treaty and its repeated definition of “denuclearization of the Korean peninsula” have focused on securing a major diminution of the U.S. military presence in South Korea and around the Korean peninsula (which North Korea defines as elimination of “the U.S. nuclear threat”). The Obama Administration, like the Bush Administration, never has expressed a willingness to negotiate on U.S. military forces as part of a denuclearization negotiation.

Bosworth stated that he secured a North Korean commitment to discuss North Korea’s uranium enrichment program in future nuclear negotiations. After seven years of denials, North Korea admitted in 2009 that it has such a program and boasted of its progress. However, Bosworth gave no indication that he raised the issue of North Korean nuclear proliferation activities with Iran and Syria.

The Clinton Mission, North Korea’s Nuclear Test, and Withdrawal from the Six Party Talks

On August 4-5, 2009, former President Bill Clinton traveled to Pyongyang, North Korea’s capital, met with North Korea’s leader, Kim Jong-il, and secured the release of two American women, Laura Ling and Euna Lee, whom North Korean authorities had arrested in March 2009 on the North Korean-Chinese border. In June, a North Korean court had sentenced the two women to 12 years imprisonment at hard labor. The women, reporters for an online media company, had been developing stories on North Korean refugees who flee the country. An agreement for the release of the women between the Obama Administration and the North Korean government reportedly had been concluded prior to the Clinton trip. The Administration reportedly had used

⁶ Yoshihiro Makino and Yusuke Murayama, A Probability; N. Korea sticks to ‘peace agreement at the US-N. Korean negotiation, *Asahi Shimbun*, December 9, 2009.

⁷ N.K. requested sanctions to be lifted, *Korea Herald Online*, December 17, 2009.

⁸ Obama wants letter to Kim Jong-il kept secret, *Chosun Ilbo Online*, December 17, 2009.

⁹ N. Korea agreed on need for six-way nuke talks: Bosworth, *Yonhap News Agency*, December 10, 2009.

intermediaries and contacts between the State Department and North Korea's United Nations mission to negotiate the agreement.¹⁰

The North Korean media reported that President Clinton had issued a "sincere apology" for the actions of the women and had requested a pardon for them. The media also claimed that Clinton delivered a "verbal message" from President Obama to Kim Jong-il. Clinton and Kim had a three hour meeting (confirmed by U.S. officials) on a "wide-ranging exchange of views on matters of common concern." North Korean Vice Foreign Minister, Kang Sok-ju, who negotiated the 1994 nuclear Agreed Framework with the Clinton Administration, attended the meeting. The White House denied that Clinton had issued an apology and had delivered a message from President Obama. However, most experts surmised that Clinton would have expressed the position of the Obama Administration on the North Korean nuclear issue and other security issues.¹¹

President Clinton's mission came amidst deteriorating U.S.-North Korean relations as a result of a number of provocative acts by North Korea since March 2009 and the response of the Obama Administration to them in securing United Nations sanctions against North Korea.

On May 25, 2009, North Korea announced that it had conducted a second test of a nuclear bomb. U.S. and foreign officials said afterwards that initial detected soundings indicated that a nuclear test had taken place. Most U.S. and foreign nuclear experts estimated the explosive power of the bomb at between four and five kilotons. By comparison, the first North Korean test of October 2006 had an explosive yield of less than one kiloton.¹² North Korean statements indicated that this second test had achieved technical advances over the first test. A North Korean diplomat in Moscow predicted that there would be further tests.

The nuclear test followed North Korea's announcement on April 14, 2009, that it was withdrawing from the six party talks on North Korea's nuclear programs. It cited as the reason for its decision a statement approved by the United Nations Security Council criticizing North Korea's test launch of a long-range Taepodong II missile on April 5, 2009. The Security Council statement, issued by the President of the Security Council, said that the missile test violated Security Resolution 1718 of October 2006, which banned tests of long-range North Korean missiles. The statement called on members of the United Nations to enforce sanctions against North Korea adopted in Resolution 1718.¹³ North Korea claimed that the missile test was a legitimate launching of a satellite into space. North Korea warned prior to the April 5 test that it would withdraw from the six party talks if the Security Council took any action against it over the missile test.

North Korea staged boycotts of the six party talks on two previous occasions, in 2004-2005 and 2005-2006, each for nearly one year. North Korea's announcement of April 13, 2009, and subsequent statements, however, contained a more absolute rejection of the six party talks than was the case in the prior boycotts. The announcement said that North Korea "will never again take part in such talks." It also said that North Korea "will take steps to restore disabled nuclear

¹⁰ Clinton in Pyongyang, The Nelson Report, August 4, 2009. Glenn Kessler, N. Korea releases U.S. journalists, Washington Post, August 5, 2009, p. 1.

¹¹ Ibid. N.Korea pardons US journalists as Clinton meets Kim, Reuters News, August 4, 2009. Ex-U.S. Pres. Clinton meets N. Korea leader Kim Jong Il, Kyodo News, August 4, 2009.

¹² Sigfried Hecker, From Pyongyang to Tehran, with nukes, The New ForeignPolicy.com, May 26, 2009.

¹³ "UN council demands enforcement of N.Korea sanctions," Reuters News, April 13, 2009.

facilities” and “revive nuclear facilities and reprocess used nuclear fuel rods.” North Korea thus threatened to restore operation of its plutonium nuclear installations at Yongbyon that have been shut down since mid-2007 under agreements between North Korea and the Bush Administration for the disablement of the Yongbyon facilities.¹⁴ By early 2009, the disablement process was about 80% completed. Following the announcement, North Korea expelled from Yongbyon technicians and monitors from the United States and the International Atomic Energy Agency who had been there since 2007.

The earliest revival of the Yongbyon facilities that North Korea could implement would be a restarting of the plutonium reprocessing plant, which takes nuclear fuel rods from North Korea’s nuclear reactor at Yongbyon and converts them into nuclear weapons-grade plutonium. It was reported at the end of May 2009 that there were signs that the reprocessing plant was operating. Experts believe that North Korea could reprocess 8,000 fuel rods available from the reactor within four to six months—enough plutonium for one atomic bomb.¹⁵ (See CRS Report RL34256, *North Korea’s Nuclear Weapons: Technical Issues*, for more information on North Korea’s ability to restart the plutonium reprocessing plant.) U.S. officials and non-government nuclear experts have said that North Korea previously had reprocessed enough plutonium for five to eight atomic bombs. Reassembling the nuclear reactor and a nuclear fuel fabrication plant and restarting them would be a more difficult, time-consuming process, taking possibly up to a year, according to U.S. officials and nuclear experts. Once these facilities were operating, North Korea would be able to produce about six kilograms of plutonium per year, enough for one atomic bomb.¹⁶ In late May 2009, too, North Korea issued a threat to undertake the enriching of uranium, another process that can be used to produce atomic bombs.

U.N. Resolution 1874

The Obama Administration responded to North Korea’s nuclear test by seeking another U.N. Security Council resolution penalizing Pyongyang. On June 12, 2009, the U.N. Security Council approved Resolution 1874. It calls on U.N. member states to apply several sets of sanctions against North Korea. The major sanctions are:

—A ban on financial transactions related to North Korea’s trade in weapons of mass destruction (WMD) and WMD technology. North Korea’s state trading companies are key vehicles for transferring WMD and WMD technology to other countries and for transmitting the foreign exchange earnings back to Pyongyang. The trading companies conduct these transactions through accounts maintained in banks in numerous countries around the world. In order to shut down these financial transactions, governments and banks in a number of countries will have to freeze these bank accounts.

U.S. officials have said that the Obama Administration is emphasizing the ban on financial transactions in its discussions with other governments regarding Resolution 1874. In July 2009, Ambassador Philip Goldberg and Undersecretary of the Treasury Stuart Levey visited China, Malaysia, and Russia. Goldberg was appointed as a special envoy to coordinate sanctions against

¹⁴ Evan Ramstad and David Crawford, “North Korea leaves six-party talks,” *Wall Street Journal Asia*, April 15, 2009, p. 1. “North Korea quits nuclear talks, to restart plant,” *Reuters News*, April 14, 2009.

¹⁵ Sigfried Hecker, *From Pyongyang to Tehran, with nukes*, *The New ForeignPolicy.com*, May 26, 2009.

¹⁶ *Ibid.*

North Korea. They emphasized to Chinese, Malaysian, and Russian officials the need to restrict activities of North Korean trading companies.¹⁷

In line with the April 2009 Security Council statement and Resolution 1874, the Security Council designated for sanctions five North Korean trading companies, an Iran-based company, a North Korean bank, and North Korea's General Bureau of Atomic Energy. It also designated five North Korean officials, including the director of another North Korean trading company. The U.S. Treasury Department announced in late June 2009 sanctions on one of these North Korean trading companies, the Namchongang Trading Corporation, and the Iran-based Hong Kong Electronics. Treasury Department officials disclosed that the Department was targeting 17 North Korean trading companies and banks for U.S. and international sanctions.¹⁸ Apparently at the behest of the Chinese government, a Chinese firm reportedly halted construction of facilities for a joint copper mine with the [North] Korea Mining Development Trading Corporation, one of the North Korean companies sanctioned by the U.N. Security Council.¹⁹

—Search of sea-borne cargoes. U.N. member states are called upon to search ships that are suspected of carrying North Korea-related weapons or WMD technology if those ships are in their territorial waters or ports. If a suspect ship is on the high seas, U.N. member states are “called upon” to request the right to board and inspect. If the request is refused, Resolution 1874 obligates the flag state of the suspect ship to direct the vessel to a near-by port for inspection. The resolution authorizes the seizure of banned items. The resolution prohibits “bunkering services” such as refueling or servicing of a ship with suspected cargo. Enforcement of this provision lies in part with the U.S. Navy, but it also will require the cooperation of China and Southeast Asian states such as Singapore, Malaysia, and Indonesia. Many North Korean ships stop at Chinese ports. Ships bound for Burma, South Asia, or the Middle East must pass through the Singapore and Malacca straits connecting the Pacific and Indian Oceans.

—Search of Air Cargo. In contrast to the detailed procedures set out in resolution 1874 for searching sea-borne cargo, the resolution is vague in how its provisions for searches of air cargo are to be implemented. Many experts believe that North Korea uses air traffic much more than sea traffic in order to transfer and exchange WMD, WMD technology, and WMD scientists and technicians. □ Many believe that the key to inspections of North Korea's air cargo is the air traffic between North Korea and Iran. North Korea and Iran have engaged in extensive collaboration in the development of ballistic missiles, and there are numerous reports since 2003 indicating collaboration in the development of nuclear warheads that could be mounted on missiles. □ The U.S.-based Institute for Foreign Policy Analysis estimated in 2009 that North Korea earns about \$1.5 billion annually from sales of missiles to other countries. □ It appears that much of this comes from missile sales and collaboration with Iran in missile development; North Korea currently has only three major foreign customers for missiles: Iran, Syria, and possibly Burma. Iran and North Korea reportedly use the Pyongyang-Tehran air route for the transfer of missiles, WMD technology, and mutual visits of nuclear and missile officials, scientists, and technicians. North Korea and Iran reportedly emphasized air travel and traffic after 2002 in response to the Bush Administration's announcement of a Proliferation Security Initiative and the Spanish Navy's

¹⁷ U.S. Department of State, Background Briefing on North Korea: Background Briefing by Two Senior Administration Officials, July 15, 2009.

¹⁸ Jay Solomon, U.S. goes after North Korea's finances, *Wall Street Journal Asia*, July 1, 2009, p. 8.

¹⁹ Is China getting tough with N.Korea? *Chosun Ilbo Online*, July 31, 2009.

search of a North Korean ship bound for Yemen. Aircraft use Chinese air space and reportedly refuel at Chinese airports. □

China would have the prime responsibility for searches of aircraft on the Pyongyang-Tehran air route. Obama Administration officials indicated that Ambassador Goldberg raised the air traffic issue with Chinese officials during his visit to China in early July 2009, but they did not indicate how Chinese officials responded. Chinese officials have urged caution in searching possible North Korea-related cargos; they have stressed that there must be evidence of weapons and WMDs before undertaking searches.²⁰

Bush Administration-North Korean Agreements and Failure of Implementation

Three developments since August 2008 appear to have influenced the situation leading up to North Korea's provocative acts, and these continue to influence the Obama Administration in developing a strategy toward the North Korean nuclear issue. One is the failure of the Bush Administration, North Korea, and the other six party governments to complete implementation of the agreements reached between the Bush Administration and North Korea in 2007 and early 2008, particularly the failure to complete the agreed upon disablement of the Yongbyon facilities. A second was the stroke suffered by North Korean leader, Kim Jong-il, in August 2008, and the apparent subsequent emergence of a collective group of leaders including an influential element of the North Korean military. A third development was the issuance by North Korea after January 1, 2009, of a set of tough negotiating demands for future round of nuclear negotiations with the United States.

The Bush Administration negotiated three agreements with North Korea between February 2007 and October 2008; two were issued in February and October 2007 as agreements of the parties to the six party talks over North Korea's nuclear programs (United States, North Korea, China, South Korea, Japan, and Russia). The third was negotiated in Singapore in April 2008 between the United States and North Korea. The Bush Administration and North Korea began a process of implementation on June 26, 2008. A six party meeting of July 10-12, 2008, set out a timetable to complete implementation by October 31, 2008. The main aim of the Bush Administration in these agreements was to secure the disablement of North Korea's plutonium installations at Yongbyon. The agreements, however, were not implemented fully when the Bush Administration left office in January 2009. This was due partly to the failure of the Bush Administration and North Korea to resolve a dispute over a verification system, especially the right of inspectors to take and examine samples of nuclear materials at Yongbyon.²¹

On June 26, 2008, the North Korean government and the Bush Administration took measures to implement the nuclear agreements that they had negotiated in 2007 into 2008. The agreements created two obligations each for North Korea and the Bush Administration to fulfill. North Korea was 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

²⁰ China urges U.S. to accommodate DPRK's 'reasonable security concerns,' Xinhua, July 29, 2009.

²¹ Glenn Kessler, N.Korea doesn't agree to written nuclear pact, Washington Post, December 12, 2008.

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 had been completed.²² A major uncompleted task was the removal of spent plutonium fuel rods from the five megawatt reactor. According to informed U.S. sources, as of February 2009, about 6,100 of 8,000 spent fuel rods reportedly had been removed.²³

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 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.²⁴ U.S. intelligence estimates reportedly conclude that North Korea has accumulated 50 to 60 kilograms of plutonium.²⁵ 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."²⁶ (They 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.²⁷

The United States' two obligations under the agreements were 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 allows U.S. companies to import North Korean goods and

²² 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.

²³ Cited in CRS Report RL34256, *North Korea's Nuclear Weapons: Technical Issues*, by Mary Beth Nikitin. In September 2008, about 4,800 fuel rods reportedly had been removed from the reactor. The disablement processes resumed after Christopher Hill negotiated an agreement with North Korea on verification, and additional fuel rods were removed before North Korea again slowed removal of fuel rods in early 2009. See Jin Dae-woong, "North Korea may play cards to press U.S.," *Korea Herald* (internet), September 24, 2008; and Yi Chong-chin, "DPRK official at energy aid talks comments on nuclear verification issue," Yonhap News Agency, September 19, 2008.

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

²⁵ Glenn Kessler, "U.S. increases estimate of N.Korean plutonium," *Washington Post*, May 14, 2008.

²⁶ 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.

²⁷ Anne Gearan, "U.S. official: North Korea has agreed to intensive US verification of its plutonium production," Associated Press, June 26, 2008.

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.²⁸ 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.²⁹

Removal from the U.S. list of state sponsors of terrorism will end the requirement that U.S. presidents oppose financial aid to North Korea from international financial agencies like the World Bank and the International Monetary Fund. An opportunity to secure such financial aid might have been a North Korean objective in seeking removal from the terrorism support list.

North Korea may have had three additional motives for its pressure on the Bush Administration to remove it from the list of state sponsors of terrorism. One was to reduce U.S. support for Japan on the issue of Japanese citizens kidnapped by North Korea. The Clinton and Bush administrations previously had cited a resolution of the Japanese kidnapping issue as linked to removal of North Korea from the terrorism support list. A second motive apparently was to improve the prospects for normalization of diplomatic relations with the United States, which North Korea says it wants.³⁰ A possible third motive may be to limit 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 first U.S.-North Korean agreement, issued as a six party statement in February 2007, also set an important obligation to North Korea by the five other parties. The five parties were to provide North Korea with one million tons of heavy fuel oil or the energy equivalent thereof, corresponding with the disablement of Yongbyon.

Implementation Process

On June 26, 2008, North Korea submitted its declaration on 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 authority to renew annually Trading with the Enemy 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 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. 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.

²⁸ Missy Ryan, "Slim trade impact seen in US move on N.Korea sanctions," Reuters, June 26, 2008.

²⁹ 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.

³⁰ "N Korea wants normalized relations with the US," *Dong-A Ilbo* (Seoul, internet), June 6, 2008.

On July 12, 2008, the six parties issued a press communique setting a target date of October 31, 2008, for completion of the disablement of Yongbyon and the completion of the delivery of heavy fuel oil and alternative energy assistance.

Verification Issue

The Bush Administration did not remove North Korea from the list of state sponsors of terrorism on August 11, 2008. In July, the Bush 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.³¹ 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 by halting the disablement process at Yongbyon and announcing that it would restart the plutonium reprocessing plant at Yongbyon.³²

Neither the February 2007 nor the October 2007 six party nuclear agreements mentioned a system of country-wide inspections. 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 are examining these documents and have disclosed no revealing information from them. The White House announcement of June 26, 2008, stated that removal of North Korea from the terrorism support list 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."

A six party meeting of July 10-12, 2008, reached agreement on verification principles, including "visits to facilities, review of documents, interviews with technical personnel." "Other measures" would have to be "unanimously agreed upon among the six parties." Verification would be carried out by experts of the six parties. The International Atomic Energy Agency would have only an advisory role.

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 2008 and negotiated a verification deal, which would concentrate inspections only on Yongbyon.³³ North Korea agreed and announced a resumption of disablement. The Bush Administration followed on October 11, 2008, with the announcement of Secretary of State Condoleezza Rice that North Korea was removed from the U.S. list of state sponsors of terrorism.

³¹ Glenn Kessler, "Far reaching U.S. plan impaired N. Korea deal; demands began to undo nuclear accord," *Washington Post*, September 26, 2008, p. A20.

³² Glenn Kessler, "Far-reaching U.S. plan impaired N.Korea deal; demands began to undo nuclear accord," *Washington Post*, September 26, 2008, p. A20.

³³ Special briefing by State Department spokesman, Sean McCormack, M2 Presswire, October 11, 2008.

The State Department's description of the verification agreement included the following points. Inspectors would have access only to the sites at Yongbyon described in North Korea's June 26, 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 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."³⁴

The Bush Administration and the State Department gave 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.³⁵ 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.³⁶ Hill and the State Department have been silent on the content of this meeting.

At the six party meeting in December 2008, an attempt was made to draw up a compromise agreement on the sampling issue, but North Korea reportedly rejected a Chinese draft proposal. The sampling issue, too, resulted in a slowing of the disablement process and the delivery of heavy fuel oil to North Korea.³⁷ Thus, by the time the Bush Administration left office in January 2009, the disablement process remained stalled at about 80% completion, and only about 80% of the heavy fuel oil and alternative energy aid had been delivered.

Kim Jong-il's Stroke and Political Changes Inside North Korea

One factor complicating U.S. dealings with North Korea is the uncertainty surrounding Kim Jong-il's health and the degree of control he still exerts in North Korea. In August 2008, North Korean leader, Kim Jong-il suffered a stroke that apparently was severe and incapacitated him. Kim reportedly has been suffering from several major ailments since 2000, including heart, liver, and kidney problems, and possibly diabetes.³⁸ South Korean and Japanese media reports in July

³⁴ Ibid.

³⁵ "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.

³⁶ "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.

³⁷ Naoko Aoki and Kakumi Kobayashi, "6-way delegates fall short of North Korea nuke verification protocol," *Kyodo News*, December 11, 2008. Jin Dae-woong, "Nuke talks zero in on China's draft protocol," *Korea Herald Online*, December 10, 2008.

³⁸ "Kim Jong Il suffering convulsions," *Chosun Ilbo* (internet), September 12, 2008. Yi Song-chu, "The truth behind rumors about Kim Jong-il's illnesses—health rapidly deteriorated due to bad heart and lungs," *Tong-A Ilbo* (internet), January 19, 2004. Katsuhiko Kuroda, "General Secretary Kim Jong-il speculated to have received health checkups in Beijing," *Sankei Shimbun* (internet), January 2006.

2009, apparently based on Chinese sources, reported that Kim Jong-il had pancreatic cancer, one of the deadliest forms of cancer. A broadcast radio run by North Korean defectors in South Korea claimed in August that Kim Jong-il started receiving kidney dialysis in May 2009.³⁹ Photographs and television footage of Kim Jong-il in April and June 2009 showed him to be frail and to have aged considerably. He showed signs of paralysis in an arm and leg. Assistant Secretary of Defense Michael Nacht stated before the House Armed Services Committee on July 15, 2009, that “the leader is very ill.” However, during President Clinton’s mission to Pyongyang in August 2009, Kim Jong-il seemed to be in charge of the dealings with Clinton during a three hour meeting.⁴⁰

In the remainder of 2008 and throughout 2009, there have been reports that a small collective leadership group of Communist Party leaders and military commanders had taken over day-to-day decision making. Kim’s brother-in-law, Chang Song-taek, reportedly was a key figure in this group, possibly in a leadership role.⁴¹ If Kim is partially incapacitated or should die, a collective leadership could remain for some time; none of Kim’s three sons seems to be in a position within the leadership to succeed him immediately. Reports surfaced that Kim Jong-il had named his youngest son, Kim Jong-un, age 26, as a successor.⁴²

In the aftermath of the stroke, the North Korean military took a more visible role in implementing policy and announcing policy positions and decisions. Assistant Secretary of State Christopher Hill negotiated with a North Korean General on the nuclear issue for the first time when he went to Pyongyang in October 2008. South Korean businessmen at the special economic zone of Kaesong inside North Korea found themselves dealing with North Korean military officials rather than civilian officials. A statement of April 18, 2009, by the North Korean military General Staff strongly suggested that the military leadership had played a lead role in the decision to withdraw from the six party talks and that, in the future, the military will control decisions on the nuclear program.⁴³

In the post-stroke period, the North Korean regime began to restrict further access to North Korea by outsiders and placed new limits on private and quasi-private economic activities. New limits were imposed on Chinese traders operating in North Korea, the quasi-private markets selling food and consumer goods that had emerged in the late 1990s, and transportation between South Korea and the Kaesong economic zone.⁴⁴ The regime shut down the U.S. food aid program in March 2009 and later added new restrictions on the United Nations World Food Program. After January

³⁹ Kim Jong-il going through dialysis due to diabetic chronic kidney failure, Open Radio for North Korea, August 17, 2009.

⁴⁰ Kim still in control of N.Korea, Obama aide says, Associated Press, August 10, 2009.

⁴¹ “N.Korea ‘to be led by Kim Jong-il’s brother-in-law,’” Chosun.com, January 15, 2009. Selig Harrison, “Living with a nuclear North Korea,” *Washington Post*, February 17, 2009, p. A13. While visiting Pyongyang in January 2009, Harrison cited “informed sources” who told him that Kim Jong-il still made key decisions but that he has turned over day-to-day authority in domestic affairs to Chang Song-taek and control over national security to the National Defense Commission.”

⁴² “NKorea leader’s son to join top military body,” Dow Jones International News, April 26, 2009.

⁴³ Korean Central Broadcasting Station, April 18, 2009. The General Staff declared that “our army from the beginning had no expectation for the six-party talks” and that the North Korean military now was “not being confined by the agreement of six-party talks.” The military, in the future, “will advance on a road of reinforcing the country’s defense power, including nuclear deterrent, in every way.” The General Staff statement did not mention Kim Jong-il.

⁴⁴ “Turning back the clock: attempts to reclaim control in North Korea after 2004,” presentation by Andrei Lankov, Korean historian, at the U.S.-Korea Institute At SAIS, February 11, 2009. “An Yong-hyon, DPRK markets that even Kim Jong Il cannot hold in check,” Chosun.com, January 17, 2009.

1, 2009, the North Korean Foreign Ministry and the military command issued a number of statements outlining a set of tough, negotiating positions for future nuclear talks with the United States (see section on Issues Facing the Obama Administration).

Issues Facing the Obama Administration

The Obama Administration appears to face at least four sets of issues in dealing with North Korea on the nuclear question in the wake of North Korea's withdrawal from six party talks, its call for strictly bilateral talks with the United States, and its May 25, 2009, nuclear test. Two relate to the Administration's professed goal of getting North Korea back into a negotiating framework in the wake of Pyongyang's rejection of six party talks. Two others relate to U.S. goals and strategy if negotiations should resume.

Getting North Korea back into a negotiating framework may require the Obama Administration to seek to bridge the gap between North Korea's rejection of six party talks and the Administration's position that talks, including bilateral talks, should remain within the six party framework.⁴⁵ Administration officials have said that they are examining a different format for the six party forum.⁴⁶ Two options appear available. One would be to agree that the six party forum would no longer have a role as a forum where actual negotiations take place. Instead, the role of the six party forum would be only to ratify U.S.-North Korean agreements. Second, the Obama Administration might have to promise to honor unilaterally U.S. commitments in U.S.-North Korean agreements and not make such commitments dependent on approval and support by other six parties, especially Japan and South Korea. (South Korea and Japan increasingly adopted tough positions against North Korea in six party meetings in 2008; this may have been factor in Pyongyang's decision to reject the six party forum.) This would be especially important regarding any financial commitments the Obama Administration might make in bilateral accords with North Korea.

If these options should prove unfeasible, the Obama Administration might have to depend mainly on the option of increasing pressure on North Korea through U.N. sanctions in order to force Pyongyang to rescind its rejection of six party talks. Increasing pressure sufficient to bring the North Korean government to accept continued six party talks no doubt would require substantial cooperation from China in enforcing U.N. sanctions. It also likely would require a situation of growing pressure on North Korea's food situation. North Korea terminated South Korean food aid programs in 2008 and 2009, and it placed new limitations on the United Nations World Food Program in 2009. Reports in August 2009 indicate that North Korea faces growing food shortages in the coming months. Severe food shortages could threaten North Korea's elite and military with food shortages. North Korea's opening of a more conciliatory policy toward South Korea in July and August 2009 may be motivated by Pyongyang's concern over its food situation.⁴⁷

A second possible issue is how the Obama Administration would deal with pressure from North Korea and possibly China to relax U.N. and U.S. sanctions if North Korea agreed to resume

⁴⁵ N Korea should return to 6-way talks for improved ties: US, Asia Pulse, August 10, 2009. Hwang Doo-hyong, US to have bilateral talks with North Korea only in six-party context: State Department, Yonhap News Agency, July 30, 2009.

⁴⁶ Paul Richter, Deal was months in the making; talks began soon after the pair were arrested in March, with each capital focused on a specific goal, Los Angeles Times, August 5, 2009, p. A1.

⁴⁷ N. Korea hints as asking for food aid from South, Dong-A Ilbo Online, September 1, 2009.

negotiations. North Korea especially might press for an end of U.N. and U.S. financial sanctions. Obama Administration officials have said that Pyongyang's agreement to resume talks will not be sufficient and that negotiations must show progress toward denuclearization of North Korea. Chinese pressure on the Administration to lift sanctions in return for a resumption of negotiations could be an especially difficult problem for the Administration. The Administration likely would find itself under increasingly pressure to define more specifically the conditions under which it would agree to lift sanctions and the sequencing of the lifting of sanctions.

If negotiations should resume either within the six party framework or bilaterally, the Administration likely would face a daunting task in developing a strategy to deal with the negotiating positions which Pyongyang laid out in January and February 2009. These negotiating positions were laid out in official statements by the North Korean Foreign Ministry and, in a new development, statements by the North Korean military. They also came in statements that North Korean officials, including military officials, made to Selig Harrison of the Center for International Policy, who visited Pyongyang in mid-January 2009. Harrison has visited North Korea on numerous occasions since the early 1990s and has met with high-ranking North Korean officials. He on occasion has been somewhat of an interlocutor between the U.S. government and North Korea.

The negotiating positions taken by North Korea can be summarized as follows:

—North Korea will not give up its nuclear weapons in return for normalization of diplomatic relations with the United States and economic aid from the United States. Normalization of relations must come before denuclearization as a step toward denuclearization.⁴⁸ North Korean officials rejected Selig Harrison's proposal that North Korea turn over its plutonium stockpile to the International Atomic Energy Agency in return for U.S. diplomatic recognition and U.S. economic aid and trade credits.

—North Korea wants to be recognized as a nuclear weapons state. North Korean officials asserted to Harrison that North Korea wants U.S. recognition of its status as a nuclear weapons state.⁴⁹ North Korea has cited this goal repeatedly since 2007, which it appears to define as a situation in which the United States and other countries normalize relations with North Korea and provide economic and financial benefits while North Korea retains nuclear weapons. According to Harrison and U.S. nuclear expert, Sigfried Hecker, who visited North Korea in February 2009, North Korean officials, including military officials, indicated that a major objective of the nuclear program is to develop nuclear warheads that could be mounted on missiles.⁵⁰ North Korea's view may be that developing nuclear warheads would force the United States, Japan, and other countries to "recognize" North Korea as a nuclear weapons state. Thus, a key purpose of the May 2009 nuclear test may have been to advance North Korean nuclear technology toward a capability to produce nuclear warheads.

⁴⁸ "DPRK Foreign Ministry's spokesman dismisses U.S. wrong assertion," Korean Central News Agency (KCNA), January 17, 2009. "DPRK Foreign Ministry spokesman's press statement on denuclearization of Korean peninsula," KCNA, February 5, 2009.

⁴⁹ Woodrow Wilson International Center for Scholars, Selig S. Harrison reports on his trip to Pyongyang, February 4, 2009.

⁵⁰ Selig S. Harrison, *Living with a nuclear North Korea*, Washington Post, February 17, 2009, p. A13. Sigfried S. Hecker, *From Pyongyang to Tehran, with nukes*, The New ForeignPolicy.com, May 26, 2009.

—North Korea no longer has a plutonium stockpile of 31 kilograms that it declared in June 2008 because North Korea has “weaponized” all of its plutonium. This implies a North Korea position that future negotiations on final denuclearization must deal only with North Korea’s plutonium atomic weapons and not the plutonium stockpile.⁵¹

—Denuclearization must include the entire Korean peninsula and must include the elimination of the “U.S. nuclear threat” to North Korea.⁵² Pyongyang’s apparent position that a final denuclearization negotiation must deal only with its atomic weapons appears to aim at giving North Korea more negotiating leverage to press its demand that the United States must agree to measures to eliminate the U.S. “nuclear threat.” North Korea repeatedly has defined the “U.S. nuclear threat” to include the composition and major operations of U.S. military forces in South Korea and around the Korean peninsula and the U.S. “nuclear umbrella” over South Korea embodied in the U.S.-South Korean Mutual Defense Treaty. North Korean strategy seems aimed at proposing that a final denuclearization agreement with the United States constitute the document that regulates the future U.S. military presence in and around the Korean peninsula, thus superseding the U.S.-South Korean Mutual Defense Treaty.

—Any system of verification and inspections must include inspections inside South Korea, including U.S. bases in South Korea. If North Korea holds to that position, negotiating an agreement on verification that would include sampling would pose additional difficulties and likely delays. Since 1993, North Korea has shown consistently a rejectionist attitude toward proposals of international inspections of its territory that would seek information about its nuclear programs. Pyongyang has been willing to allow only a limited monitoring role for the International Atomic Energy in monitoring agreements that limited operations at Yongbyon.

The Obama Administration’s ability to develop a strategy to deal with these likely North Korean positions may involve a difficult choice of U.S. objectives in negotiations. Administration officials, including Secretary of State Hillary Clinton, have stated on numerous occasions that the Administration does not want to negotiate over past, unfulfilled agreements that dealt with a shutting down of Yongbyon. Instead, U.S. officials have said that they seek a comprehensive package deal for the complete denuclearization of North Korea. Secretary Clinton stated at the ASEAN Regional Forum meeting in July 2009 that if negotiations produced “irreversible steps by North Korea to denuclearize,” the United States would reciprocate with a “package of incentives” including “full normalization of relationships, a permanent peace regime [to replace the 1953 Korean War armistice] and significant energy and economic assistance.” Such a negotiation could involve a range of difficult issues, which the Bush Administration decided to set aside in its negotiations with North Korea in 2008: North Korea’s atomic weapons, its plutonium stockpile, a verification system (which the Bush Administration unsuccessfully attempted to negotiate after July 2008), North Korea’s highly enriched uranium program (which North Korea admitted to for the first time in June 2009), and its proliferation activities with Iran and Syria.

Moreover, Clinton’s proposal omits any offer to negotiate over U.S. military forces in and around the Korean peninsula in response to North Korea’s position that elimination of the “U.S. nuclear threat” embodied in U.S. forces must be the quid pro quo for complete denuclearization. If these

⁵¹ Choe Sang-hun, “Tensions rise on Korean peninsula,” *New York Times* (internet), January 19, 2009.

⁵² “DPRK’s principled stand on denuclearization of Korean peninsula,” KCNA, February 2, 2009. Statement by the General Staff of the Korean People’s Army, KCNA, February 2, 2009. “DPRK Foreign Ministry’s spokesman dismisses U.S. wrong assertion,” January 16, 2009.

apparent irreconcilable positions create a stalemate in negotiations, the Obama Administration would be faced with the issue of whether it would be willing to negotiate major military concessions to North Korea regarding the composition and operations of U.S. forces in South Korea and around the Korean peninsula. Past U.S. administrations have refused to negotiate with North Korea over U.S. troops. The roles of South Korea and Japan in any U.S.-North Korean negotiations over U.S. forces also would be an important consideration.

If the Obama Administration should conclude that the successful negotiation of a comprehensive agreement to denuclearize North Korea is unrealizable, it may be pulled back toward a negotiation aimed at the limited goal of shutting down Yongbyon and thus containing the production of additional North Korean plutonium. China likely would support such a decision, given Beijing's longstanding urging of the Bush Administration to focus on shutting down the North Korean plutonium program and leaving other elements of North Korea's nuclear programs for future negotiations. In this scenario, the Obama Administration might set the goal of a complete dismantlement of the Yongbyon nuclear facilities rather than the more limited disablement of the facilities that the Bush Administration failed to achieve in 2008.

North Korea's negotiating positions also suggest the demands and conditions that Pyongyang likely would lay out for an agreement of a dismantlement of Yongbyon. North Korea appears ready to call on the United States to agree to diplomatic relations in a dismantlement agreement. North Korea also is certain to demand that the United States agree to begin a second project to construct light water nuclear reactors inside North Korea;⁵³ the 1994 Agreed Framework initiated the first light water reactor project, which was halted in 2002. North Korea also can be expected to insist that the actual physical dismantlement of Yongbyon would take place only when the construction of light water reactors is completed (a process that would take ten years or more, according to estimates by nuclear experts on the time required to construct a light water reactor). Another North Korean condition likely would be a continuation of heavy oil shipments until light water reactors are completed.

North Korea also may raise another condition related to the Bush Administration's removal of Pyongyang from the U.S. list of state sponsors of terrorism. North Korean negotiators may assert that the Obama Administration must "complete" North Korea's removal through a second step of proposing and supporting financial aid to North Korea from the World Bank and/or the International Monetary Fund. The Bush Administration's removal of North Korea lifted the requirement in U.S. law that the President must oppose aid to North Korea from international financial agencies because of its inclusion on the terrorism-support list.⁵⁴

In negotiating over the dismantlement of Yongbyon, two of North Korea's likely demands would appear to present particular problems for the Obama Administration. North Korea's likely call for diplomatic relations in a dismantlement agreement (and/or prior to final denuclearization) runs counter to the longstanding U.S. position, reiterated by Secretary of State Clinton during her July 2009 trip to East Asia, that the United States would normalize relations with North Korea only when North Korea's nuclear programs and weapons are eliminated.⁵⁵ North Korea's repeated

⁵³ Ibid.

⁵⁴ For a hint of this North Korean position, see the January 2, 2009, article in *Choson Sinbo*, a North Korean newspaper in Japan. *Choson Sinbo* noted that "there was no immediate change in the conditions of [North Korean] international economic activities" after the removal from the U.S. terrorism support list and that the removal constituted "a first step toward a [U.S.] policy shift."

⁵⁵ "Clinton reaffirms pledge for N. Korea's nuclear dismantlement," *Asia Pulse*, February 18, 2009.

demand for light water nuclear reactors also would force the Obama Administration to choose whether to go back into another light water reactor project that likely would take ten years or longer, or, alternatively, propose a package of incentives to North Korea, including energy incentives, that would not include light water reactors.

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:⁵⁶

- *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. Satellite photographs reportedly show that the reactor has no attached power lines, which it would have if used for electric power generation. North Korea in 1989 shut down the reactor for 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. Under the February 2007 six party agreement, North Korea shut down the reactor in July 2007. As of late 2008, North Korea had completed eight of the eleven steps of the disablement of the reactor, including the removal of equipment from the reactor and the blowing up of reactor's cooling tower. In 2009, North Korea announced that it would resume nuclear weapons production. It claimed that it had restarted the plutonium reprocessing plant at Yongbyon. However, by August 2009, there was no visual evidence that North Korea had begun construction work to restore the five megawatt reactor, including reconstruction of the cooling tower.⁵⁷
- 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

⁵⁶ 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.

⁵⁷ Jon Herskovitz, North Korea looks at new deal of its nuclear cards, Reuters News, August 12, 2009. US think tank says 'no evidence' of reconstruction of DPRK's Yongbyon reactor, Chosun Ilbo Online, September 7, 2009.

- 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, in accord with the February 2007 six party agreement, the reprocessing plant was not in operation. Further disablement of it continued into early 2009. However, in conjunction with its April and May missiles and nuclear tests, North Korea announced that the reprocessing plant was in operation. Nuclear experts said that North Korea had available enough nuclear fuel rods from the operation of its nuclear reactor prior to the 2007 shutdown to reprocess plutonium from them sufficient for one atomic bomb.⁵⁸*

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

After years of denials, North Korea on June 13, 2009, admitted that it had a nuclear program based on the development of highly enriched uranium (HEU). A North Korean Foreign Ministry statement declared: “Enough success has been made in developing uranium enrichment technology to provide nuclear fuel to allow the experimental procedure. The process of uranium enrichment will be commenced.” In a statement to the U.N. Security Council on September 4, 2009, North Korea claimed progress in the HEU program: “Experimental uranium enrichment has successfully been conducted to enter into completion phase.” HEU is another element that can be used to produce atomic weapons. The bomb dropped on Hiroshima in 1945 was an HEU bomb in contrast with the plutonium bomb that was dropped on Nagasaki. The process involves the operation of several thousand centrifuges, machines that separate weapons-grade U-235 from natural uranium. An infrastructure of 2,600 P1 centrifuges could produce about 20 kilograms of HEU per year, enough for

⁵⁸ A look at North Korea's nuclear arms programme, Reuters News, August 3, 2009.

two small (four kilotons) atomic bombs.⁵⁹ One advantage for North Korea developing HEU is that a centrifuge-based infrastructure could be located completely underground while a plutonium reactor and reprocessing plant must operate above ground.

U.S. intelligence agencies gained substantial information that North Korea was intent on initiating an HEU program in the late 1990s and early 2000s. This information involved two elements of the program: North Korea's imports and attempted imports of components for an HEU infrastructure and the technology and components supplied by Pakistan's nuclear czar, A.Q. Khan. However, U.S. intelligence agencies acknowledge that they have gained little information on progress the North Koreans may or may not have made in the actual construction of a HEU infrastructure. This created uncertainty after 2006 in how the Bush Administration should deal with the HEU issue in its negotiations and agreements with North Korea.

The inception of the HEU program began with North Korea's contacts with Pakistan in the 1990s. 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.⁶⁰ Other information dates North Korea-Pakistan cooperation to 1993 when Pakistani President Benazir Bhutto visited North Korea.⁶¹ The core element of this collaboration was A.Q. Khan, who developed Pakistan's HEU program to produce atomic weapons, including nuclear warheads for missiles. He reportedly visited North Korea 13 times from 1993 to 2003.⁶² He negotiated an agreement with North Korea under which Pakistan would provide North Korea with HEU technology and components in exchange for North Korean assistance to Pakistan in the development of Pakistani missiles based on North Korea's Nodong missile. According to Pakistan's former President Pervaiz Musharraf, North Korean nuclear and missile scientists reportedly visited the Khan laboratories in Pakistan.⁶³ Khan supplied North Korea with about 24 P1 and P2 centrifuges and blueprints and supporting equipment. Khan also had supplied Libya with designs for an HEU nuclear warhead and had offered similar designs to Iran and Iraq; the CIA reportedly concluded in 2004 that he probably had provided North Korea with the same warhead design.⁶⁴

U.S. intelligence agencies also tracked North Korea's import of components which could be used in an HEU program. Initial imports began in 1998 and 1999 and accelerated in 2000 and afterwards. Major imports included 150 tons of aluminum tubes from Russia, equipment for uranium fuel and withdrawal systems, uranium hexafluoride from Pakistan, an industrial inverter from Japan that could be used in an HEU program, and three specialized power supply devices.⁶⁵ In April 2003, a North

⁵⁹ Hui Zhang, Assessing North Korea's uranium enrichment capabilities, *Bulletin of Atomic Scientists* (internet), July 8, 2009.

⁶⁰ Kim Min-cheol. "Hwang tells of secret nuke program." *Choson Ilbo* (Seoul, internet version), July 5, 2003.

⁶¹ Glenn Kessler, Bhutto dealt nuclear secrets to N. Korea, book says, *Washington Post*, June 1, 2008, p. A16.

⁶² Pakistan denies aiding N. Korea on nuclear arms, *Reuters News*, January 20, 2003. NK indirectly admitted HEU program, *Dong-A Ilbo* (internet), February 22, 2007.

⁶³ Candace Rondeaux, Father of Pakistan's bomb stands defiant, *Washington Post*, June 5, 2008, p. A10.

⁶⁴ David E. Sanger, U.S. widens view of Pakistan link to Korean arms, *New York Times*, March 14, 2004, p. A1. Bill Gertz, Data on N. Korea centrifuges sought, *Washington Times*, June 12, 2007, p. A1. William J. Broad and David E. Sanger, Pakistani's nuclear black market seen as offering deepest secrets of building bomb, *New York Times*, March 21, 2005, p. A9.

⁶⁵ Hui Zhang, Assessing North Korea's uranium enrichment capabilities, *Bulletin of Atomic Scientists* (internet), June 18, 2009.

Korean shipment of 200 tons of aluminum tubing, purchased in Germany, was seized at the Suez Canal.

The Clinton Administration reportedly learned of an HEU program 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.” Reportedly, according 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.”⁶⁶ The CIA stated publicly in November 2002 that it had evidence that North Korea had begun constructing a centrifuge facility and North Korea could produce two atomic bombs annually through HEU beginning in 2005;⁶⁷ other intelligence estimates reportedly projected a bomb producing capability between 2005 and 2007. U.S. intelligence agencies reportedly gained information in 2005 that North Korea was able to produce uranium hexafluoride, a gaseous material essential for the production of HEU.⁶⁸

However, there were doubts expressed by some experts over whether North Korea was developing a genuine centrifuge infrastructure. These doubts increased into 2006, 2007, and 2008. U.S. intelligence agencies reportedly gained less information about North Korean imports of potential HEU-related materials and equipment. Administration officials stated in 2007 and 2008 that they did 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. They expressed “mid-confidence” that North Korea was trying to develop an HEU production infrastructure.⁶⁹ Then, during the U.S.-North Korean negotiations of late 2007 and mid-2008, North Korea turned over to the United States a sample of the aluminum tubes it had acquired from Russia and 18,000 pages of documents related to its nuclear programs. U.S. scientists found traces of HEU on both of these.

There reportedly was debate within the U.S. intelligence community about the sources of this HEU,⁷⁰ but these findings influenced the attempt of the Bush Administration in July 2008 to inject proposals for a broad system of international inspections of North Korea into the recently negotiated U.S.-North Korean agreement for the disablement of Yongbyon.⁷¹ North Korea’s use of the word “experimental” in its September 4, 2009, statement suggests North Korea may not have a full-scale centrifuge infrastructure. However, Pyongyang claims of an advancing HEU program likely will thrust the issue into any future nuclear negotiations.

While U.S. intelligence officials have said that they do not know the locations of HEU facilities in North Korea, there have been a number of reports citing possible locations. Some of this information has come from defectors, some from Chinese sources. Locations cited from these sources include Mount Chonma, the city of Kusong, Hagap, and Pakchon. The most recent report came in February

⁶⁶ Pincus, Walter. “N. Korea’s nuclear plans were no secret.” *Washington Post*, February 1, 2003. p. A1.

⁶⁷ CIA unclassified point paper distributed to Congress, November 19, 2002.

⁶⁸ The Nelson Report, September 4, 2009. Statement by Joel Wit, former nuclear expert with the Clinton Administration. Dafna Linzer, U.S. misled allies about nuclear export; North Korea sent material to Pakistan, not to Libya, *Washington Post*, March 20, 2005. p. A1.

⁶⁹ Kessler, Glenn. “New doubts on nuclear efforts by North Korea.” *Washington Post*, March 1, 2007. p. A1. Intel chief says N.K. can’t tell truth, Yonhap News Agency, February 27, 2008.

⁷⁰ Glenn Kessler, New data found on North Korea’s nuclear capacity; intelligence on enriched uranium revives questions about weapons, *Washington Post*, June 21, 2008, p. A8.

⁷¹ Glenn Kessler, White House voices concern on North Korea and uranium, *Washington Post*, January 8, 2009, p. A11. N. Korea ‘still dangerous,’ Bush says, *Kyodo News*, January 12, 2009.

2009; the source was a “senior” South Korean official. According to the official, South Korean and U.S. intelligence agencies had discovered underground facilities capable of producing small amounts of enriched uranium at Sowi-ri, north of Yongbyon.⁷²

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.⁷³

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 1997.⁷⁴ The Bush Administration released no information on the reactor and North Korean involvement in it until April 2008 in response to pressure from the House Foreign Affairs Committee and the House Intelligence Committee. U.S. intelligence officials on April 24, 2008, privately briefed members of committees on North Korea’s role, and they provided a background news briefing to the media.⁷⁵ (See CRS Report RL33487, *Syria: Background and U.S. Relations*.)

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.⁷⁶ 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.⁷⁷

⁷² NK has built uranium enrichment facilities, *Dong-A Ilbo* Online, February 18, 2009.

⁷³ “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.

⁷⁴ Sara A. Carter and Bill Gertz, “Intelligence on Syria delayed to avoid fight,” *Washington Times*, April 25, 2008, p. A1.

⁷⁵ Sara A Carter and Bill Gertz, Intelligence on Syria delayed to avoid fight; lawmakers hit U.S. ‘veil of secrecy,’ *Washington Times*, April 25, 2008, p. A1. Glenn Kessler and Robin Wright, Accusing N. Korea may stall nuclear pact, *Washington Post*, April 26, 2008, p. A12.

⁷⁶ Robin Wright, “N. Koreans taped at Syrian reactor,” *Washington Post*, April 24, 2008, p. A.1.

⁷⁷ “U.S. called N. Korea’s bluff over Syria,” *Chosun Ilbo* (internet), April 1, 2008.

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.⁷⁸

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.⁷⁹

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 could be located 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.⁸⁰ 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 July 2008 that according to "a source familiar with the Syrian nuclear issue," "a secret Iranian Revolutionary Guards base" in Iran would house a planned plutonium reprocessing facility designed to reprocess nuclear fuel rods from the Syrian reactor.⁸¹ *Sankei Shimbun* reported in September 2009 that North Korean nuclear technicians had visited Iran to provide technical support for a planned reprocessing installation.⁸² The newspaper reported from Washington in July 2008, citing "a source well-informed on the Syrian nuclear issue," that Iranian officials had visited the Syrian reactor in 2005 and 2006. The source named two Iranian visitors to the reactor: Ali Larijani, the chief of Iran's Supreme National Security Council and a delegation led by Mohsen Fakhrizadeh, a senior scientist of the Iranian Ministry of Defense.⁸³ In March 2009, a Swiss newspaper report cited "a former German defense ministry official" that Iran had financed the construction of the Syrian nuclear reactor.⁸⁴

Additional information pointing to North Korean-Iranian collaboration in plutonium nuclear development came from European and Israeli defense and government officials in 2007 and 2008.

⁷⁸ "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.

⁷⁹ Nicholas Kralev and Sara A. Carter, "Syria's nuke facility was nearly finished," *Washington Times*, April 24, 2008, p. A1. Robin Wright, "N. Koreans taped at Syrian reactor," *Washington Post*, April 24, 2008, p. A1.

⁸⁰ "Asad's risky nuclear game," *Spiegel Online*, June 23, 2008.

⁸¹ Takashi Arimoto, "Reprocessing facility of bombed nuclear base in Iran; intimate ties between Syria and North Korea," *Sankei Shimbun* (internet), September 12, 2008.

⁸² Takashi Arimoto, Iran prepares reprocessing facilities for extracting plutonium with technology from North Korea, *Sankei Shimbun Online*, September 3, 2009.

⁸³ Takashi Arimoto, "Iran involved in nuclear program: trilateral cooperation of Syria, Iran, North Korea," *Sankei Shimbun* (internet), July 12, 2008. A report by Kyodo News of Japan (August 14, 2009), citing "a western diplomatic source familiar with relations between the three countries" and "a Middle Eastern military source," described an errant test of a new model of the Scud missile by the three countries in Syria in May 2009. According to these sources, North Korean technicians from the Ryonhap-2 Trading Company, supervised the missile test and that Iran was believed to be financing the development of the advanced Scud missile.

⁸⁴ Tomotaro Inoue, N Korea missile test; test-firing of new Scud missiles by N. Korea, Syria, Iran fails, *Kyodo News*, August 14, 2009.

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. The *London Daily Telegraph* reported that according to a “senior European defense official,” a sharing of the data would help Iran prepare for conducting an underground nuclear test in the future.⁸⁵ A report of Iranian involvement in North Korea second nuclear test of May 25, 2009, came from *Sankei Shimbun*'s Washington correspondent, Takashi Arimoto, who cited “an intelligence source who specializes in the situation on the Korean peninsula” that a seven person Iranian delegation had observed the nuclear test and had high level meetings in Pyongyang. The delegation reportedly was made up of officials of the Iranian Revolutionary Guards and the Iranian Atomic Energy Organization.⁸⁶

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 principal interlocutor being the Iranian Revolutionary Guards (IRGC). Some of these reports cite the Central Intelligence Agency, Western intelligence sources and documents (some probably European), and foreign intelligence officials as sources of information. Other cited sources are European and German defense officials. High ranking Israeli government officials have been cited. A key *Los Angeles Times* feature on Iran's nuclear program cites a former Iranian intelligence official as a source for information about North Korean involvement. The Japanese newspaper, *Sankei Shimbun*, often cites sources in Washington, DC, familiar with North Korea. Specific events or factors in the alleged North Korean-Iranian nuclear collaboration often 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.”⁸⁷

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.⁸⁸ 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.⁸⁹ 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.

⁸⁵ Jin Dae-woong, “Concerns grow over missile links between N. Korea, Iran,” *Korea Herald* (internet), January 28, 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. Israel to give Japan data on NKorea-Iran relations in military sphere, ITAR-TASS, February 26, 2008.

⁸⁶ Takashi Arimoto, Iranian delegation observed North Korea's nuclear test, *Sankei Shimbun*, June 25, 2009.

⁸⁷ U.S. Department of State, Fact Sheet: Designation of Iranian Entities and Individuals for Proliferation Activities and Support for Terrorism, October 25, 2007.

⁸⁸ “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.

⁸⁹ “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, (continued...)

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.⁹⁰ 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.⁹¹ The *Los Angeles Times*, in a major article on Iran's nuclear program, cited "people inside Iran and foreign intelligence officials" that North Koreans were seen at Iranian nuclear facilities in 2003 and that a large number of North Korean nuclear and missile specialists reportedly were in Iran.⁹² The *Los Angeles Times* feature cited "a foreign intelligence official and a former Iranian intelligence officer" that North Korean experts were assisting the Iranians in developing a nuclear warhead that could be fitted on the Shahab-4 missile. The German publication, *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."⁹³ The *Asia Times* and the German publication *Tagesspiegel*, citing information from "German intelligence" and "western intelligence sources," reported that Iranian Revolutionary Guards secret facilities for nuclear research and development had received important equipment from North Korea.⁹⁴

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."⁹⁵ 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.⁹⁶ 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.⁹⁷ Nuclear experts voiced concern that the North Koreans and Iranians could be using detailed designs for a sophisticated

(...continued)

p. 18.

⁹⁰ 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.

⁹¹ 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, Iran planning joint development of nuclear warheads," *Sankei Shimbun* (internet version), August 6, 2003.

⁹² "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.

⁹³ "Mullahs helping Stalinists," *Der Spiegel* (internet), November 28, 2005.

⁹⁴ Safa Haeri, Korea: WMD transport targeted on high seas, *Asia Times*, September 11, 2003.

⁹⁵ Dafna Linzer, "Strong leads and dead ends in nuclear case against Iran," *Washington Post*, February 8, 2006, p. AO1.

⁹⁶ Louis Charbonneau, "Iran said to step up plans for Shahab missiles," Reuters, March 6, 2006.

⁹⁷ 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.

uranium-based nuclear warhead that had been developed by Pakistan's nuclear czar, A.Q. Khan, for the Pakistan Ghauri missile, another missile based on the Nodong missile.⁹⁸

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 were at this facility, according to the National Council. Reportedly, commercial-satellite images showed a system of heavy security at the Khojir site that restricted access to the facilities.⁹⁹

Reports in the Israeli press have described Israeli government concern over North Korean-Iranian collaboration. During the Bush Administration's negotiations with North Korea in early 2008 over the contents of the North Korean declaration of its nuclear programs, Israeli advisers to Prime Minister Ehud Olmert were reported to have pressed Bush Administration officials to insist that North Korea admit to its nuclear collaboration with Iran.¹⁰⁰ Israeli President Shimon Peres was reported to have expressed concern over Iran-North Korean nuclear collaboration in a meeting with former U.S. Secretary of State Madeleine Albright on November 5, 2007.¹⁰¹ When Prime Minister Olmert visited Japan in February 2008, Japanese and Russian press reports cited an aide to the Prime Minister that Olmert would brief Japanese officials on North Korean-Iranian military cooperation, including Israeli information that North Korea had shared data with Iran from its October 2006 nuclear test.¹⁰²

The Japanese newspaper *Sankei Shimbun* reported on March 2, 2009, that North Korean missiles experts had worked with Iranian counterparts in Iran's launch of a satellite on February 2, 2009. Iran's Safir 2 missile, reportedly based on the North Korean Taepodong missile, was launch vehicle for the February 2 satellite.¹⁰³

Another form of North Korean-Iranian nuclear collaboration reportedly involved an 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.¹⁰⁴

⁹⁸ Joby Warrick, Smugglers had design for advanced warhead, *Washington Post*, June 15, 2008, p. A1. David E. Sanger and William J. Broad, Officials fear bomb design went to others, *New York Times*, June 16, 2008, p. 1.

⁹⁹ 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. Iran still developing nuclear warheads: exiled opposition group, *Agence France Presse*, February 20, 2008.

¹⁰⁰ Nathan Guttman, Israel may reveal details of attack on alleged Syrian nuclear program; U.S. lawmakers push disclosure, point to North Korean proliferation, *The Forward* (internet), April 10, 2008.

¹⁰¹ *Jerusalem Voice of Israel Network B*, November 5, 2007.

¹⁰² Israel PM to charge NKorea link with Iran, Syria, *Agence France Presse*, February 26, 2008. Israel to give Japan data on NKorea-Iran relations in military sphere, *ITAR-TASS*, February 26, 2008.

¹⁰³ Takashi Arimoto, North Korea cooperates in Iran's satellite launch, secretly linked to development of long-range ballistic missiles, *Sankei Shimbun Online*, March 2, 2009.

¹⁰⁴ "Nukes too deep to hit." *Newsweek*, November 3, 2008, p. 8, 10.

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 assistance.¹⁰⁵ 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 reported cited “a [Washington] source related to the six party talks” that the Iranian delegation included officials of Iran’s Atomic Energy Organization and National Security Council. A possible purpose of the visit, according to the source, 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.¹⁰⁶

North Korea’s Delivery Systems

North Korea’s missile program since the early 1990s has developed on four levels. The first three are types of missiles developed for North Korea’s arsenal. North Korea is estimated to have more than 600 Scud missiles with a range of up to 300 miles. Newer versions tested in July 2006 are solid-fuel Scuds, which can be fired quickly, in contrast to liquid-fuel missiles. The range of the Scuds could cover all of South Korea. The second level is the development of intermediate range missiles, where North Korea also has made progress. North Korea is estimated to have deployed 200 and possibly over 300 intermediate-range Nodong missiles.¹⁰⁷ The Nodongs have an estimated range of 900 miles, which could reach most of Japan. North Korea tested both Scuds and Nodongs in July 2009. North Korea reportedly has developed since 2003 a more accurate, longer-range intermediate ballistic missile. This new missile, dubbed the Taepodong X or the Musudan, appears to be based on the design of the Soviet SS-N-6 missile. It is believed to have a range of 1,500 to 2,400 miles, sufficient to reach Okinawa and Guam, the site of major U.S. military bases and thousands of U.S. military personnel and their families and Guamanian U.S. citizens.¹⁰⁸ South Korea’s Defense Ministry may have been referring to the Musudan when it states in a report of February 22, 2009, that North Korea had deployed a new medium-range missile with a range of at least 1,800 miles.¹⁰⁹

Evaluations of North Korea’s launches of several Scud and Nodong missiles 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 these missiles and that the launches displayed the ability of North Korea’s command and control apparatus to coordinate multiple launchings of

¹⁰⁵ Robin Hughes, “Tehran takes steps to protect nuclear facilities,” *Jane’s Defence Weekly*, January 25, 2006, p. 4-5.

¹⁰⁶ 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.

¹⁰⁷ North Korea’s missile arsenal, Reuters News, July 3, 2009.

¹⁰⁸ “Factbox—a look at North Korea’s missile arsenal,” *Reuters News*, March 28, 2008.

¹⁰⁹ Jae-soon Chang, “SKorea: NKorea has deployed new ballistic missile,” Associated Press, February 23, 2009.

missiles at diverse targets.¹¹⁰ (For additional information, see CRS Report RS21473, *North Korean Ballistic Missile Threat to the United States*, by Steven A. Hildreth.)

In contrast, North Korea has failed to develop a workable long-range missile that could reach Alaska, Hawaii, or the U.S. west coast. North Korea attempted a test of the Taepodong II on July 4, 2006, but the first stage of the missile crashed into the Sea of Japan after about 40 seconds. On April 5, 2009, North Korea attempted to test launch a three stage Taepodong II, claiming that the third stage apparently consisting of a satellite. This time, the first and second stages of the missile, dubbed the Unha-2, separated successfully, and the second stage landed more than 3,000 kilometers (1,980 miles) from the launch site in the Pacific Ocean.¹¹¹ The third stage allegedly carrying the satellite either did not separate from the second stage, or if it did separate, it landed nearby in the Pacific Ocean.¹¹² U.S. officials and most independent experts initially judged the test a failure, concluding that the 2009 test was a better performance than the July 2006 test but that North Korea had not mastered key elements of long-range missile technology.¹¹³ If the Unha-2 had been targeted at Anchorage, Alaska, the closest major U.S. target in the 50 U.S. states, the second and third stages would have fallen short by over 1,500 miles. However, subsequent evaluations pointed out that the missile tested in 2009 performed considerably better than the missile tested in 2006. In one lengthy assessment, MIT professor Theodore Postol and David Wright, a physicist at the Union of Concerned Scientists, wrote that the test represented a “significant advance” toward the development of a ballistic missile that could carry a warhead of 1,000 kilograms or more at least 7,000-7,500 and possibly as far as 10,000-10,500 kilometers. Such a range would reach as far as Alaska and Hawaii and possibly the U.S. west coast. Postol and Wright assessed that the main technological advances were the employment of the SS-N-6 as the second stage in the Unha and a duplicate of the Iranian Safir-2 launch vehicle as the third stage¹¹⁴

The fourth level of North Korea’s missile program has been the export of missiles to other countries in the Middle East and South Asia and joint collaboration in the development of missiles with Iran and Pakistan. In the 1990s, North Korea exported Scud and Nodong missiles to Pakistan, Iran, Yemen, Syria, and reportedly Egypt. It entered into joint development programs with both Pakistan and Iran. The collaboration with Iran reportedly has continued in the development of more sophisticated versions of the Nodong (called the Shahab by Iran), the Musudan, and the Iranian Safir-2.¹¹⁵ Iranian delegations of missile experts and Iranian Revolutionary Guard officials reportedly attended the July 2006 and April 2009 test launches of the Taepodong II long range missile.¹¹⁶

¹¹⁰ “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.

¹¹¹ Pamela Hess, “Pentagon official calls missile test a failure,” *Washington Times*, April 7, 2009, p. A11.

¹¹² *Ibid.* “N. Korea satellite launch fails,” *Chosun Ilbo* (online), April 6, 2009.

¹¹³ “NKorea’s rocket launch was a failure: analysts,” Agence France Presse, April 6, 2009. William J. Broad, “Korean missile was a failure, trackers say,” *New York Times*, April 6, 2009, p. 1.

¹¹⁴ David Wright and Theodore A. Postol, A post-launch examination of the Unha-2, *Bulletin of the Atomic Scientists* (internet), June 29, 2009.

¹¹⁵ Jim Mannion, ROK, US express concerns over DPRK’s development of long-range missiles, Agence France Presse, November 7, 2007. Charles P. Vick, Has the NodongB/Shahab-4 finally been tested in Iran for North Korea, *Global Security* (internet), May 2, 2006.

¹¹⁶ Takashi Arimoto, Iranian delegation of 15 members visiting North Korea for observation of missile launch, *Sankei Shimbun Online*, March 29, 2009. Ivan Antonov and Viktor Zozulya, Kim Jong-il shakes the world once again, *Izvestiya Online*, May 27, 2009.

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.¹¹⁷ 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 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.¹¹⁸

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 in 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.¹¹⁹

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.

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.

¹¹⁷ Sanger, David E. "North Korea's bomb: untested but ready, C.I.A. concludes," *New York Times*, November 9, 2003. p. 4.

¹¹⁸ 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.

¹¹⁹ 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.

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 and since has visited several times. 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.¹²⁰ 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.¹²¹ 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. As stated previously, Dr. Hecker has estimated that if North Korea restarts its plutonium reprocessing plant in 2009, it could reprocess quickly available nuclear fuel rods into enough plutonium to produce one nuclear bomb; and if North Korea restarts the nuclear reactor at Yongbyon, the Yongbyon complex could produce enough plutonium for one nuclear bomb annually.

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 sufficient weapons-grade plutonium until it could use it to produce a nuclear warhead. A key North Korean objective of the May 2009 nuclear test may have been to make technical progress toward development of a nuclear warhead. Statements by U.S. officials reflect an apparent uncertainty over whether North Korea has achieved a warheading capability,¹²² and they have not addressed publicly the reports of North Korean-Iranian collaboration in nuclear warhead development.

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.

¹²⁰ 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.

¹²¹ David Albright and Paul Brannan, "The North Korean Plutonium Stock," Institute for Science and International Security, February 20, 2007.

¹²² 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.

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.

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

4/14/09—North Korea announced that it was withdrawing from the six party talks, citing the statement of the U.N. Security Council criticizing its missile test of April 5, 2009.

5/25/09—North Korea conducted a second nuclear test of a device with an estimated explosive power of four to five kilotons.

6/12/09—The United Nations Security Council approved Resolution 1874, imposing sanctions on North Korea for its nuclear test.

9/04/09—North Korean leader Kim Jong-il pardoned and released two American reporters, held by North Korea since March 2009, after he met with former President Bill Clinton in Pyongyang.

For Additional Reading

CRS Report RL31555, *China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues*, by Shirley A. Kan.

CRS Report RL31785, *Foreign Assistance to North Korea*, by Mark E. Manyin.

CRS Report RL33567, *Korea-U.S. Relations: Issues for Congress*, by Larry A. Niksch.

CRS Report RL31696, *North Korea: Economic Sanctions*, by Dianne E. Rennack.

CRS Report RS21473, *North Korean Ballistic Missile Threat to the United States*, by Steven A. Hildreth.

CRS Report RL33324, *North Korean Counterfeiting of U.S. Currency*, by Dick K. Nanto.

CRS Report RL33709, *North Korea's Nuclear Test: Motivations, Implications, and U.S. Options*, by Emma Chanlett-Avery and Sharon Squassoni.

CRS Report RL34256, *North Korea's Nuclear Weapons: Technical Issues*, by Mary Beth Nikitin.

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