

An Overview of North Korea's Nuclear Weapons Program¹

Summary of Current Status*

Plutonium

The Democratic People's Republic of Korea (DPRK)[†] is "assessed to have enough plutonium for several nuclear weapons," according to General Walter L. Sharp, the top-ranking U.S. military official based in South Korea.² Siegfried Hecker, Emeritus Director of Los Alamos National Labs, believes that out of the 40 to 60 kilograms of plutonium that North Korea has produced over time, it has 24-42 kilograms "available for weapons today."³ A report from CRS estimates that after the 2006 and 2009 tests of nuclear devices, North Korea's remaining plutonium stockpile would be enough for 5 to 8 nuclear weapons of 6 kg of plutonium each.⁴ The graphite-moderated 5 MWe (megawatt) experimental nuclear reactor that has been the central focus of denuclearization agreements is currently not operating.⁵ In November 2010 two non-official delegations of U.S. visitors to the DPRK were shown an experimental light water reactor (LWR) in the first stages of construction; although its stated purpose is for electricity production, it could be used for the production of weapons grade plutonium.⁶ However, it is difficult to extract plutonium from LWRs, which is why they are considered to be relatively proliferation-resistant.⁷

Uranium Enrichment Program

In November 2010 a team of U.S. researchers from Stanford University (including Hecker) visiting North Korea's Yongbyon nuclear facility were shown a uranium enrichment facility with over a thousand centrifuges.⁸ North Korean officials said that the centrifuges were functioning and producing low enriched uranium (LEU) "destined for fuel for the new [experimental light water] reactor."⁹ The Stanford team was unable to verify independently that the facility was operating.¹⁰ Hecker, without commenting on the DPRK's intent, noted that "the uranium enrichment facilities could be readily converted to produce highly-enriched uranium (HEU) bomb fuel."¹¹

* The DPRK has pursued a nuclear program since the 1950s. At this point, North Korea's nuclear program is considered to have a dual purpose, the production of electricity and the development of nuclear weapons. This briefing paper considers only the weapons aspects of North Korea's nuclear programs.

[†] The "Democratic People's Republic of Korea" is the official name for North Korea.

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Weapons

On February 10, 2005 North Korea's Foreign Ministry announced that the DPRK has "produced nuclear weapons."¹² The DPRK continues to assert that it is weaponizing plutonium extracted from the 5MWe reactor.¹³ On February 16, 2011, James R. Clapper, Director of National Intelligence (DNI), testified to Congress that "Although we judge North Korea has tested two nuclear devices, we do not know whether the North has produced nuclear weapons, but we assess that it has the capability to do so."¹⁴ Hecker believes that the DPRK "can build a Nagasaki-like simple plutonium bomb with a yield of 20 or so kilotons, and most likely possesses a nuclear arsenal of four to eight such primitive weapons."¹⁵

Background Information

Plutonium

North Korea's 5MWe nuclear reactor began operating in 1986. Plutonium production was suspended when the 5MWe plant was frozen under the Agreed Framework of 1994. After the collapse of the Agreed Framework in 2003, the DPRK resumed plutonium production. Hecker notes that North Korea "conducted three reprocessing campaigns since 2003. The reprocessed plutonium, combined with the roughly 2 to 10 kilograms North Korea may have produced before 1994, yields an estimated plutonium production of 40 to 60 kilograms."¹⁶ The reactor was partially disabled in 2009 as part of the Six Party Talks; it is estimated it would take six months to make it fully operational.¹⁷ Hecker points out that during the suspension of North Korea's nuclear program under the Agreed Framework there was extensive corrosion of the fuel fabrication equipment, leaving that facility "only partially operational."¹⁸ In December 2010 Governor Bill Richardson made an unofficial visit to the DPRK; he reported that North Korea offered to negotiate the sale of 12,000 fuel rods in storage in Yongbyon.¹⁹

Nuclear Tests

North Korea tested nuclear devices in October 2006 and May 2009. The yield of the first test was estimated to be slightly below a kiloton, considerably smaller than the 21 kiloton yield for the bomb dropped at Nagasaki.²⁰ The second test was considered more successful, with a yield of two to four kilotons.²¹ U.S. analysts believe that neither test was fully successful. However many conclude that the second test was more successful than the first.²²

Uranium Enrichment Program

For years the existence and extent of a North Korean uranium program has been a matter of debate. The US Government claimed that, during a meeting in Pyongyang in October 2002, the DPRK admitted to having a uranium enrichment program. The North has denied that it said this at the meeting. In November 2002, the CIA estimated with "high confidence" that North Korean research on a uranium program began in 2000; they also said that "the North is constructing a [uranium enrichment] plant that could produce enough weapons-grade uranium for two or more nuclear weapons per year when fully operational -- which could

be as soon as mid-decade.”²³ That estimate was reassessed at a February 28, 2007 House hearing when Assistant Secretary of State Christopher Hill testified that while the United States believed that the DPRK had made purchases consistent with the development of a uranium program, there was not clarity on its extent.²⁴ The existence of a uranium program, or lack therefore, became a major issue in the Six Party Talks. In February 2008 Hill said that while the DPRK was willing to declare that there was no current uranium program and commit to not developing a program in the future, it was unwilling to discuss the past.²⁵

In April 2009, following the UN Presidential Statement condemning its rocket launch, North Korea announced it was going to “positively examine the construction of its light water reactor power plant in order to round off the structure of the Juche-based nuclear power industry.”²⁶ Later that month, the DPRK announced it was going to develop means of producing fuel for the reactor and in June it announced that “enough success has been made in developing uranium enrichment technology to provide nuclear fuel to allow the experimental procedure.”²⁷ This claim has been challenged by U.S. experts: “With less than two months separating the two statements, it is doubtful that North Korea could have shown that much progress in its program without the presence of a previous small-scale covert enrichment program.”²⁸

North Korea told the November 2010 Stanford University delegation that development of the Yongbyon uranium facility began in April 2009.²⁹ The Stanford delegation’s observations strengthened U.S. government opinion that a covert program began earlier. Clapper’s written testimony stated “Based on the scale of the facility and the progress the DPRK has made in construction, it is likely that North Korean has been pursuing uranium enrichment for an extended period of time.”³⁰ Clapper continued that if this first assumption is true, then it is likely that there are other uranium enrichment facilities in the DPRK, although “Analysts differ on the likelihood that other *production-scale* facilities may [sic] exist elsewhere in the DPRK.”³¹

As noted above, November 2010 visitors to Youngbyon also saw the experimental LWR in the beginning stages of construction, which the DPRK had indicated would be fueled with enriched uranium.³² North Korea has stated that it needs a uranium enrichment capability in order to fuel a light water reactor program that it has wanted for years. But Sharp denied that the North Korean uranium enrichment program is wholly intended for power production, arguing “experts believe that North Korea’s true motive is to produce highly enriched uranium for its nuclear weapons program.”³³

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Resources

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Table I. North Korean Nuclear Power Reactor Projects

Location	Type/Power Capacity	Status	Purpose
Yongbyon	Graphite-moderated Heavy Water Experimental Reactor/5 MWe	Currently shut-down; cooling tower destroyed in June 2009 as part of Six-Party Talks; estimated restart time would be 6 months	Weapons-grade plutonium production
Yongbyon	Graphite-moderated Heavy Water Power Reactor /50 MWe	Never built; Basic construction begun; project halted since 1994	Stated purpose was electricity production; could have been used for weapons-grade plutonium production
Yongbyon	Experimental Light-Water Reactor/100 MWT (25-30 MWe)	U.S. observers saw basic construction begun in November 2010	Stated purpose is electricity production; could be used for weapons-grade plutonium production
Taechon	Graphite-moderated Heavy Water Power Reactor/200 MWe	Never built; Basic construction begun; project halted since 1994	Stated purpose was electricity production; could have been used for weapons-grade plutonium production
Kumho District, Sinp'o	4 Light-water reactors/440 MW	Never built; part of 1985 deal with Soviet Union when North Korea signed the NPT; canceled by Russian Federation in 1992	Stated purpose is electricity production; could have been used for weapons-grade plutonium production
Kumho District, Sinp'o [KEDO Project]	2 Light-water reactors (turn-key)/1000 MWe	Never built; part of 1994 Agreed Framework, reactor agreement concluded in 1999; Project terminated in 2006 after North Korea pulled out of Agreed Framework	Electricity production

Source: Mary Beth Nikitin, "North Korea's Nuclear Weapons: Technical Issues." January 20, 2011. CRS RL34256. p. 8.

¹ As NTI explains, production of a plutonium-based nuclear bomb "requires capabilities to mine and mill uranium, process it into reactor fuel, transform the isotopic content of the fuel by "burning" it in a reactor, extract plutonium from the spent fuel, form the plutonium into the core of a fission-implosion weapon, and develop and test high explosives used to initiate fission. . . A uranium-based bomb program requires capabilities to mine and mill uranium, and to enrich it to weapons-grade or near-weapons-grade." NTI, "North Korea/Nuclear/Overview, accessed on April 21, 2011 at http://www.nti.org/e_research/profiles/NK/Nuclear/capabilities.html#nukes. Manson Benedict, Thomas Pigford and Hans Levi, Nuclear Chemical Engineering, and David Albright and Mark Hibbs provide an easy-to-understand graphic of the nuclear fuel cycle for nuclear weapons production in "Nuclear Weapon's Fuel Cycle," in "Iraq's shop-till-you-drop nuclear program", Bulletin of the Atomic Scientists, 48: 3. Available at <http://www.isisnucleariran.org/sites/weapons-fuel-cycle/>.

² General Walter L. Sharp, Commander, United Nations Command, Commander, United States-Republic of Korea Combined Forces Command and Commander, United States Forces Korea, testimony for the House Armed Service Committee's April 6, 2011 Hearing, "U.S. Pacific Command and U.S. Forces Korea budget request 2012." P. 8. Accessed on April 13, 2011 at http://www.ncnk.org/resources/publications/GenL_SSharp_HASC_April_2011.pdf/file_view.

³ Siegfried S. Hecker, "Lessons Learned from the North Korean Nuclear Crises." Dædalus, American Association for the Advancement of Science, Issue 44, Winter 2010. Accessed on April 15, 2011 as "Nautilus Policy Forum 10-055: November 17, 2010" at <http://www.nautilus.org/publications/essays/napsnet/forum/lessons-learned-from-the-north-korean-nuclear-crises>.

⁴ Mary Beth Nikitin, "North Korea's Nuclear Weapons: Technical Issues." January 20, 2011. CRS RL34256. p. 5.

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⁵ Ibid., p. 8.

⁶ Ibid., p. 8.

⁷ “Chronology of U.S.-North Korean Nuclear and Missile Diplomacy,” Arms Control Association
<http://www.armscontrol.org/factsheets/dprkchron>

⁸ Siegfried Hecker, “A Return Trip to North Korea’s Yongbyon Nuclear Complex,” Center for International Security and Cooperation, Stanford University. November 20, 2010. Accessed on April 13, 2011 at
http://www.ncnk.org/resources/publications/HeckerYongbyonfin.doc/file_view op. cited, p. 4.

⁹ Ibid., p. 1.

¹⁰ Hecker, “A Return Trip to North Korea,” op. cited. p. 1.

¹¹ “A Return Trip to North Korea,” op. cited. p. 1.

¹² “Chronology of U.S.-North Korean Nuclear and Missile Diplomacy,” op.cited.

¹³ For example, on June 13, 2009, a spokesman for the DPRK Foreign Ministry issued a statement declaring that “The whole amount of the newly extracted plutonium [from the 5 Mwe reactor] will be weaponized.” “DPRK Foreign Ministry Declares Strong Counter- Measures against UNSC’s “Resolution 1874,” Korean Central News Agency,[hereafter KCNA] June 13, 2009.

http://www.ncnk.org/resources/publications/KCNA2.doc/file_view

¹⁴ James, R. Clapper, “Worldwide Threat Assessment.” Written testimony submitted, to the Senate Select Committee on Intelligence. February 16, 2011. Accessed on April 26, 2011 at
http://www.ncnk.org/resources/publications/Clapper_Intell_Feb_2011.pdf/file_view.

¹⁵ Hecker, “Lessons Learned,” op. cited.

¹⁶ Ibid.

¹⁷ Nikitin, op. cited, p. 15.

¹⁸ Hecker, “Lessons Learned,” op. cited.

¹⁹ Nikitin, op. cited. p. 25

²⁰ For a discussion of the October 2006 nuclear test, see Peter Hayes, Jungmin Kang, “Technical Analysis of the DPRK Nuclear Test.” Nautilus Institute (Oct 20 2006)

<http://www.nautilus.org/publications/essays/napsnet/forum/security/0689HayesKang.html/>

²¹ For more information on the May 2009 nuclear test, see Jeffery Park, “The North Korean nuclear test: What the Seismic Data Says.” Bulletin of the Atomic Scientists. May 26, 2009. Available at

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²² Peter Crail. “N. Korean Nuclear Test Prompts Global Rebuke.” Arms Control Today, June 2009. Accessed on April 26, 2011 at http://www.armscontrol.org/act/2009_6/NK

²³ “Untitled CIA estimate provided to Congress on November 19, 2002.” Federation of American Scientists, <http://www.fas.org/nuke/guide/dprk/nuke/cia111902.html>

²⁴ Transcript of House Foreign Affairs Committee Hearing “North Korea: The February 13th, 2007 Agreement.” House Foreign Affairs Committee, February 28, 2007. p. 84. Accessed on April 20, 2011 at
<http://foreignaffairs.house.gov/110/32548a.pdf>.

²⁵ “U.S. Envoy Says North Korean Uranium Program Remains Stumbling Block,” Interviewee: Christopher T. Hill, Assistant Secretary of State for East Asian and Pacific Affairs, Interviewer, Robert McMahon, Deputy Editor, Council on Foreign Relations. February 15, 2008. <http://www.cfr.org/human-rights/us-envoy-says-north-korean-uranium-program-remains-stumbling-block/p15514>

²⁶ “DPRK Foreign Ministry Vehemently Refutes UNSC’s ‘Presidential Statement.’” April 14 2009. KCNA.

²⁷ Joshua Pollack, “About That Enrichment Program,” July 6, 2009 is available at
<http://totalwinkerr.com/2054/about-that-enrichment-program>.

²⁸ NTI, “North Korea/Nuclear/Overview/uranium enrichment. op.cited.

²⁹ Siegfried Hecker, “A Return Trip to North Korea.” op. cited, p. 4. This timing corresponds to the April 14th statement on KCNA that “the DPRK will boost its nuclear deterrent for self-defense in every way,” (DPRK Foreign Ministry Vehemently Refutes UNSC’s ‘Presidential Statement.’” However, it appears to contradict the Foreign Ministry’s June 13, 2009 statement that “The process of uranium enrichment will be commenced.” DPRK Foreign Ministry Declares Strong Counter- Measures against UNSC’s “Resolution 1874,” op. cited.

³⁰ Clapper, op. cited., p. 6.

³¹ Ibid. p. 6. Emphasis not in original.

³² Thanks to Paul Brannan, Institute for Science and International Security, for help with this paragraph.

³³ Sharp, op. cited, p. 10.