Beyond the Agreed Framework: The DPRK's Projected Atomic Bomb Making Capabilities, 2002-09

An Analysis of The Nonproliferation Policy Education Center (NPEC)

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Overview

With Pyongyang's admission that it has been secretly enriching uranium to make bombs in violation of the Nuclear Nonproliferation Treaty (NPT) and the Agreed Framework of l994 and President Bush's decision to suspend fuel oil shipments to North Korea as called for by the l994 deal, the fate of this understanding is in question. Proponents of the deal argue that the U.S. should uphold as many aspects of the understanding as possible, particularly its freeze on North Korea's declared plutonium production facilities. Without this freeze, they argue, Pyonygang would be free to make 50 bombs a year. The following analysis of open source materials suggests that although this last point is technically plausible, it cannot be realized for at least the next six years. Until then, the DPRK can creep out of the plutonium freeze with about five weapons beyond the one to five it already has and can produce one more additional weapon each year after this. There are several good political, diplomatic and military reasons why the DPRK may choose to maintain its freeze on its plutonium production. Even if Pyongyang does, though, Pyongyang's enrichment program, which is not covered by the freeze, might still produce as many as 30 weapons before 2009. As a result, the difference in what the DPRK could produce by 2009 with a freeze and without one - 45 to 60 weapons - although interesting, is ultimately of less concern than the number of weapons the DPRK already has and is likely to acquire - 10 to 40 -- even if the freeze is kept in place. This suggests that the U.S. and its allies will have do more than merely extend the Agreed Framework to address the DPRK nuclear threat.

DPRK's Current Plutonium (Pu) Bomb Inventory = 1 to 5

North Korea could currently have up to five nuclear weapons according to Secretary of Defense Donald Rumsfeld and several Asian intelligence projections or as few as "one, possibly two" according to consensus U.S. intelligence estimates. The range

between these projections is a function of uncertainties surrounding 1. how much spent reactor fuel the DPRK removed from its 5 Mwe reactor, which operated at Yongbyon from l986 until l994; 2. at what level of capacity this reactor was running since it came on line in l986; 3. whether and to what extent the DPRK used an additional older, smaller research reactor to make illicit bomb plutonium; and 4. how advanced the DPRK's weapons design is (the more advanced it is, the less plutonium the DPRK would need to make a given bomb). The 5 Mwe reactor can make 6 kilograms (kgs) of plutonium a year assuming it is operated at near full capacity 300 days a year. There have been reports, however, that the reactor initially operated poorly. It also is unclear how much of the reactor's fuel was unloaded or how much plutonium it contained when it was shut down for refueling in l989. This has led to a variety of estimates. As Larry Niksch of the U.S. Congressional Research Service noted:

> South Korean and Japanese intelligence estimates reportedly are higher [than the CIA's]: 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 l989 reactor shutdown and the view of a higher possibility that North Korea removed fuel rods during the l990 and l991 reactor slowdowns. Russian Defense Ministry Analyses of late l993 reportedly came to a similar estimate of about 20 kilograms of plutonium, enough for 2 or 3 atomic bombs [assuming 6-8 kilograms per bomb]. Some individual U.S. government experts that under optimum conditions, North Korea could have produced close to 20 kilograms of plutonium since l989.

Other experts discount these high-end plutonium production scenarios: The DPRK may have removed less than a full core in l989 and not removed any fuel again until l994; it probably operated the reactor initially at less than optimal levels. Factoring in these considerations, these analysts conclude that North Korea probably extracted between one and two bombs worth of plutonium in l989. An additional consideration is that the DPRK may have used its small research reactor, which it has had on line since the l970s, to

produce plutonium for bombs. If so, it could have produced one-half to one bomb's worth of additional plutonium. Finally, this paper has assumed 5 kgs is needed to make a fission weapon. In fact, less probably would be needed. The Department of Energy, for example, now cites 4 kgs. as being needed for a nominal fission weapon (of around 20 kilotons of explosive yield) and other experts have noted that with medium technology - something the DPRK as a rocket making nation surely has -- a Hiroshima-sized device of 10 kilotons might require as little as 3 kgs of plutonium.

Pu Bombs the DPRK Could Make from Stored Spent Fuel = Around 5

If Pyongyang decided to break out of the Agreed Framework's freeze on North Korea's operation of its large reprocessing plant, it could chemically strip out a bit more than 5 bombs' worth of plutonium (25-30 kgs.) from its declared spent reactor fuel holdings. It could do so weeks after taking its large plutonium chemical separation plant out of mothballs.

Pu Bombs the DPRK Could Make for the Next 5 to 6 years = 1/yr.

If the DPRK restarted its 5 Mwe reactor, it could make 6 kgs. of plutonium a year. Again, it is assumed here that it takes about 5 kgs. to make a fission device.

Number of Pu Bombs the DPRK Could Have Late in 2003 = Around 9

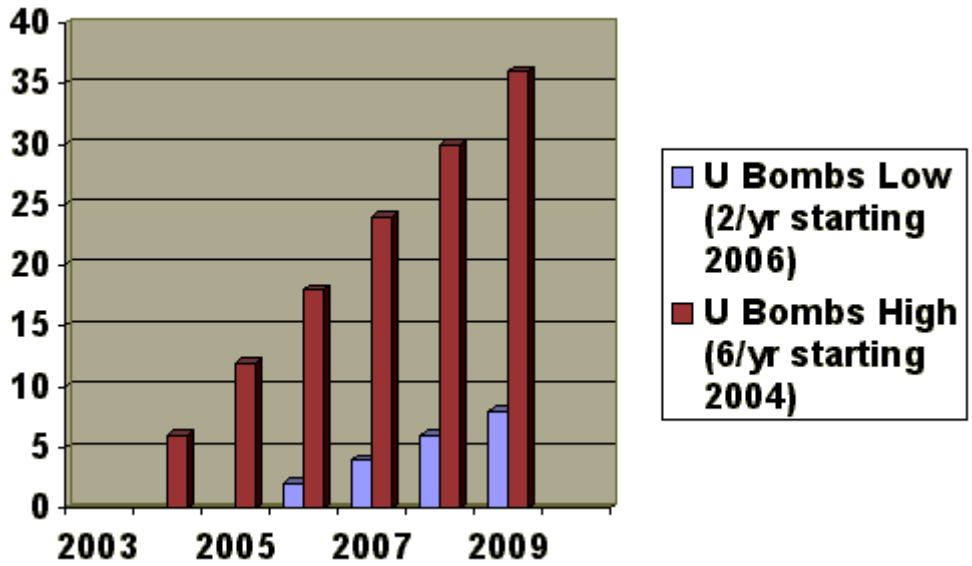
Again, assuming 1-2 as a low and 5 as a high estimate of the number of plutonium weapons (of 5 kgs each) the DPRK has on hand, adding one from new production and around 5 from the spent fuel, one gets a range of 7 to 11 bombs that North Korea could have if it decides to breakout from the l994 Agreed Framework's freeze on its declared plutonium activities.

When DPRK might begin making uranium weapons = Early 2004 to Early 2006

The CIA recently released an unclassified estimate that North Korea might complete construction of centrifuge enrichment facilities capable of making two or more bombs' worth of highly enriched uranium (HEU) a year by "mid-decade". This unclassified estimate appears to be a compromise or consensus figure. Reports of Bush Administration officials' views state that the DPRK may

have enough centrifuges on line in one year (i.e. by January 2004) to three years (by January 3006) to begin to make as much as six bombs worth of HEU (about 100 kgs.) per year. The reason for this range of estimates is uncertainties as to 1. when the DPRK began its uranium enrichment effort with centrifuges; and 2. how far along the DPRK is with this program. The CIA has publicly estimated that the DPRK "embarked on the effort to develop a centrifuge-based uranium enrichment program about two years ago" and that the DPRK "began seeking centrifuge-related materials in large quantities….last year". Reports from DPRK defectors, however, suggest that these CIA estimates may be too conservative. A Japanese double-agent who worked in the DPRK's nuclear-capable missile program, for example, recently reported that 30 to 40 Pakistani nuclear engineers began working on the uranium enrichement program in the DPRK not "about two years ago," but in l994. He also stated that nuclear scientists in the DPRK were "celebrating the arrival" of transferred centrifuges in l996, which is much earlier than the CIA's unclassified estimate would suggest. This testimony lends support to projections that the DPRK may begin operating enough centrifuges to make as much as 100 kgs of HEU within as little as 12 months. It should be noted that Pakistan needed 3,000 of these machines on-line to make 6 bombs worth of HEU a year. That said, Pakistan required several years before it could get all 3,000 of its machines running at full capacity. Whether or not North Korea will need as much time to bring its centrifuges to full capacity is unclear.

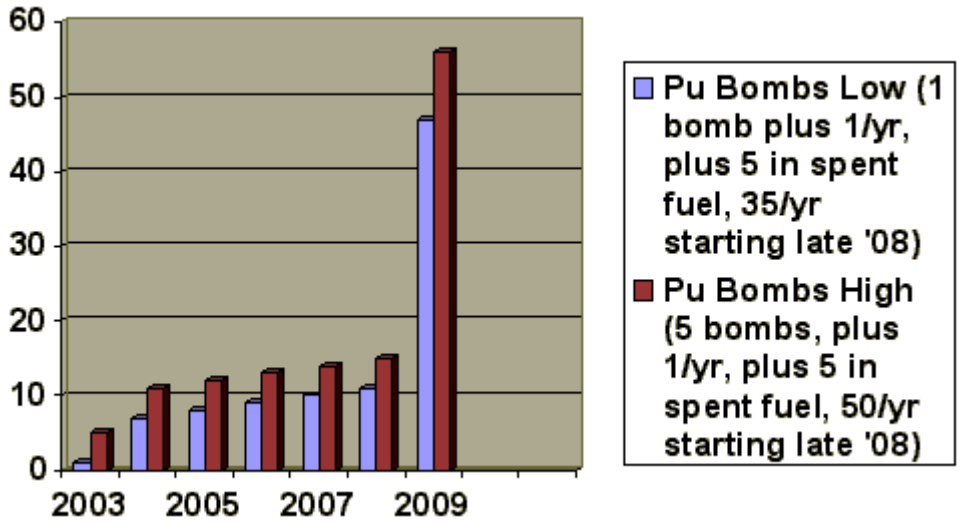
I. How Many Uranium Bombs Could N. Korea Produce by When?



When the DPRK Could Begin to Make As Much As 50 Bombs Worth of Pu Annually = Late 2008

Under the Agreed Framework, the DPRK froze construction of two reactor projects - a 50 MWe reactor at Yongbyon and a 200 MWe reactor at Taechon. The CIA has made public its estimate that the DPRK could generate about 275 kg per year - enough for more than 50 bombs a year -- from these reactors once they were completed. The CIA's pubic estimate, though, says it would take several years to complete construction of these reactors. The 200 Mwe reactor project - which under optimal operating conditions could make as much as 40 bombs' worth of plutonium annually -- does not yet have even its exterior walls completed. Finishing the other 50 Mwe electrical reactor - which is much further along - will also take time: In l994, IAEA monitoring staff visited the reactor site and noticed that critical parts of the reactor, inside the building, were missing. How long would it take to complete the two reactors? A Congressional report to the House Speaker on the subject in l999, estimated 6 years. This projection accords with reports that the CIA estimated that the DPRK would have had 100 bombs worth of plutonium today (eight years after the Agreed Framework was stuck) if it was not for the plutonium production freeze that the l994 deal imposed. Subtracting two years that the CIA estimates would be needed for these reactors to make a little over 100 bombs, and you have 6 years to for the DPRK to finish constructing the reactors and getting them up to full capacity. The CIA estimate of more than 50 bombs' worth of plutonium a year from these reactors, however, assumes they would be run 300 days a year at nearly full capacity. If the reactors were run the same number of days at lower capacity (e.g., 70 percent), the amount of plutonium they would produce would be less (e.g., at 70 percent, 35 bombs' worth).

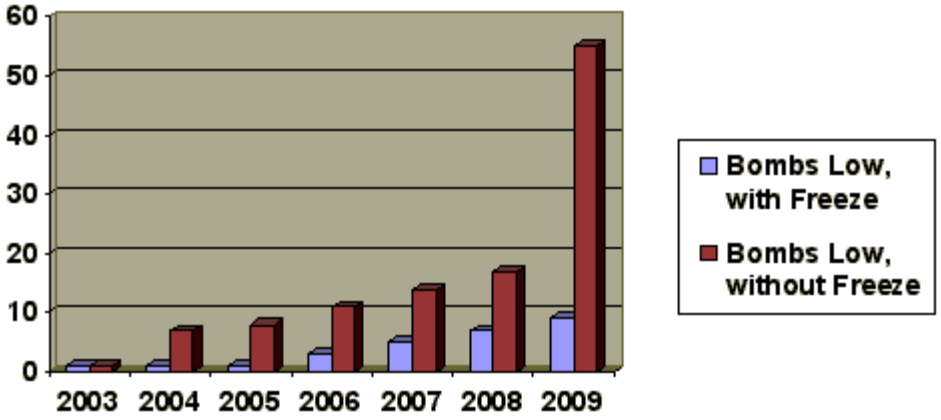
2. How Many Plutonium Bombs Could N. Korea Produce by When?



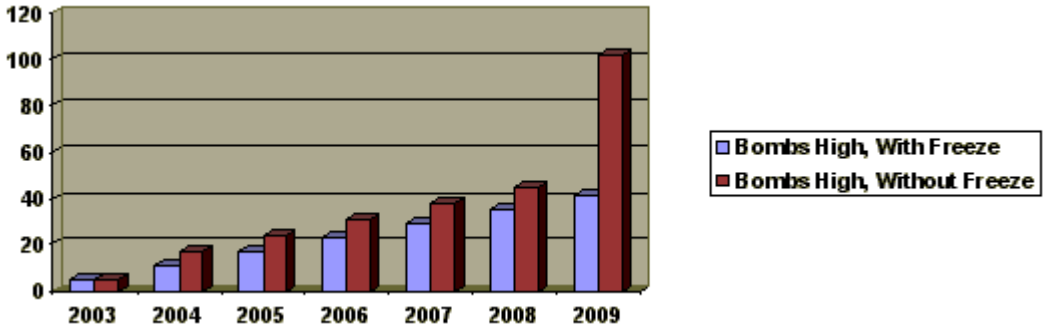
What to Make of These DPRK Bomb Making Projections

Looking at the two summation charts above, it's clear that whatever value there might be in continuing the freeze on plutonium production, in the short- run, it is hardly dramatic as the DPRK already has one or more weapons. The freeze would clearly be useful against DPRK's projected ability to make large amounts of plutonium five to six years from now. Its value in keeping the DPRK from producing a significant number of weapons, however, all but vanishes as the DPRK begins to ramp up its uranium production capabilities in the next 12 to 36 months. In 2009, the DPRK, in fact, could have nearly as many uranium bombs in its inventory - over 35 - as it might produce by this year if it broke out of the plutonium freeze. To be sure, it could make much more nuclear weapons if it combined all of its uranium and plutonium making capabilities. But the military and political difference between the DPRK having 20 to 40 weapons and it having 100 or more seems faint. One thing is clear, the DPRK must be considered to be a serious nuclear power, one whose arsenal is likely to grow, with or without continuation of the Agreed Framework. Indeed, this much is evident in the summation charts below.

3. Low Scenario (With and Without a Freeze)



4. High Scenario (With and Without a Freeze)



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1. On these disincentives, see Henry Sokolski, "All Deals Are Off? - Contending with a Nuclear North Korea," *National Review On Line*, November l9, 2002. Go to www.npec-web.org.
2. U.S. National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat Through 2015, Unclassified Summary of a National Intelligence Estimate, December 2001," go to http://www.odci.gov/nic/ppubs/other_products/Unclassified ballisticmissilefinal.htm
3. Larry Niksch, "North Korea's Nuclear Program," *Congressional Research Issue Brief IB91141*, November 8, 2002. Go to http://www.fas.org/spp/starwars/crsIB91141.pdf
4. See David Albright, *Solving the North Korean Nuclear Puzzle* (Washington, DC: The Institute for Science and International Security, 2000), pp111-65.
5. See Niksch cited above and Thomas B. Cochran and

Christopher E. Paine, "The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons," *Nuclear Weapons Databook* (Washington, DC: The Natural Resources Defense Council, l3 April l995).
6. This estimate is appended in Appendix I of this paper.
7. See, e.g., Barbara Slavin, "N. Korea Hastens Nuclear Program: U.S.-Mass Production Could Be A Year Away," *USA Today*, p. 1A.
8. Cf. the CIA estimate in Appendix I, Doug Struck, "Defector From N. Korea Creating a Stir in Japan, *The Washington Post,* p. A12; and Jane MacCartney, "Pakistan's Benazir Oversaw Korea Nuclear Deal, Says Source," *Reuters*, November 21, 2002. Go to http://www.enn.com/news/wire-stories/2002/11/11212002/reu_4900l.asp
9. See "Kahuta, Khan Research Laboratories, A.Q. Khan Laboratories" at http://www.fas.org/nuke/guide/pakistan/facility/kahuta.htm.
10. See Appendix I, below
11. See U.S. Congress, North Korea Advisory Group, *Report to the Speaker U.S. House of Representatives*, (Washington, DC: USGPO, ISBN 0-16-059653-X, November 1999), p. 5. Go to www.house.gov/internationa_lrelations.nkag.htm.
12. See Brent Scowcroft and Daniel Ponenman, "Charting a New Course In North Korea," *The Wall Street Journal*, November 14, 2002.
13. See Albright, *Solving*, p. 160.
14. For additional elaboration of this point, see Victor Gilinsky and Henry Sokolski, "A Time For Demanding," *National Review On Line*, November 6, 2002. Go to www.npec-web.org.

Appendix I

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Nuclear Weapons
The US has been concerned about North Korea's desire for nuclear weapons and has assessed since the early 1990s that the North has one or possibly two weapons using plutonium it produced prior to 1992.

In 1994, P'yongyang halted production of additional plutonium under the terms of the US-DPRK Agreed Framework.

· We have assessed, however, that despite the freeze at Yongbyon the North has continued its nuclear weapons program.

If the Framework Collapses
If North Korea abandoned the Agreed Framework P'yongyang could resume production of plutonium.

· Reprocessing the spent 5 MWe reactor fuel now in storage at Yongbyon site under IAEA safeguards would recover enough plutonium for several more weapons.
· Restarting the 5 Mwe reactor would generate about 6 kg per year.
· The 50 MWe reactor at Yongbyon and the 200 MWe reactor at Taechon would generate about 275 kg per year, although it would take several years to complete construction of these reactors.

Uranium Enrichment
The United States has been suspicious that North Korea has been working on uranium enrichment for several years. However, we did not obtain clear evidence indicating the North had begun constructing a centrifuge facility until recently. We assess that North Korea embarked on the effort to develop a centrifuge-based uranium enrichment program about two years ago.

· Last year the North began seeking centrifuge-related materials in large quantities. It also obtained equipment suitable for use in uranium feed and withdrawal systems.
· We recently learned that the North is constructing a 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.

· We continue to monitor and assess the North's nuclear weapons efforts, which given the North's closed society and the obvious covert nature of the program, remains a difficult intelligence collection target.