

# The North Korean Plutonium Stock Mid-2005

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# The North Korean Plutonium Stock Mid-2005

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## **The North Korean Plutonium Stock Mid-2005**

by the Institute for Science and International Security (ISIS)

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## **I. Introduction**

The Institute for Science and International Security (ISIS) released this report on the DPRK's plutonium stock and its means to produce and separate plutonium. The report states: "Assuming that the recently unloaded fuel has not yet been separated, the DPRK has about 15-38 kilograms of separated plutonium. At 4-5 kilograms of plutonium per weapon, this plutonium is enough for 3-9 nuclear weapons."

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## **II. Report by the Institute for Science and International Security (ISIS)**

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## **Introduction**

The DPRK's plutonium stock and its means to produce and separate plutonium has been extensively studied. Prior to the restart of the 5 megawatt-electric reactor in early 2003, the DPRK had an estimated stock of roughly 30-40 kilograms of plutonium. With the restart of the 5 megawatt-electric reactor in early 2003, this stock has been growing at a rate of about 5-7 kilograms of plutonium each year. Unclassified reports, confirmed by commercial satellite imagery, indicate that the DPRK shut down the reactor in April 2005, likely to unload the fuel. At this time, the reactor is estimated to have contained 10-15 kilograms of additional plutonium, bringing the total plutonium stock to about 40-55 kilograms of plutonium.

The plutonium must be separated from the irradiated fuel before it can be used in nuclear weapons. Prior to 2003 and the unfreezing of the Yongbyon site, the DPRK was estimated to have up to 10 kilograms of plutonium in separated form, although this estimate was a "worst-case" estimate subject to continuing scrutiny and controversy. This plutonium would have been separated in the Radiochemical Laboratory prior to about 1992. The worst case estimate was that the DPRK separated and did not declare to the IAEA about 8 to 9 kilograms of plutonium produced in the 5 megawatt-electric reactor. Some US intelligence agencies believed that the DPRK also separated and did not declare up to another 1 to 2 kilograms of plutonium produced in the Russian-supplied IRT research reactor at Yongbyon. Other intelligence agencies believed the amount of plutonium produced in the IRT reactor was no more than a few hundred grams. The IAEA also independently arrived at this smaller estimate. In any case, a reasonable estimate is that no more than about 10 kilograms of plutonium were separated prior to 1994, when the Agreed Framework froze all plutonium activities at the Yongbyon site.

In its assessments, the CIA has focused on the estimate of 8-9 kilograms of separated plutonium. In interviews, CIA officials involved in these assessments have stated that there is a better than even chance that the DPRK separated this plutonium, although the basis for this specific judgment can be debated. Nonetheless, after taking account of estimated losses, the CIA concluded that this is enough separated plutonium for one or perhaps two nuclear weapons. However, assuming losses of 20 percent, which is reasonable for an initial effort, the DPRK would have been unlikely to have had enough plutonium for more than one nuclear weapon, needing approximately 4-5 kilograms of plutonium per weapon.

Until 2003, the bulk of the plutonium produced by the DPRK remained in almost 8,000 irradiated fuel rods stored in a pond near the 5 megawatt-electric reactor and subject to monitoring by the IAEA. These rods contained an estimated 27-29 kilograms of plutonium.

Since restarting the Radiochemical Laboratory in 2003, the DPRK may have reprocessed most of the 8,000 irradiated fuel rods stored under the Agreed Framework. The DPRK states that it has reprocessed all the fuel rods, but this statement remains unconfirmed. Nonetheless, a reasonable conclusion is that the DPRK has separated a significant amount of plutonium from these rods. Thus, the DPRK is estimated to have separated about 15-28 kilograms of plutonium from these rods. The lower bound reflects confidence that at least many of rods have been reprocessed and the amount separated is highly unlikely to be lower than this value. The upper bound is the amount that would result if all the rods have been reprocessed with only small losses of plutonium during the entire process.

It is unknown if the DPRK has started reprocessing the fuel that is believed to have been recently

unloaded from the 5 megawatt reactor. The DPRK is likely to store the irradiated fuel in water for a few months prior to its reprocessing to allow its radioactivity and heat to decline. Afterwards, all the fuel could be reprocessed within 6-12 months.

Assuming that the recently unloaded fuel has not yet been separated, the DPRK has about 15-38 kilograms of separated plutonium. At 4-5 kilograms of plutonium per weapon, this plutonium is enough for 3-9 nuclear weapons.

If the DPRK separated the 10-15 kilograms of plutonium from recently discharged fuel, it would have in total 25-53 kilograms of separated plutonium. It could build about 5-13 nuclear weapons from this plutonium.

In June 2005, satellite imagery indicated that the 5 megawatt-electric reactor was not operating; it is, therefore, unclear whether it has yet been refueled. In August 2005, Japanese media reported that US satellites had detected a plume at the 5 megawatt-electric reactor indicating operation had resumed.

In addition, uncertainties surround how much fresh uranium fuel the DPRK has in stock, although the DPRK is reported to have enough to refuel the 5 megawatt-electric reactor one to two more times using fresh fuel fabricated prior to 1994. However, the amount of fuel fabricated since the freeze ended in 2002 is unknown.

DPRK officials recently stated that construction of the 50 megawatt-electric and 200 megawatt-electric reactors restarted. As of early June 2005, commercial satellite imagery did not show any significant construction activity, although media reports state that more recently a mobile crane was moved to the site of the 50 megawatt-electric reactor. Additional reports say that new gravel has been seen along the road at the same site. Because of the long period of inactivity at these reactor sites, and the effect of the weather on the unfinished reactors, the completion of these reactors would likely take several years. If finished, the 50 megawatt-electric reactor could produce enough plutonium annually for roughly ten nuclear weapons.

### **III. Nautilus Invites Your Responses**

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