



# **North Korea's Nuclear Capabilities: A Fresh Look**

## **Summary of Major Findings in Conjunction with PowerPoint Slides Presented During a Series of Talks Given in DC**

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### **Through 2016**

One way to summarize the estimates of plutonium, weapon-grade uranium (WGU), and nuclear weapons presented in the PowerPoint slides<sup>1</sup> is to use ranges of the medians of each case considered. They are as of the end of 2016:

- 33 kilograms of separated plutonium (median value of a distribution).
- 175-645 kilograms of weapon-grade uranium, where 175 kilograms corresponds to a median estimate for the case of one centrifuge plant and 645 kilograms corresponds to the median estimate for the case of two centrifuge plants.
- 13 to 30 nuclear weapons, where these values reflect the utilization of 70 percent of the available, estimated stocks of plutonium and weapon-grade uranium. The limits correspond to the median values for the cases of one or two centrifuge plants and each weapon contains either plutonium or weapon-grade uranium.
- Based on this cumulative estimate, North Korea is currently expanding its nuclear weapons at a rate of about 3-5 weapons per year.
- Thirty percent of North Korea's total stocks of plutonium and weapon-grade uranium are assessed as in production pipelines, lost during processing, or held in a reserve.

North Korea keeps secret the number of nuclear weapons that it has built, and there is little, if any, reliable public information about this value. The above range of 13-30 nuclear weapons as of the end of 2016, based on the estimates of North Korea's production and use of plutonium and WGU, is an assessment.

North Korea may have a handful of plutonium-based warheads for its Nodong ballistic missile.

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<sup>1</sup> To be published.

One uncertainty is judging North Korea's dependence on plutonium for its deployed nuclear weapons. It would have incentives to be able to build miniaturized, reliable weapons with only a weapon-grade uranium core, as its declaration after the September 2016 test could suggest it has done.

North Korea would have an incentive to build more advanced nuclear weapons. One type is a composite core nuclear weapon made from both plutonium and weapon-grade uranium. How many it may have built is unknown, as is their size, weight, and reliability. North Korea has enough plutonium for up to 12 nuclear weapons using a composite core of plutonium and weapon-grade uranium, where likewise 70 percent of the fissile material is utilized in the weapons themselves. However, North Korea is unlikely to build only composite core weapons. This estimate would suggest that North Korea could build several of them in addition to other types of nuclear weapons as well.

It is unknown if North Korea could mount a warhead on a Nodong that uses only weapon-grade uranium or has a composite core. In particular, are they too large for the Nodong? However, both possibilities appear increasingly likely.

It is uncertain, and there are reasons to doubt, that North Korea can yet build reliable, survivable warheads for ICBMs.

Continued underground testing will provide North Korea opportunities to improve significantly its weapons in terms of less fissile material (particularly plutonium) per weapon, increased warhead miniaturization, and/or greater explosive yields.

Developing thermonuclear weapons, which can achieve all three above goals, is a declared priority of North Korea.

It appears capable of developing thermonuclear weapons. It is far more likely to be working on one-stage thermonuclear weapons rather than traditional two stage thermonuclear weapons, or "H-Bombs." The Institute does not assess North Korea as yet capable of building two stage thermonuclear weapons or utilizing gaseous mixtures of deuterium and tritium in a U.S.-style boosted fission weapon. However, North Korea is assessed as able to handle solid forms of lithium-6, deuterium, and/or tritium, such as those used in one-stage thermonuclear weapons or other types of boosted fission weapons.

Its existing knowledge should allow it to continue to make progress on a variety of deliverable nuclear weapons, even in the absence of additional underground nuclear tests.

### **Through 2020**

Through 2020, North Korea is projected to have 25-50 (rounded) nuclear weapons.

A worst case, involving the operation of the Experimental Light Water Reactor (ELWR) at Yongbyon, is that it would have up to 60 nuclear weapons by the end of 2020.

In regards to composite core nuclear weapons, it would have enough plutonium for up to 17-32 nuclear weapons, where the above worst case including the ELWR determines the upper bound.

Significantly higher estimates are possible, such as one that is in an earlier 2015 Institute study on North Korean nuclear explosive materials, if North Korea significantly expands its gas centrifuge program and dramatically boosts its production and separation of plutonium over what is assumed in the current analysis.