



## Government Official Raises Concern about Plutonium Separation at Yongbyon

David Albright and Serena Kelleher-Vergantini

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There are growing indications that North Korea is separating plutonium from irradiated fuel from the 5 megawatt-electric (MWe) reactor at the Radiochemical Laboratory, a process commonly referred to as reprocessing. Recently, a government official who monitors the situation closely, stated to the Institute for Science and International Security (ISIS) that it is possible that North Korea may have started reprocessing the spent fuel from the reactor.

In the past, North Korea has reprocessed its spent fuel in secret, separating plutonium without the international community detecting this activity as it occurred. Given the absence of clear external signatures, monitoring reprocessing and plutonium separation activities with commercial satellite imagery alone is very difficult. In addition, the few signatures that exist can be easily hidden. In fact, during previous plutonium separation campaigns, according to a senior North Korean nuclear official interviewed by one of the authors in 2007, North Korea took steps to hide activities related to plutonium separation, making it even more difficult to determine when such separation took place.

In the current situation, with tensions high and North Korea being deliberately provocative about its nuclear and missile efforts, it is possible that North Korea may choose not to hide the signatures associated with plutonium separation, but opt to clearly reveal signs of reprocessing. However, even in this case, it remains very difficult to assess with certainty whether plutonium separation is or has occurred.

On February 9, 2016, James Clapper, Director of National Intelligence, stated in testimony: *“We further assess that North Korea has been operating the reactor long enough so that it could begin to recover plutonium from the reactor’s spent fuel within a matter of weeks to months.”* The government official's comment above raises concern that the plutonium separation has indeed started, possibly shortly after Director Clapper’s statement.

If North Korea has indeed started, or even partially completed, this plutonium separation process, the question becomes: how much plutonium for nuclear weapons could it separate? The amount of plutonium separated will depend on the amount of plutonium produced in the 5 MWe reactor since it restarted in mid-2013. ISIS estimated previously that the reactor produced roughly 3-4 kilograms of weapon-grade plutonium since the reactor restarted in the summer of 2013 through the end of the summer of 2014.<sup>1</sup> During this one year period, the reactor appeared to run continuously, although perhaps not at full power. Since mid-2014, the reactor has operated intermittently, based on analyses of satellite imagery and interviews with government officials who monitor the plant closely (see [here](#)). These officials have stated that the reactor has not been shut down during the last year and half. Commercial satellite imagery supports this assessment. During this roughly 15-18 month period of

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<sup>1</sup> Albright, *North Korean Plutonium and Weapon-Grade Uranium Inventories*, Institute for Science and International Security, January 8, 2015 (revised October 7, 2015), p. 8. [http://isis-online.org/uploads/isis-reports/documents/North\\_Korean\\_Fissile\\_Material\\_Stocks\\_Jan\\_30\\_2015\\_revised\\_Oct\\_5\\_2015-Final.pdf](http://isis-online.org/uploads/isis-reports/documents/North_Korean_Fissile_Material_Stocks_Jan_30_2015_revised_Oct_5_2015-Final.pdf)

intermittent operation, the reactor could have produced an additional 2-3 kilograms of plutonium. In total, the 5 MWe reactor could have produced an estimated 5-7 kilograms of weapon-grade plutonium since its 2013 restart. This is enough plutonium for one to three nuclear weapons, assuming 2-4 kilograms of weapon-grade plutonium per weapon.

The issue of plutonium separation is complicated by the absence of public information on the amount of fuel that North Korea has unloaded from the 5 MWe reactor. The first indications of fuel being unloaded after the 2013 restart dates back to the end of 2014, but these indications were ambiguous (see [here](#)). Moreover, North Korea's fuel re-loading strategy for the reactor is unknown. It is unclear if North Korea operates the reactor for a period of time and then unloads all the fuel in the core while it reloads fresh fuel, as it has done in the past, or instead unloads part of the fuel in the core and replaces that portion with fresh fuel.

In any case, the Radiochemical Laboratory is oversized for the fuel discharges of the 5 MWe reactor. It was built to handle not only spent fuel from the 5 MWe reactor but also from a 50 MWe reactor North Korea never finished. It can process all the irradiated fuel in the 5 MWe reactor core in 3-6 months.<sup>2</sup>

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<sup>2</sup> Albright, *Solving the North Korean Nuclear Puzzle* (Institute for Science and International Security: Washington, DC, 2000).