

Update on North Korea's Yongbyon Nuclear Site

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At the latest IAEA Board of Governors meeting in Vienna, Director General Amano [reportedly](#) stated that renovation and construction activities have been observed in various locations within the Yongbyon nuclear site in North Korea. On September 15, 2015, North Korea's director of the Atomic Energy Institute [stated](#): *"As was clarified by a spokesman for the then General Department of Atomic Energy of the DPRK in April 2013, all the nuclear facilities in Nyongbyon including the uranium enrichment plant and 5 MW graphite-moderated reactor were rearranged, changed or readjusted and they started normal operation, pursuant to the line of simultaneously pushing forward the economic construction and the building of a nuclear force advanced at the historic plenary meeting of the Central Committee of the Workers' Party of Korea."* This statement seems to suggest that North Korea's enrichment plant and small reactor are operating normally.

Additionally, the director suggested that North Korea is improving the quality and quantity of its nuclear weapons by stating: *"Scientists, technicians and workers in the field of atomic energy of the DPRK have made innovations day by day in their research and production to guarantee the reliability of the nuclear deterrent in every way by steadily improving the levels of nuclear weapons with various missions in quality and quantity as required by the prevailing situation."*

Enrichment Plant

This announcement implies that the [expansion](#) section of the centrifuge plant is operational (figure 1). However, there is no concrete evidence of such operation visible via satellite imagery. We and others noted snow melt on the building last winter (see [here](#)). Although this signature implies the building is heated, it does not reveal whether centrifuges are in operation, particularly in the expansion section.

However, there are a range of factors which would support that the plant, in particular the extension, is operational, as North Korea states. North Korean engineers and scientists are experienced enough to have finished the extension and enough time has passed to accomplish this task and get it into operation. Moreover, this plant is a major priority of the government, so the project likely received ample resources. North Korea is also known to have procured many dual-use goods in sufficient quantity for the extension of this facility. These goods were purchased in China and include a range of vacuum equipment, computer control equipment, and frequency-inverters or related subcomponents. Thus, although the available information does not confirm the plant's operation, nothing contradicts the North Korean statement that the plant, including the extension, is operational.

Five Megawatt-Electric Reactor

Over the last several years, North Korea has engaged in retrofitting and upgrading its small 5 megawatt-electric (MWe) reactor. Since approximately October 2014, the reactor appears to have operated at low power or operated intermittently. This assessment is supported by historical analysis of satellite imagery

gathered during the end of 2014 and January, February, March, April, June and August 2015.¹ Recent imagery dated August 22, 2015 does not show a steady stream of water being discharged from the reactor's discharge pipeline, which is the main sign of full-power operation (see figure 2). Thus, it is harder to confirm North Korea's claim about "normal" operation. Nonetheless, other signatures suggesting renewed activity are visible in this August 2015 image. Several vehicles and trucks are visible at the entrance of the 5 MWe reactor and water runoff is present on the roof of the reactor's turbine building, indicating recent turbine activity. It is, therefore, very likely that the reactor was still operating intermittently as of August.

Other analysts have [highlighted](#) activity at the radiochemical laboratory which is a facility dedicated to the separation of plutonium from the irradiated 5 MWe spent fuel.

Isotope Production in 5 MWe Reactor

As part of the renovation of the reactor, North Korean technicians reportedly installed (or renovated) irradiation channels in the core. These channels would be used to make various types of isotopes, potentially for civilian or military purposes. Earlier, North Korea made isotopes in its Soviet-supplied research reactor but this reactor has not been in operation for several years. Moreover, North Korea lacks fuel to operate this reactor.

Although a gas graphite reactor is not an ideal producer of isotopes, it can be used in this way. North Korea would be expected to make a variety of isotopes for use in medicine or industry.

One candidate isotope that must be considered is tritium, which could be used in making more sophisticated nuclear weapons. The 5 MWe reactor is a military reactor and militarily-useful isotopes would be expected to be the reactor's priority instead of civilian isotopes. North Korea has stated repeatedly its intention to improve the quality of its nuclear weapons, and tritium would enable nuclear weapons designs that could have a greater explosive yield than weapons made from only plutonium or weapon-grade uranium. Whether North Korea can make nuclear weapons using tritium is unknown although we believe that it remains a technical problem North Korea still needs to solve. Solving this problem would likely require more underground nuclear tests.

Isotope production requires a facility to separate the isotopes. North Korea built such a facility years ago, called the Isotope Production Laboratory in the northern part of Yongbyon near the old Soviet-supplied reactor.² This facility dates to the 1970s and its operational status is unknown. It is also a relatively small facility. As described next, North Korea may be building a larger replacement.

Hot Cell Facility

For a while, we have been observing a new facility being constructed in the southwest corner of North Korea's Yongbyon nuclear site, at a location adjacent to the train tracks that connect the fuel fabrication

¹ See David Albright and Serena Kelleher-Vergantini, "Yongbyon: A Better Insight into the Status of the 5MWe Reactor," April 29, 2015, <http://isis-online.org/isis-reports/detail/yongbyon-a-better-insight-into-the-status-of-the-5mwe-reactor/10#images>; "Yongbyon: Monitoring Activities during Shutdown of 5 MW Reactor," December 5, 2014, <http://isis-online.org/isis-reports/detail/yongbyon-monitoring-activities-during-shutdown-of-5-mw-reactor/10#images>; "Yongbyon: Centrifuge Enrichment Plant Expands while 5 MWe Reactor is Possibly Shut Down," October 3, 2014, <http://isis-online.org/isis-reports/detail/yongbyon-centrifuge-enrichment-plant-expands-while-5-mwe-reactor-is-possible/10#images>.

² For further information about the Isotope Production Laboratory, see David Albright and Keven O'Neill, *Solving the North Korean Nuclear Puzzle* (Washington, DC: ISIS Press, 2000).

complex to other locations within the Yongbyon nuclear complex. ISIS first published information about this new construction activity in [April 2015](#). The facility appears to be a hot cell facility and may be a new facility that will be dedicated to separating isotopes from irradiated material produced in the 5 MWe reactor.

As figures 3 and 4 show, the site containing this facility has been repurposed since 2009. In February 2002, two buildings and a stack were present. Prior to 2003, these buildings were believed to have been devoted to supporting activities, according to a former senior UN official close to the IAEA who had frequently visited the site when the Agreed Framework was in effect. However, between 2003 and 2009 both buildings were demolished. Since 2009, the site has been fundamentally reconstructed.

As of August 2015, the site consists of one large building, two medium size buildings, and one small one. The foundations for two additional buildings are visible and it is possible that North Korea is preparing to lay down foundations for a new large building in the area it has used, so far, as a construction staging area. The two medium size buildings are adjacent to each other. One is three stories tall and is adjacent to a shorter rectangular-shaped one. The taller building has a stack, several possible vents on the roof, and tanks behind it while the shorter one seems to have an entrance connected to the train tracks and a large object on the roof, possibly also a large vent. Nearby is a large rectangular shaped building with a large stack. ISIS was able to purchase satellite imagery of this site during the construction phase of this building. Imagery from April and June 2015 allow the visualization of the internal structure of this building. The left side of the building is taller and is divided into five cells. The lower side of the building is also divided into cells. Finally, nearby is a smaller building with a stack.

Although the precise purpose of this site is unknown, the signatures visible through an historical analysis of satellite imagery are consistent with an isotope separation facility, including tritium separation, according to an expert we consulted. This assessment is also shared by a government expert we consulted who has long experience in assessing activities at the Yongbyon site. The presence of three stacks indicates activities that require the release of harmful gases. The presence of tanks suggest processes using chemicals. The signatures of the cells within the larger building are consistent with hot cells possibly for isotope separation. ISIS does not believe this building to be related to reprocessing activities since the thickness of the cell walls is not consistent with that expected for reprocessing activities.



Figure 1. Airbus imagery showing the status of North Korea’s Yongbyon Fuel Fabrication Complex on August 22, 2015.



Figure 2. Airbus imagery showing North Korea’s Yongbyon 5 megawatt-electric and experimental light water reactors on August 22, 2015.



Figure 3. Google Earth/DigitalGlobe/Airbus imagery showing the demolition of the existing buildings east of the fuel fabrication complex between 2002 and 2009.

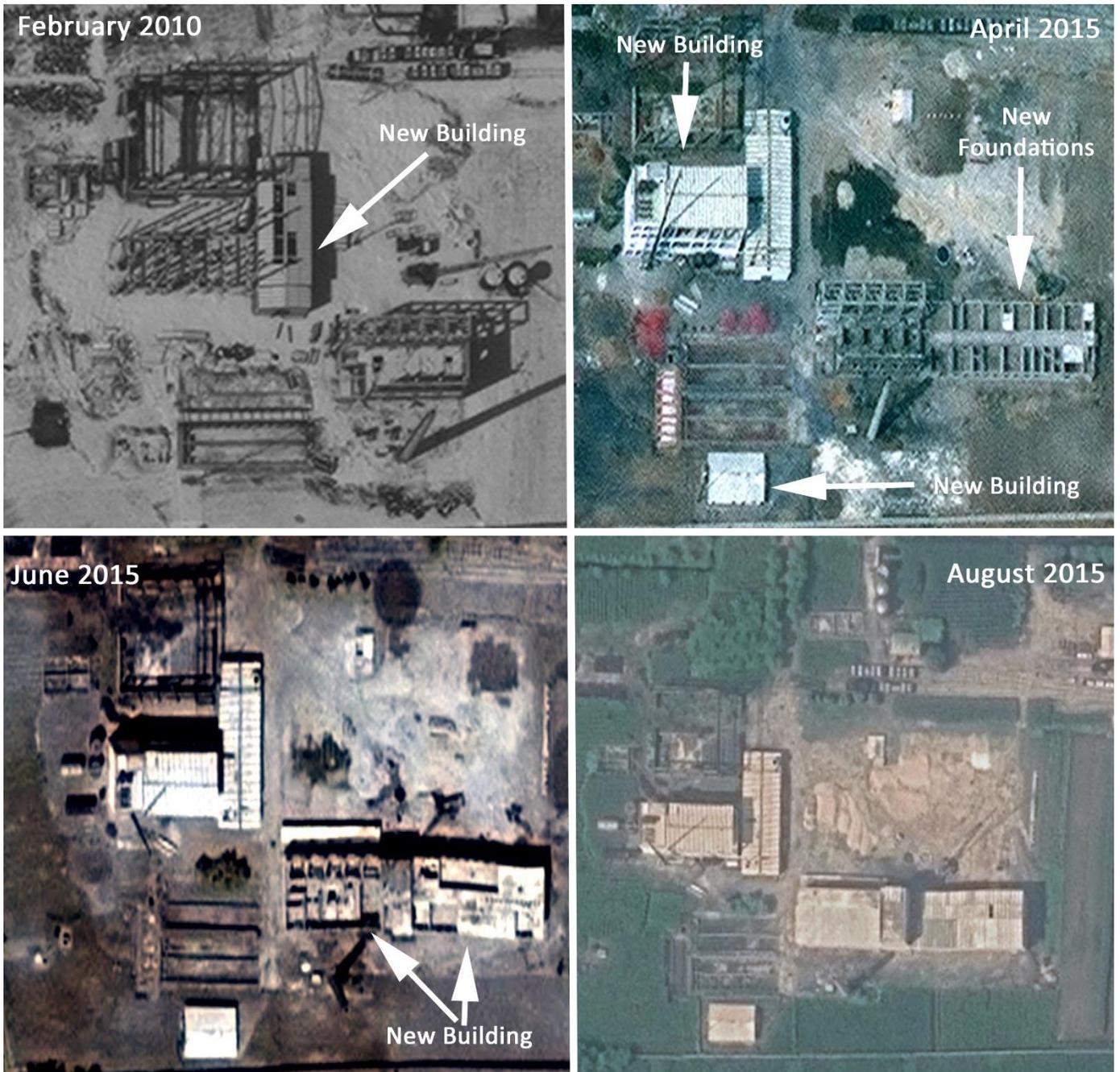


Figure 4. Google Earth/DigitalGlobe/Airbus imagery showing the construction activities east of the fuel fabrication complex between 2010 and 2015.