



## Update on North Korea's Reactors, Enrichment Plant, and Possible Isotope Separation Facility

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*Analysis of recent satellite imagery dated January 25, 2016 confirms previous ISIS assessments that the 5 megawatt-electric (MWe) reactor at Yongbyon is operational, albeit periodically and at reduced power. The gas centrifuge plant at Yongbyon, including its expansion, is likely operational as well. The image also shows that construction is still ongoing at the site ISIS assessed as a possible isotope separation facility, located in the southwest corner of North Korea's Yongbyon nuclear site.*

### 5 Megawatt-Electric (MWe) Reactor and Experimental Light Water Reactor (LWR)

Analysis of recent satellite imagery dated January 25, 2016 is consistent with ISIS's [previous](#) assessment that the 5 MWe reactor is operational. Signatures such as snow melting on the roof of the 5 MWe reactor and no snow present on the roof of the turbine building are consistent with the reactor operating at low power or intermittently. The reasons for this type of operation are still unknown.

An additional signature suggesting operation is visible in this January 25<sup>th</sup> image. As figure 2 shows, although the river shore is covered in snow, the snow directly above the 5 MWe reactor's discharge pipeline has melted. This indicates that the pipe is warm either because it discharged warm water before this image was taken or because it is discharging smaller amounts of water that are not visible via commercial satellite imagery.

The January 2016 image does not show new activities at the experimental light water reactor (LWR). Snow is still visible on the dome of the reactor and on the adjacent building. Some snowmelt is visible but is believed to be caused by the sun, not by heat originating from inside the building. These are strong indications that the reactor is not operational.

As mentioned in a previous assessment, the delay in the reactor's operation may be a consequence of the fact that it is no longer a priority. However, it is possible that North Korea may have also decided to redesign the reactor. In fact, there are growing indications that the reactor may not be a light water reactor modeled after the KEDO reactors that were being supplied by South Korea under the 1994 Agreed Framework. The available evidence suggests a reactor with a larger core vessel than that typical of a small KEDO-type LWR. Leading alternative candidates are a light water cooled, graphite moderated reactor, similar to Russian designs, or a large research reactor.

### Enrichment and Reprocessing Plants

North Korea's gas centrifuge enrichment plant is located at the fuel fabrication complex in the southern corner of the Yongbyon nuclear site (see figure 1). The January 25, 2016 image does not show any new

signs of external activity at this site, except for the absence of snow on several roofs, including the roof of the main centrifuge building, indicating that the Yongbyon gas centrifuge plant is operational.<sup>1</sup>

The January 25, 2016 image shows no signatures related to external activity at the reprocessing plant, known also as the Yongbyon Radiochemical Laboratory, where North Korea would chemically process the 5 MWe reactor's spent fuel to extract plutonium for nuclear weapons.

### **Possible Isotope Separation Facility**

The January 25, 2016 image continues to show external construction signatures at the site ISIS assessed as a possible isotope separation facility, located in the southwest corner of North Korea's Yongbyon nuclear site. Vehicles, construction material, and earth displacement activities are taking place around the main buildings at this site.

In [April](#) and [September 2015](#), ISIS first highlighted a new facility being constructed in this location. The site is adjacent to the train tracks that connect the fuel fabrication complex to other locations within the Yongbyon nuclear complex. The precise purpose of this site remains unknown. However, it is of interest because the signatures visible through a historical analysis of satellite imagery are consistent with an isotope separation facility, including tritium separation. This assessment is shared not only by an expert ISIS consulted but also by a government expert we consulted who has long experience in assessing activities at the Yongbyon site. The major visible signatures relate to the presence of three stacks, indicating activities that require the release of harmful gases; tanks, suggesting processes using chemicals; and the fact that the building is divided into cells.

Prior to 2003, these buildings were believed to have been devoted to supporting activities, according to a former senior United Nations official close to the International Atomic Energy Agency 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.

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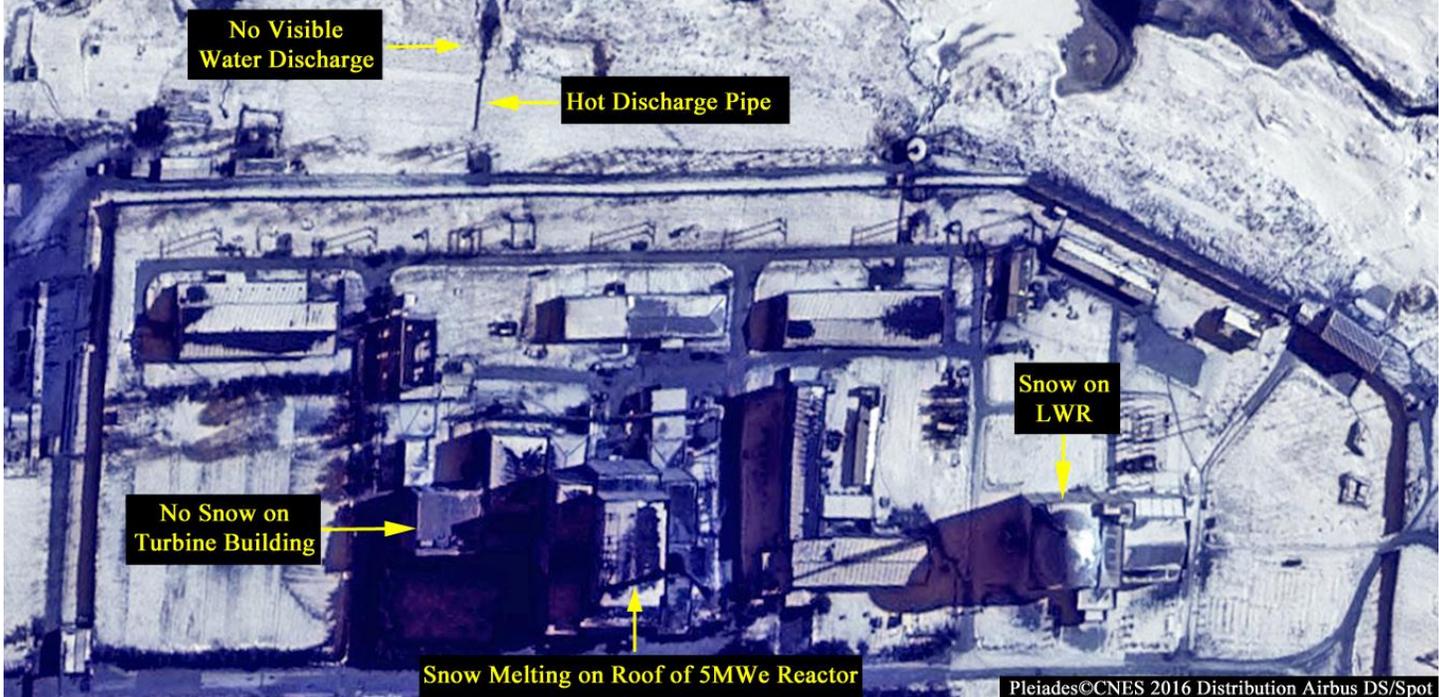
<sup>1</sup> The lack of snow on these roofs could be due to the combined effect of the sun and heat being emitted from inside the buildings. North Korea is likely heating the inside of the centrifuge hall in order to assure the correct functioning of the centrifuge machines. These machines are very delicate and require a stable temperature of about 23° C (75° F). Additionally, the centrifuge plant also emits heat from its autoclaves, which are used to heat the uranium hexafluoride in a cylinder into a gas prior to its entry into the cascades. The lack of snow on the roofs is consistent with the centrifuge plants being operational.

**Airbus - ISIS**  
**January 25, 2016**



**Figure 1.** Airbus imagery dated January 25, 2016 showing North Korea's Yongbyon nuclear facility.

**Airbus - ISIS  
January 25, 2016**



**Figure 2.** Airbus imagery showing the status of North Korea's 5 MWe and LWR reactors on January 25, 2016.



**Airbus - ISIS  
January 25, 2016**

**Figure 3.** Airbus imagery showing the status of North Korea's centrifuge enrichment plant at the fuel fabrication facility on January 25, 2016.