



## March 2016: Movement at North Korea's Yongbyon Nuclear Site

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*Analysis of recent Airbus satellite imagery dated March 15, 2016 shows no clear indicators that the 5 megawatt-electric (MWe) reactor is operating at full power. The reactor is likely still operating intermittently or at low power. However, other signatures of external activity are visible, such as a truck carrying a white, unidentified object and new earth excavation activities in the vicinity of the reactor's discharge pipeline. Three new unidentified structures have been constructed at the Radiochemical Laboratory, possibly for use as storage of chemicals or water. New construction material, possibly for new roof renovations, is present at the centrifuge plant, while movement of construction material and clean-up activities continue at a site ISIS has identified as a possible isotope separation facility. No significant new external activities are visible at the site of the Experimental Light Water Reactor. A carbon dioxide production site is understood to be near the Yongbyon site but its location is unknown; a possible site identified earlier now appears unlikely to be such a plant.*

### 5 Megawatt-Electric Reactor

Analysis of recent Airbus satellite imagery dated March 15, 2016 shows no clear indicators that the 5 MWe reactor is operating at full power. No water is visibly being discharged from the 5 MWe reactor's discharge pipeline and no steam is venting from the turbine building (see figure 1). However, the absence of these two indicators is in line with ISIS's previous assessments that the reactor has been operating intermittently or at low power. Since mid-2014, the reactor appears to have operated at lower power and has been shut down at certain times. Before that, from mid- 2013 to mid-2014, the reactor appears to have operated at near full power.

However, other signatures of external activity are visible in the March 2016 image. First, two trucks are visible at the entrance of the 5 MWe reactor. One is a large open-bed truck which has been spotted at this location several times before. The other truck, however, is carrying an unidentified, white, 2-meter by 2-meter object. Although it is very difficult to assess with certainty the nature of this object, the shape and size are consistent with some type of reactor equipment, a container of fresh fuel for the reactor, or even a spent fuel cask. In the last case, such a cask would be in the wrong place, but it could be parked there temporarily. In all three cases, however, higher resolution imagery or other information is required to determine the nature of this object.

Additionally, North Korea seems to have started new earth excavation activities in the vicinity of the 5 MWe reactor's discharge pipeline. Similar activity was observed in October 2014 when North Korea dug a long trench in this area. However, the purpose of these excavation activities remains unknown.

### Suspect Carbon Dioxide Production Plant

The 5 MWe reactor is cooled by carbon dioxide (CO<sub>2</sub>) gas, which needs periodic replenishment. The carbon dioxide is understood to be produced at a facility near the Yongbyon nuclear site. In a previous [Imagery Brief](#), ISIS identified a possible location for this CO<sub>2</sub> plant located about 10.5 kilometers south of the 5 MWe reactor. Given that this was a new site identification, we welcomed comments from other experts. We received comments and analysis from *38North*. Using access to a larger archive of high-resolution satellite imagery of this location, these analysts highlighted signatures that are more consistent with a livestock facility than a CO<sub>2</sub> production plant. We see no reason to question this analysis. Given the difficulty in identifying with certainty a CO<sub>2</sub> production plant, ISIS continues to welcome comments on the plant's location and North Korean methods to produce carbon dioxide.

### **Radiochemical Laboratory**

The Radiochemical Laboratory is the site where North Korea would chemically process newly discharged irradiated fuel from the 5 MWe reactor and separate plutonium for nuclear weapons. Although no external activity related to the operational status of the reprocessing building is visible, the plant is likely ready to operate as soon as it receives irradiated fuel from the reactor. In recent years, North Korea has procured chemicals, such as exchange resins, in China for the Radiochemical Laboratory and likely has enough for its operation.

The recent image shows three new unidentified structures at the Radiochemical Laboratory site (see figure 2). Although the purpose of these structures is unknown, it is possible that they are used to store chemicals or water. They may alternatively be associated with nuclear waste disposal. The foundations were laid in the fall of 2014 while the three structures were built in November 2015. The fact that the foundations were laid just after the 5 MWe reactor stopped full operation in the summer of 2014 could suggest that North Korea's intent was to build additional storage structures to help with the processing of spent fuel from the 5 MWe reactor, which had been in full operation between August 2013 and June 2014.

Another potential signature of reprocessing operations is the status of the nearby coal plant that is associated with the Radiochemical Laboratory. This coal plant is the source of industrial steam for the plant. In the most recent image it is not operational. However, plutonium separation could still occur without the coal plant being operational.

On balance, it is difficult to determine through satellite imagery alone if reprocessing is imminent or occurring at this site. In addition, in the past, North Korea took steps to hide activities related to plutonium separation, making it even more difficult to determine when plutonium separation took place.

### **Experimental LWR**

No significant new external activities are visible at the site of the Experimental Light Water Reactor.

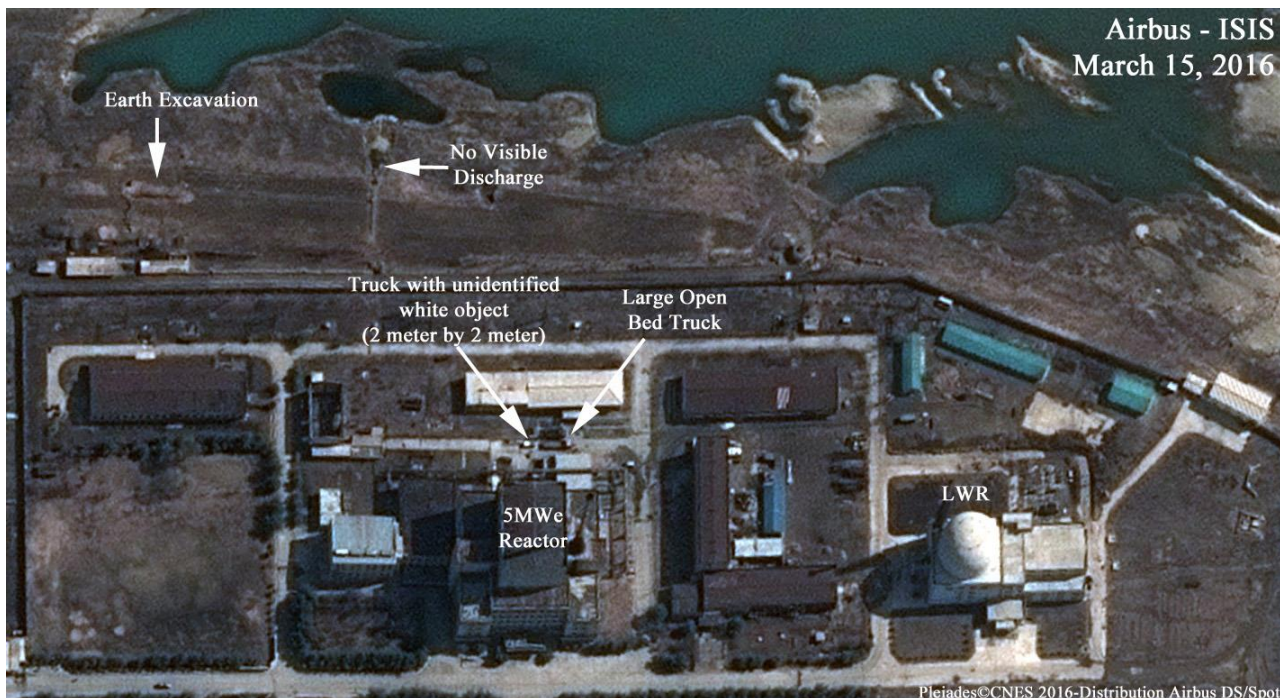
### **Suspect Isotope Separation Plant**

External movement of construction material and clean-up activities continue at a site ISIS has identified as a possible isotope separation facility (see figure 3). The site is close to the Yongbyon fuel fabrication complex and it presents signatures consistent with an isotope separation facility, including tritium separation (see earlier studies in [April](#) and [September](#) 2015). In [February 2016](#), a large 10 meter by 3 meter rectangular-shaped white object was present near the train tracks adjacent to this site. This

object presented signatures consistent with a large tank and continues to be present at the site as of March 15, 2016.

### Centrifuge Plant

The only significant new activity visible at the centrifuge plant is the presence of construction material east of the main centrifuge building (see figure 4). This material has been spotted before and is believed to be used for the roof renovation activities taking place at the building adjacent to the main centrifuge hall.



**Figure 1.** Airbus imagery showing the status of North Korea's 5 MWe and LWR reactors on March 15, 2016





**Figure 2.** Airbus imagery showing the status of North Korea's Radiochemical Laboratory on March 15, 2016



**Figure 3.** Airbus imagery showing the status of North Korea's possible isotope separation facility on March 15, 2016





**Figure 4.** Airbus imagery showing the status of North Korea's enrichment facility on March 15, 2016