



# Monitoring Developments at North Korea's Yongbyon Nuclear Site

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*The 5 megawatt-electric (MWe) reactor at the Yongbyon nuclear site appears to still be operating at low power or intermittently. A possible carbon dioxide production plant that supplies the 5 MWe reactor has been identified. No external activity is visible at the Radiochemical Laboratory, although it is likely ready to operate once it receives irradiated fuel. No significant new activity is visible at the centrifuge plant, although it is reasonable to assume that it is operational. The experimental light water reactor building does not show significant new external activity. External construction and clean-up activities continue at a site that presents signatures consistent with an isotope separation facility.*

## 5 Megawatt-Electric Reactor

Analysis of recent Airbus satellite imagery dated February 21, 2016 shows that no water is visibly being discharged from the 5MWe reactor's discharge pipeline, and no steam is venting from the turbine building (see figure 1). Thus, there are no clear indicators in this image that the reactor is operating at full power. 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 (see [here](#)). On some dates, there has been evidence of steam venting or small amounts of water discharge (visible in snow melt), and on other dates, no such evidence.

The image shows the movement of large vehicles and objects at the 5 MWe reactor (see figure 1). Two large trucks and a large 6 meter by 2 meter rectangular-shaped white object, which is either a truck or a tank, are visible at the entrance of the 5 MWe reactor. The purpose of the trucks could not be determined.

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.

On February 9, 2015, James Clapper, Director of National Intelligence, stated that North Korea had restarted the 5 MWe reactor.<sup>1</sup> We interpret his statement as a general statement, meaning that the reactor was restarted in 2013 following a North Korean announcement to refurbish and restart the reactor and other nuclear facilities. The reactor had previously been shut down in 2007 as a result of Six Party negotiations that froze plutonium operations at Yongbyon, and North Korea restarted the reactor

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<sup>1</sup> Statement for the Record Worldwide Threat Assessment of the US Intelligence Community, Senate Armed Services Committee, James R. Clapper, Director of National Intelligence, February 9, 2016.

soon after its 2013 announcement. We do not believe Clapper was referring to a restart of full power operations in the last several months.

Nonetheless, since its 2013 restart, the 5 MWe reactor has operated in total for about two and half years. Notwithstanding the intermittent operation over the past year and a half, the reactor has continued to produce plutonium in the uranium fuel. At some point, North Korea would be expected to remove the irradiated fuel and send it to the Radiochemical Laboratory to extract the plutonium for use in nuclear weapons. Clapper also said in his February 9th 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.”

Previously, North Korea has used trucks to move irradiated fuel from the spent fuel building near the 5 MWe reactor to the Radiochemical Laboratory. The trucks visible in this recent image are not next to the spent fuel building, which is just south of the reactor. Thus, it is not possible to conclude that North Korea is in the process of moving spent fuel.

### **Suspect Carbon Dioxide Production Plant**

The reactor is cooled by carbon dioxide (CO<sub>2</sub>) gas, which needs periodic replenishment. Figure 2 shows a possible carbon dioxide tank on a truck next to the reactor on December 1, 2014 (see report [here](#)). The carbon dioxide is believed to be produced at a nearby facility that makes a number of gases for the nuclear program. Figures 3 and 4 show a possible site of this gas plant that is about 10.5 kilometers south of the 5 MWe reactor. This is a new site identification and comments are welcome. We are still unable to identify the method North Korea uses to make 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. No external activity is visible at the Radiochemical Laboratory. However, the plant also is likely ready to operate, once it receives irradiated fuel. North Korea has in recent years obtained chemicals, such as exchange resins, in China for the Radiochemical Laboratory and likely has enough for its operation.

### **Experimental LWR**

The Experimental Light Water Reactor (ELWR) building does not show significant new external activity.

### **Suspect Isotope Separation Plant**

ISIS has assessed that a site, which is close to the Yongbyon fuel fabrication complex, presents signatures consistent with an isotope separation facility, including tritium separation (see earlier studies in [April](#) and [September 2015](#)). The February 21, 2016 image also shows that construction activity has continued at the site. The new imagery shows that external construction and clean-up activities continue, and a large 10 meter by 3 meter rectangular-shaped white object is present near the train tracks adjacent to this site (see figure 5). This object presents signatures consistent with a large tank.

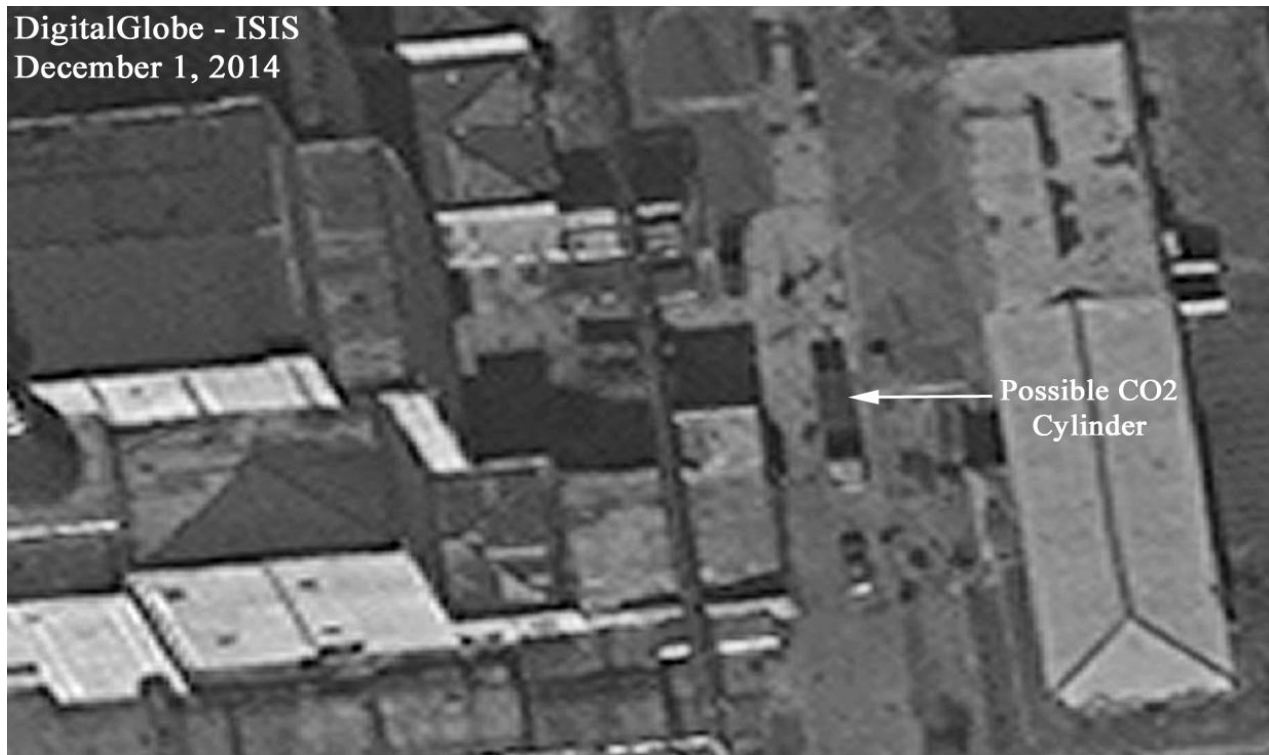
### **Centrifuge Plant**

No significant new activity is visible at the centrifuge plant. It is reasonable to assume that the centrifuge plant is enriching uranium, including in the recently built addition.



**Figure 1.** Airbus imagery showing the status of North Korea's 5 MWe and ELWR reactors on February 21, 2016.

DigitalGlobe - ISIS  
December 1, 2014



**Figure 2.** Digital Globe imagery showing North Korea's Yongbyon 5 megawatt-electric (MWe) reactor and a truck carrying a possible CO<sub>2</sub> cylinder on December 1, 2014.



**Figure 3.** Google Earth imagery showing the possible location of North Korea's CO<sub>2</sub> production plant in reference to the Yongbyon Nuclear Site.



**Figure 4.** Google Earth imagery showing the possible location of North Korea's CO<sub>2</sub> production plant.



**Figure 5.** Airbus imagery showing the status of North Korea's possible Isotope Separation Facility on February 21, 2016.



**Figure 6.** Airbus imagery showing the status of North Korea's Fuel Fabrication Facility and possible Isotope Separation Facility on February 21, 2016.