



November 13, 2008

Arak Heavy Water Reactor Construction Progressing

By David Albright and Paul Brannan

Much of the focus on Iran's nuclear facilities remains fixed on the Natanz enrichment plants and Iran's progress toward mastering the gas centrifuge uranium enrichment process. While seldom noticed, Iran continues with construction of a heavy water reactor at Arak, called the IR-40, which has a declared power of 40 megawatts-thermal.¹ ISIS has obtained commercial satellite imagery from DigitalGlobe of the Arak heavy water reactor taken on October 7, 2008 (see figure 1). A comparison of this image to one taken by GeoEye OrbView-3 (see figure 2) on February 25, 2007 shows significant progress. Construction of the reactor dome is nearing completion and other buildings adjacent to the reactor appear much further along. Construction of the cooling towers also appears complete in the October 2008 image, whereas its foundation is absent in the February 2007 image.

According to a senior official close to the IAEA in September 2008, Arak reactor construction will end in 2011 and the reactor will achieve criticality in 2013. Several years ago, at least one Iranian official stated publicly that the reactor could be finished in 2009, suggesting delays in its construction. One unknown is whether Iran would decide to speed up construction of the reactor site.

If operating optimally, the reactor at Arak would produce about 9 kilograms of plutonium annually or enough for about two nuclear weapons each year, should Iran choose to separate plutonium from the reactor's irradiated fuel. Extracting plutonium from irradiated fuel requires a reprocessing facility. Iran has insisted that it will not build any such facilities; however, suspicions remain that it could do so—perhaps even at this site.

¹[*Further Construction at Arak 40 MW Heavy Water Reactor*](#), David Albright and Paul Brannan, ISIS, March 20, 2007.

[*Update on Construction Activities at Arak 40 MW Heavy Water Reactor*](#), David Albright and Paul Brannan, ISIS, April 21, 2006.

[*Iran Constructing the 40 MW Heavy Water Reactor at Arak Despite Calls Not to Do So by the European Union and the IAEA Board of Governors*](#), David Albright and Paul Brannan, ISIS, March 4, 2005.

According to IAEA safeguards reports on Iran and recent discussions with senior diplomats close to the IAEA, there are thick-walled hot cells in a facility next to the reactor to handle irradiated fuel and targets taken from the reactor. According to Iran, these hot cells would be used for packaging of the irradiated fuel and targets. According to the design information Iran provided to the IAEA, the hot cells will not separate plutonium from irradiated fuel. On the reactor site, Iran is constructing a radioisotope production laboratory, with its own thinner-walled hot cells, that would chemically extract radionuclides from the targets. According to Iran, these radionuclides would be used for civil applications, including medicine.

Periodically, the IAEA visits the facilities that are part of the reactor site including the reactor building, the hot cells, and the radioisotope production facility.² As of October 2008, Iran had not yet installed equipment in the hot cells, including manipulators and specialized windows. The status of construction of the radioisotope production facility is not known, but it too lacks equipment. According to one official close to the IAEA, the reactor also requires more nuclear equipment. In addition, Iran lacks reactor fuel, which will use natural uranium and be manufactured at Esfahan.

Iran can produce much of the equipment needed to build and operate these reactor facilities. To acquire some of the missing equipment, however, it is expected to turn to illicit overseas procurement. If it fails to defeat international sanctions, Iran may have to further delay the start-up of the reactor.

² The IAEA performs routine design information verification at the IR-40 reactor. In March 2007, the Iran informed the IAEA that it was suspending implementation of the so-called modified Code 3.1 of Iran's safeguards agreement and reverting to the 1976 version of the code, which did not require design information inspections until six months before the introduction of nuclear material into a facility. The IAEA protested that such agreements cannot be modified unilaterally and urged Iran to reconsider. In July 2007, Iran agreed to allow IAEA inspectors to conduct design information inspections of the IR-40 reactor. Monitoring of the adjacent heavy water production plant however continues remotely, via satellite imagery analysis.

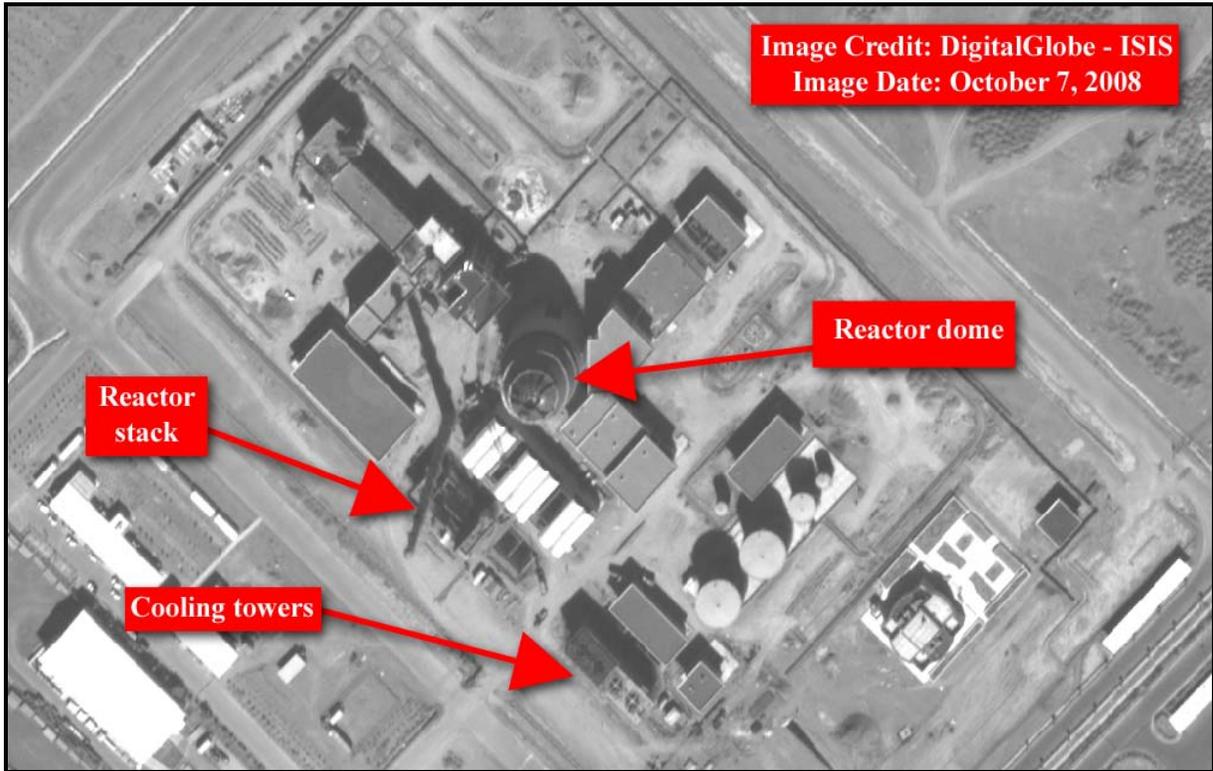


Figure 1. October 7, 2008 DigitalGlobe image of Arak heavy water reactor in Iran.

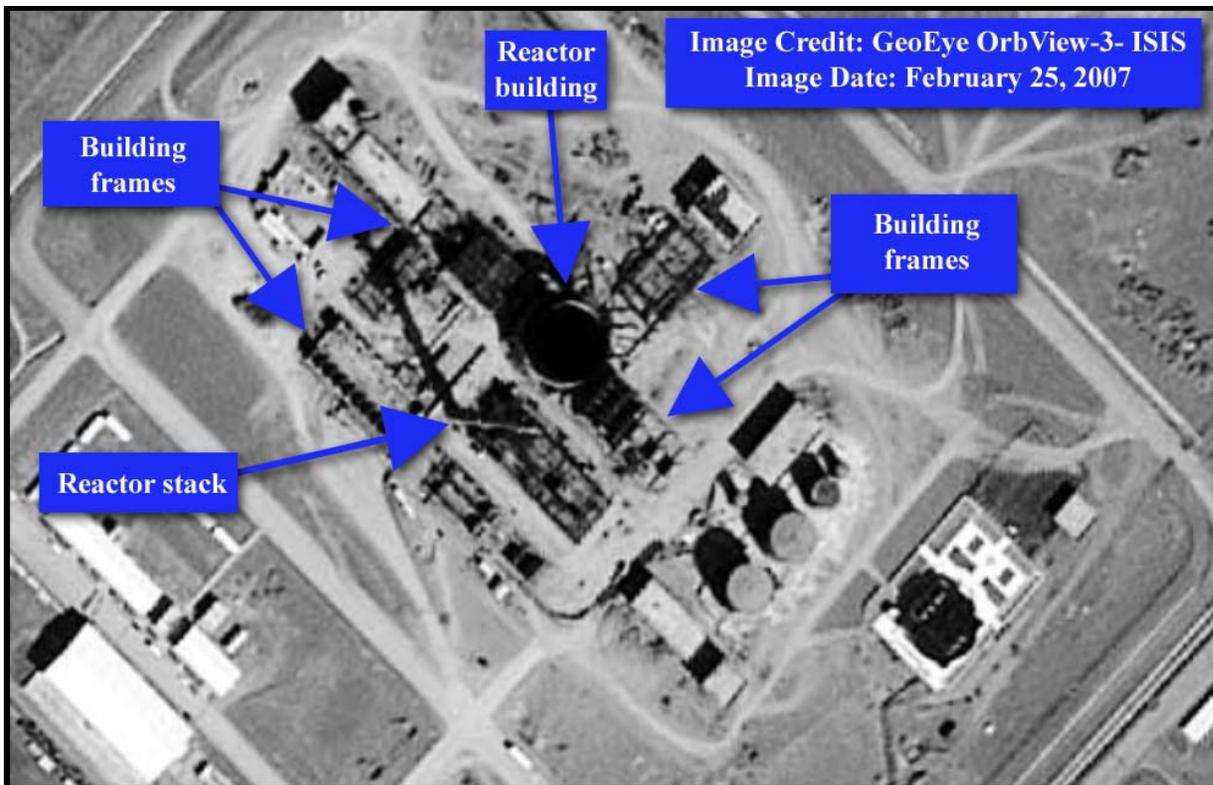


Figure 2. February 25, 2007 GeoEye OrbView-3 image of Arak heavy water reactor in Iran.