



Chashma Nuclear Site in Pakistan with Possible Reprocessing Plant

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ISIS has obtained commercial satellite imagery from DigitalGlobe and GeoEye of the Chashma nuclear industrial park in Pakistan (Figure 1). The Chasnupp 1 reactor is visible in the northeast part of the site and construction of the Chasnupp 2 reactor is seen just to the east (Figures 1 and 2). To the south of Chasnupp 1 is what appears to be a large area to support the excavation for and construction of Chasnupp 2. To the northwest of Chasnupp 1 is a compound believed to be the Kundian nuclear fuel fabrication facility (Figure 3).

The most noteworthy section is in the southwest corner of the site, surrounded by perimeter walls, which could be the site of the widely discussed Chashma reprocessing facility¹ (Figure 4). If so, we believe that the most likely building to house the main reprocessing operations is a large, tall building with an adjacent stack. It is not yet clear whether this facility at Chashma is operational. However, the nature and rate of the construction suggests that the facility may soon start operations, if it has not done so already.

The imagery raises the question of whether Pakistan may intend on bringing into operation a new reprocessing facility—capable of separating weapons-grade plutonium out of spent reactor fuel. Such a capability, combined with Pakistan's ability to make large quantities of highly enriched uranium (HEU) for nuclear weapons, would aid Pakistan in developing thermonuclear weapons as well as increasing the size of its nuclear arsenal.

Background

In 1974, Pakistan began soliciting European firms for bids to build a reprocessing plant capable of separating weapons-usable plutonium from 100 tonnes of spent nuclear fuel per year from its KANUPP reactor in Karachi. Pakistan eventually contracted with a French firm for the plant at Chashma, but the deal fell through in 1979 after the U.S. government registered strong objections. A certain amount of design information for the plant was transferred from the firm to Pakistan, however, despite the termination of the deal. The facility was partially constructed, but the full extent of the technology transfer

¹ *Pakistan's Past, Current and Future Reprocessing Capabilities*, Jack Boureston, First Watch International, October 1, 2006.

is not known. Since the cancellation of the Chashma reprocessing deal, media have reported that Pakistan may have continued obtaining equipment for the plant—perhaps from China.²

Pakistan's current reprocessing plant, New Labs facility at PINSTECH located near Islamabad, is capable of handling the spent nuclear fuel from the first Khushab heavy water reactor. Bringing into operation a reprocessing facility at Chashma would significantly increase Pakistan's plutonium separation capability and account for what will soon be an expanded plutonium production capacity—as represented by the construction of a second heavy water reactor at Khushab.

Southwest Area May Contain Reprocessing Facility

The large size and windowless facades of the large, tall building adjacent to the stack in the southwest area of the Chashma nuclear site (as seen in Figure 10) suggests an industrial purpose. If reprocessing activities were to take place in the surrounding buildings, the stack would serve as a means of expelling up and away from the site the fission product gases such as iodine and the noble gases resulting from the separation process.

A comparison of imagery from 2000, 2002, 2005 and 2006 indicates construction activity in this area resumed sometime between late 2000 and late 2002, and continued steadily through the next four years. An image of the site from October 21, 2000 shows the site largely overgrown, without construction activity or even roads (Figure 5). Two years later, in the October 19, 2002 image, a significant amount of construction has taken place, with materials next to buildings and dirt paths already well worn from vehicles (Figure 6). By 2005, there are more noticeable differences suggesting further progress in construction (Figure 7). Partially constructed buildings in October of 2002 appear finished in September 2005. The pond located near the stack is empty and recently excavated with adjacent soil dumps in October of 2002, but it is full in the September 2005 image. Furthermore, the October 2002 image shows this part of the Chashma site full of soil dumps and with dirt paths instead of paved roads. The roads at this part of the site in the September 2005 image are paved. The September 3, 2006 image shows construction materials and trucks next to buildings as well as the construction of two more buildings (Figure 8).

The 2000 image adds support to the view that this is the site of the old Chashma reprocessing plant. Construction of these buildings would have started in the 1970s following the order of the French reprocessing plant. Sometime after the French cancelled the order, site construction may have stopped and the site allowed to become overgrown. In addition, the revamped construction at this site started at about the same

² *China Aids Pakistani Plutonium Plant; Facility May Boost Missile Efforts*, Gertz, The Washington Times, April 3, 1996.

time that Pakistan started construction of the new heavy water production reactor at Khushab³.

There are three rail lines that split off from a main line from the southwest and enter this section (Figure 9). The remnants of two of the rail lines lead into the western side of the large building (Figure 10). The rail lines, which appear to be defunct (portions of track are missing) may once have served as the intended means of transporting spent fuel to the building from the KANUPP reactor in Karachi, which is over 900 kilometers to the southwest. The tracks leading up to the building may have been removed as a result of the cancellation of the original French reprocessing deal or in anticipation of the construction of newer, closer heavy water reactors. Spent fuel from the Khushab reactors, located approximately 80 kilometers to the east, could arrive at the Chashma facility via trucks.

An image of the Chashma site collected on October 19, 2002 and posted on Google Earth shows a series of trenches leading from building to building (Figures 11). The system of trenches indicates the movement of liquids through underground pipes among the buildings. These liquids could include the liquid radioactive waste resulting from the separation process. In the September 25, 2005 image (Figure 12), most of these trenches appear to have been covered though the faint outline of some sections can still be seen. The earth surrounding the buried pipes would serve as insulation as some of the liquid waste may be intermediate or high-level radioactive waste.

Conclusion

The large size of the building, the resumption of construction activities, the presence of rail lines leading up to it, the adjacent tall stack, and the system of trenches among the buildings all constitute circumstantial evidence that the site is intended for reprocessing. Other key signatures of a reprocessing facility, such as the presence of thick wall shielding and individual cells inside the building, cannot be determined from the imagery, all of which was taken after the roof was installed.

This potential finding raises a number of important questions: If Pakistan has indeed recently intensified efforts to build a reprocessing capability at Chashma, what will be the plutonium separation capacity of the facility? Could its capacity be similar to its original intended capacity of 100 tonnes of spent nuclear fuel per year? Did Pakistan receive any further assistance from other states? How is the construction of a new heavy water reactor at Khushab related? What would be the impact of increased plutonium production and separation on India? Noting India's recently intensified efforts to

³ "Commercial Satellite Imagery Suggests Pakistan is Building a Second, Much Larger Plutonium Production Reactor at Khushab," by David Albright and Paul Brannan, The Institute for Science and International Security, July 24, 2006: <http://isis-online.org/publications/southasia/newkhushab.pdf>

increase uranium enrichment capabilities at the Rare Materials Plant⁴, the prospect of Pakistan dramatically increasing its own plutonium separation capability would raise the question of whether the two countries are already engaged in an expanded arms race focused on expanding the size and quality of their nuclear arsenals, including building significant numbers of thermonuclear weapons.

⁴ "India's Gas Centrifuge Program: Growing Capacity for Military Purposes," by David Albright and Susan Basu, The Institute for Science and International Security, January 18, 2007: <http://isis-online.org/publications/southasia/indiagrowingcapacity.pdf>



Figure 1. An overview of the Chashma site.

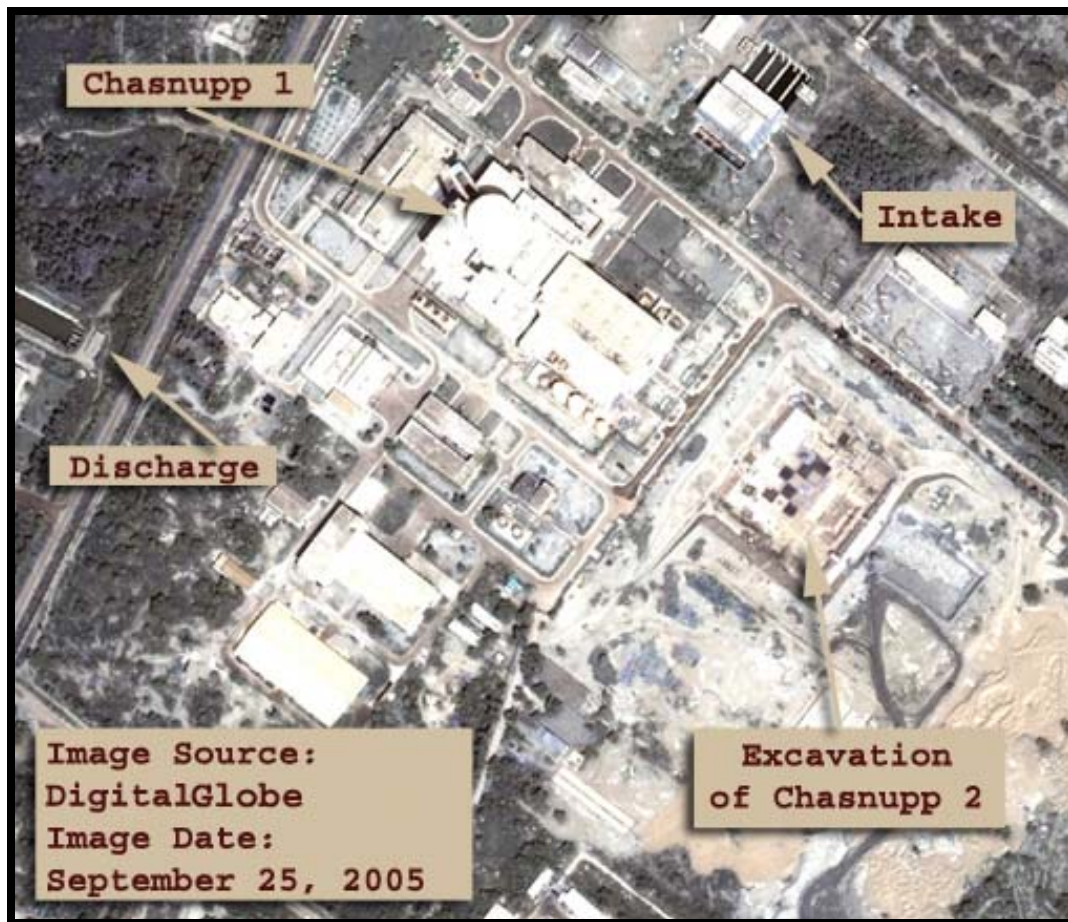


Figure 2. Overview of Chasnupp 1 and the excavation for Chasnupp 2.

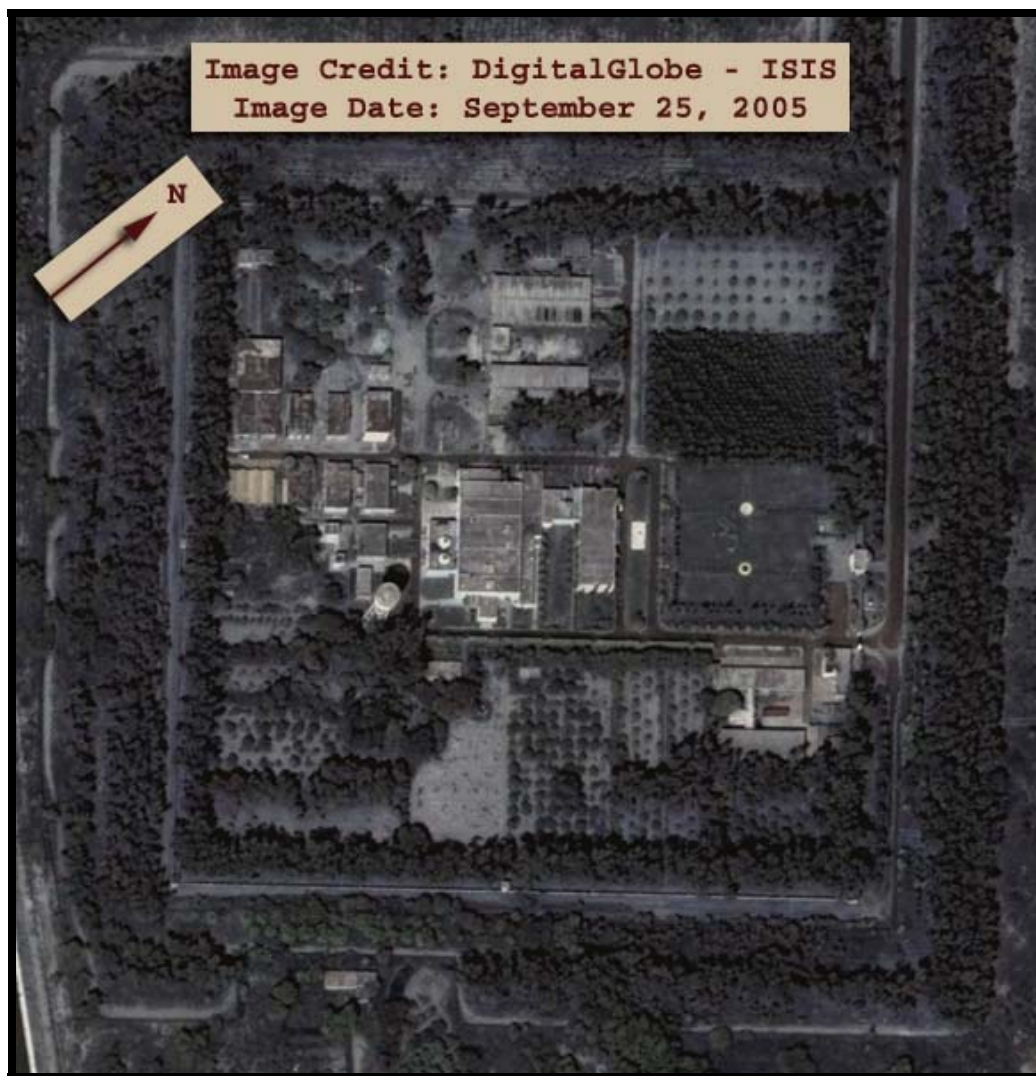


Figure 3. Possible Kundian nuclear fuel fabrication plant.



Figure 4. Chashma, southwest corner, possible reprocessing facility.



Figure 5. October 21, 2000 image of the possible reprocessing facility.



Figure 6. October 19, 2002 image of the possible reprocessing facility.



Figure 7. September 25, 2005 image of the possible reprocessing facility.

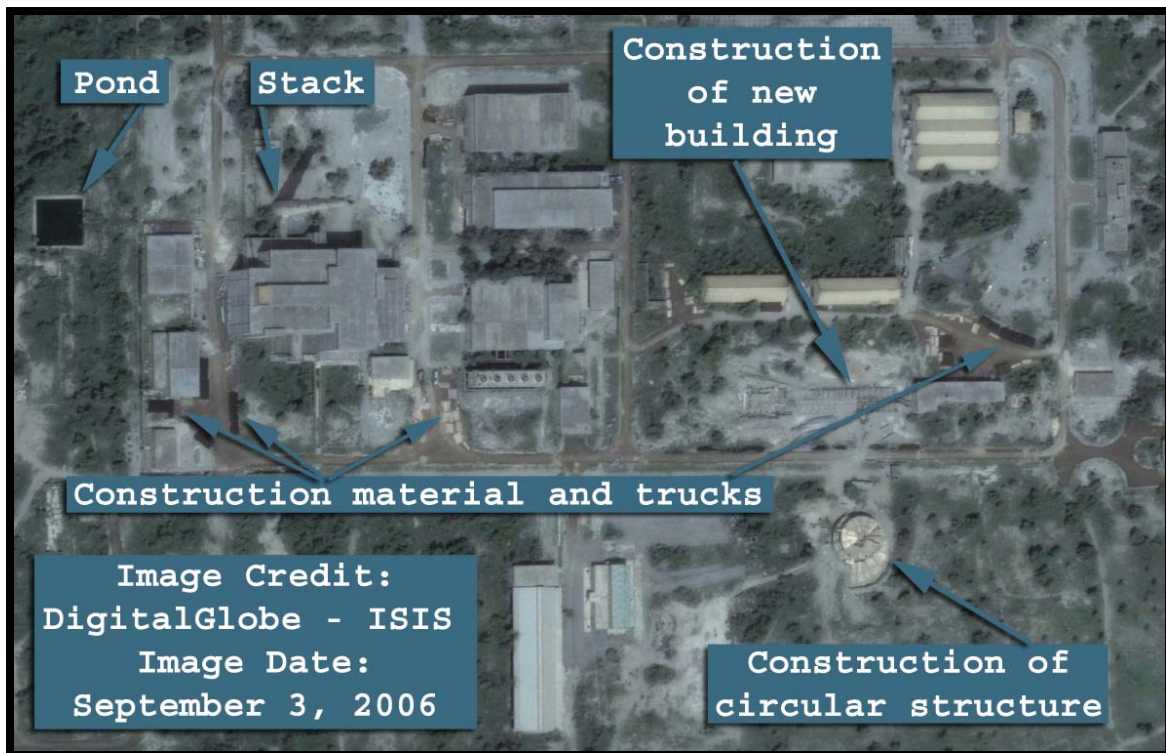


Figure 8. September 3, 2006 image of the possible reprocessing facility.



Figure 9. Three rail lines splitting off from the main line. The two northern-most lines lead into the western edge of the building.



Figure 10. Remnants of two rail lines leading into the side of the building.



Figure 11. October 19, 2002: One system of trenches can be seen next to the large building. It then continues past three more buildings, continues down and ends at a building in the bottom-left corner of the image.



Figure 12. September 25, 2005: Most of these trenches appear to have been covered and the outline can still be seen in some sections.