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Taking Stock and Moving Forward on the Issue of the Parchin High Explosives Test Site

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For almost a year, international attention has focused on Iran's Parchin military complex. This site is where Iran is suspected to have conducted in the early 2000s high explosive compression tests pertinent to the development and manufacturing of nuclear weapons. The experiments are alleged to have occurred inside an explosive chamber located in a compound in the north of the sprawling military complex. As far as can be determined, neither the International Atomic Energy Agency (IAEA) nor the U.S. government has alleged that the experiments continued after 2004. Iran's goal of using this chamber would likely have been to hide its activities from overhead observation by foreign intelligence agencies and minimizing the chance that material used in testing would be dispersed off-site, increasing chances of detection. Western intelligence agencies have historically devoted considerable resources via ground and air-based methods to detecting nuclear related facilities, activities, and material at Iranian sites suspected of having been involved in nuclear weaponization and enrichment work.

According to IAEA information, the chamber was constructed in 2000 and designed to contain explosions involving up to 70 kilograms of high explosives. The IAEA has not published a detailed rationale for its request to Iran to visit the Parchin site. However, it reported in its November 2011 safeguards report that Iran used the test chamber to conduct high explosive tests in the early 2000s, possibly related to nuclear weapons development. A senior U.S. official [told CNN](#) (and the same official independently stated to ISIS), "We know explosive compression was done at this chamber." The use of such chambers was pioneered by the Soviet nuclear weapons program; the Soviet, U.S., and British nuclear weapons programs have each used chambers for high explosive compression work related to nuclear weapons development. Based on its information and assessments, the IAEA requested a visit to this building in early 2012 to verify the chamber's existence and evaluate whether high explosive tests were conducted that are relevant to developing nuclear weapons. So far, as of the January 2013 high-level negotiations with the IAEA in Tehran, Iran has refused access while at the same time conducting major demolition and construction on the grounds of the site.

Tests Conducted?

The IAEA has not provided complete information on which tests it believes Iran could have conducted inside the Parchin chamber. It has provided partial information and the media have reported on additional types of possible tests. As best as can be determined, three types of tests could have been conducted, each with appropriate diagnostic equipment, although the IAEA has never confirmed such a list and still other types of tests are possible. The three most commonly discussed tests have been:

- A test of the initiation components of a nuclear warhead, which [could have involved](#) up to 50 kg of high explosives. This test would not contain any uranium. The November 2011 safeguards report noted that the explosive chamber at Parchin would be suitable for carrying out this type of test.
- A test to ascertain the symmetry of an imploding hemispherical shell of high explosives, surrounding a uranium metal hemisphere, in a scaled down experiment. A technical advisor to ISIS with decades of involvement in the experimental study of nuclear weapon mock-up explosions evaluated this case. He assessed that based on the constraints of this chamber and the use of powerful high explosives, the explosive shell would contain about 50 kilograms of high explosives, an amount within the constraints of the chamber.
- A test of a uranium deuterium neutron initiator used in a nuclear weapon. The initiator is located at the center of a compression system involving a sphere of high explosives and possibly a non-nuclear surrogate material for the weapon-grade uranium core. The goal of the experiment is to compress the initiator, causing the fusion of the deuterium and a spurt of neutrons. This test would involve only a few grams of uranium and deuterium with variable amounts of explosives.

Update on Current Activities at Parchin

A reconstruction phase continues at a steady pace at the alleged Parchin high explosives test site, as shown by recent Digital Globe commercial satellite imagery acquired by ISIS. The site underwent a demolition phase from April to August 2012 and entered what appears to be a reconstruction phase in late September or early November. In satellite imagery from January 17, 2013, several activities at the site appear to be almost complete and there is also evidence of new construction work (figure 1).

In a May 30, 2012 [report](#) ISIS published satellite imagery showing the demolition of two buildings located near the building suspected to contain the high explosive test chamber (figure 2). ISIS was not able to establish the purpose for why the buildings were demolished. Debris from the larger of the two was completely cleared from the site but some debris from the smaller building was left. As seen in the January 17 satellite imagery, the smaller building has now been reconstructed (figure 1). The new imagery also shows what appears to be the foundation of a new building not far from where the second demolished building was located. The size and layout of the excavation, however, do not suggest that the same building is being reconstructed.

Construction of the new security perimeter also appears to be nearing completion. The new perimeter resembles the previous layout except its southern section has been visibly extended and it now runs much closer to the buildings on the western side of the site (figure 1). There is also new construction of what appears to be a small building located outside the northern side of the security perimeter. Earth piles initially visible in early November 2012 are still visible in the northern part of the site as are heavy machinery and materials indicating the likelihood of further construction. There is also earth displacement nearby the two support buildings located just south of the suspected chamber building although at this stage it is impossible to determine its origin.

IAEA at a Crossroads

ISIS has consistently called for strong diplomatic measures to be taken in support of IAEA inspectors gaining access to the Parchin site. The legal justification for IAEA access is [well established](#). The IAEA is seeking to fulfill its mandate to determine both the correctness and completeness of Iran's declaration under its traditional comprehensive safeguards agreement (CSA).

However, Iran's continued refusal to allow access and the degree of alterations made to the site may have severely undermined the possibility of the IAEA reaching a conclusion about allegations that Iran conducted nuclear weapons related research at this site. The IAEA has also reached this conclusion.

What should the IAEA do now? It could continue asking for a visit or it could call for a special inspection, which it can use in circumstances where there is sufficient suspicion of undeclared nuclear weapons related activities and insufficient cooperation from a member state that would allow for inspections. At this point, neither option is attractive.

The IAEA has asked to visit the Parchin site as opposed to calling for a special inspection. In the case of a visit, Iran would need to grant it on a voluntary basis. Iran could impose limitations on inspectors' access during a visit, which is not the case under a special inspection. During the IAEA's first visit to Parchin in 2005, Iranian conditions for allowing the visit forced IAEA inspectors to choose between one of several sections of the sizeable complex. As a result, the 2005 visit, while helpful, did not resolve the IAEA's questions about the activities in other areas of the Parchin military complex.

In the case of an IAEA visit to the building containing the alleged high explosive chamber, Iran could likewise limit inspectors' access and the quality of sampling they could carry out.¹ It is conceivable that the original tests and considerable earth displacement at the site more recently could have spread incriminating radioactive material beyond the immediate area of the buildings. In the scenario of a visit, Iran could legitimately prevent IAEA access to areas of interest, thus limiting access to only those areas that have been heavily sanitized, such as those inside the newly reconstructed perimeter of the site. The example of the IAEA's visit to the Lavisan-Shian site in Tehran shows that extensive excavation and removal of dirt can prevent effective sampling. During this visit, Iran refused the IAEA access to extensive rubble and debris removed from the site. It could also do so in the case of Parchin.

Finding incriminating evidence inside sanitized or reconstructed buildings is challenging and often impossible. One of the inspectors' key tools in uncovering undeclared nuclear activities is environmental sampling, but such sampling can be thwarted by the types of actions Iran has taken at the Parchin site. The Kalaye Electric site in Tehran is often rightly given as a major success story of environmental sampling, despite extensive Iranian efforts in 2003 to hide evidence of secret, undeclared enrichment of uranium in two buildings at the site. But this case should also be a cautionary tale. Although required under its comprehensive safeguards agreement to declare the site as enriching uranium, Iran chose to hide its activities in violation of its CSA. In early 2003, when the site was exposed, Iran took major steps to hide its past centrifuge related activities at this site.² It refused the IAEA access while it reconstructed the building that had held a small cascade of centrifuges and undertook significant renovations at another building that had conducted single centrifuge testing. Subsequent IAEA environmental sampling of the building that held the small cascade discovered no enriched uranium particles, although Iran later admitted to significant enrichment in that building. The reconstruction effort successfully thwarted such sampling. But Iran had not sanitized the building containing the single centrifuge tests, and inspectors took a sample in the unsanitized ventilation system above where a single machine test stand had been located. The collected sample showed evidence of enriched uranium particles.

¹ For example, during the 2008 IAEA visit to the Al Kibar (Dair Alzour) reactor site in Syria, the IAEA was allowed to collect sandy soil at the site but could not include any rubble mixed in with that soil. In fact, the IAEA sample tubes were checked at least once by a Syrian official, who removed a piece of rubble from one sample. These soil samples still yielded a significant number of uranium particles. Particles were also found in a changing room in a building associated with the reactor. The IAEA reported that analysis of the samples taken in June 2008 at the Dair Alzour site indicated the presence of particles of anthropogenic natural uranium of a type not included in Syria's declared inventory of nuclear material. The IAEA's assessment was that there is a low probability that the uranium was introduced by the use of missiles since the isotopic and chemical composition and the morphology of the particles were all inconsistent with what would be expected from the use of uranium based munitions. [From IAEA Director General, *Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic*, GOV/2009/9, February 19, 2009.] The analysis suggested that the uranium originated in a metal form, which is consistent with the type of fuel used in a North Korean gas-graphite reactor of the type alleged to have been built by Syria.

² Albright, *Peddling Peril* (New York: Free Press, 2010).

The Kalaye Electric case shows that the reconstruction or sanitization of buildings can prevent environmental sampling from detecting uranium or at least make it difficult to uncover undeclared work. In the case of Parchin, given Iran's history of hiding its undeclared activities, the IAEA cannot depend on Iran again making a mistake.

The IAEA could call for a special inspection of Parchin and probably should have done so early last year. However, today, Iran would be expected to defy a call for a special inspection, especially since such an inspection would place the IAEA in charge of establishing the inspection procedures and methods used at the site. Pursuing a special inspection would likely force a showdown with Iran at the Board of Governors meeting. Furthermore, such an action taken now would focus the conflict between the IAEA and Iran on this one facility. The controversy over Iran's nuclear weaponization efforts is considerably larger than one facility.

Most of the criticism of the IAEA's call for a visit to Parchin has offered few recommendations for a constructive way forward. Many criticisms have focused on undermining the IAEA's rationale for asking to visit Parchin and have presented faulty, alternative interpretations of the IAEA's legal authority, satellite imagery of the site, and technical details related to the site. Some have urged an acceptance of Iran's denials of any nuclear weapons related work at Parchin; still others claim that Iran has done nothing suspicious at the site but was deliberately modifying it as part of a clever negotiating strategy. Iran has shown little interest in successful negotiations and its actions at the site have significantly increased suspicion throughout the world that it is actually removing evidence. One critic recently recommended inspections of Parchin, although he recommended they be carried out by a group other than the IAEA. No formula was offered for how to establish such a group or how to achieve agreement among the many stakeholders involved in that decision. Furthermore, the IAEA is accepted by the vast majority of the world as the legitimate, credible nuclear inspection authority and a non-IAEA inspection would undermine its authority.

Going to the Board

With little hope for a meaningful IAEA visit and recognition of the risks of calling for a special inspection, what should be done next?

The IAEA cannot close the case on Parchin without a visit. And as long as the IAEA cannot settle the Parchin issue, it will remain a source of suspicion that undermines any effort to establish confidence or achieve a negotiated outcome.

The best way forward is likely for the IAEA to take the entire issue of possible military dimensions of Iran's nuclear program to the Board of Governors. The IAEA has tried for several years to negotiate an umbrella agreement with Iran aimed at resolving the evidence of Iran's past and possibly on-going work on nuclear weapons and a past parallel, military fuel cycle program. This effort has likewise reached an impasse.

The Board of Governors should now pass a resolution condemning Iran's refusal to allow an inspection at Parchin and to answer the IAEA's questions about possible military dimensions, noting that such actions thwart the IAEA's ability to answer the fundamental question of whether Iran's nuclear declaration is complete. This resolution should then refer the entire set of issues to the U.N. Security Council for further discussion and action.



Figure 1. Satellite imagery from January 17, 2013 showing a new security perimeter, reconstruction of one of the demolished buildings, and the possible foundation of a new building at the Parchin site.



Figure 2. Imagery from May 25, 2012 showing the debris from the demolition of two support buildings located near the building suspected to contain the high explosive test chamber.