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Iran's Nuclear Program: Recent Developments

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Summary

Revelations about Iran's capability to produce enriched uranium — the fissile material for a nuclear weapon — prompted a flurry of inspections, diplomatic missions and rhetoric in mid-2003 regarding Iran's compliance with the Nuclear Nonproliferation Treaty (NPT). The International Atomic Energy Agency's (IAEA) most recent findings reportedly detail two enrichment programs (centrifuges and lasers) and the separation of plutonium, another fissile material, in small quantities. Although the IAEA has stated previously that Iran has not met all of its NPT obligations, it has not yet declared Iran in violation of the NPT. On November 20-21, 2003, the IAEA Board of Governors will meet to discuss Iran. Meanwhile, Iran agreed on November 10 to sign the Additional Protocol, which contains provisions for enhanced inspections. This report, which will be updated as needed, analyzes the significance of the IAEA's findings for a possible Iranian nuclear weapons program. See also CRS Report RL30551, *Iran: Arms and Weapons of Mass Destruction Suppliers*.

Background

Iran has had a nuclear program for close to 50 years, beginning with a research reactor purchased from the United States in 1959. The Shah's plan to build 23 nuclear power reactors by the 1990s may have been regarded as grandiose, but was not necessarily viewed as a "back door" to a nuclear weapons program, possibly because Iran then did not seek the technologies to enrich its own fuel or reprocess its own spent fuel.¹ There were a few suspicions of a nuclear weapons program, but these abated in the decade between the Iranian 1979 revolution and the end of Iran-Iraq war, both of which brought a halt to nuclear activities. Iran's current plans — to construct nuclear power plants with a total capacity of 6000MW within two decades — are still ambitious, and some question the

¹ However, there have been reports that Iran's AEOI sought laser enrichment technology in the United States in the late 1970s, and that reprocessing-related experiments were conducted. In addition, there were intelligence reports that the Shah had a secret group to work on nuclear weapons. See Leonard S. Spector, *Nuclear Ambitions* (Colorado: Westview Press), 1990, p. 204.

need for nuclear power in a state with considerable oil and gas reserves. Iran, however, is using the same argument it used in the 1970s: that nuclear power is necessary in the context of rising domestic energy consumption rates and a desire to preserve oil and gas to generate foreign currency. Recently, however, Iran's stated intention to explore fuel cycle, safety, and waste management technology, which include sensitive fissile material production capabilities, has elevated concern about possible nuclear weapons production.

In May 2003, the Iranian officials told other NPT Prepcom delegates that "we consider the acquiring, development and use of nuclear weapons inhuman, immoral, illegal and against our basic principles. They have no place in Iran's defense doctrine."² Iranian officials call the speculations over the secrecy of Natanz and Arak "quite unfounded and irrational;" that it is not obligated under its current safeguards agreement to declare the heavy water production plant; and that it made no attempt to hide construction (although it did argue similarly for the enrichment plant). On August 6, President Khatami stated that Iran "cannot use such weapons based on our Islamic and moral teachings," but that Iran would not give up nuclear technology for power generation.³

Longstanding U.S. concerns about Iran's intentions to develop nuclear weapons have escalated in the last two years. First, Iraq's capabilities clearly have advanced.⁴ Much concern in the last decade focused on what Iranians might learn through Russian help on the Bushehr nuclear reactor project. Despite U.S. attempts to impose an international embargo on nuclear cooperation with Iran since the 1980s, Iran appears to be on the threshold of enriching uranium. The IAEA said in August that it detected particles of highly enriched uranium in samples taken at Natanz, which may or may not indicate that Iran has been able to enrich uranium. Iran has asserted that its nuclear program is strictly peaceful, but few observers believe uranium enrichment necessary or economic for a civilian nuclear fuel cycle like Iran's.

The Bush administration's emphasis on three "axis of evil" states — Iraq, Iran, and North Korea — has also focused attention on Iran. Some observers have argued that the WMD capabilities of Iran and North Korea were more worrisome than those of Iraq, particularly in the nuclear area. Iran's uranium centrifuge enrichment capability — a key technology that is difficult to detect and quite efficient for producing highly enriched uranium for simple gun-type assembly nuclear weapons — seems to be more advanced than Iraq's and, possibly, North Korea's.⁵

² Statement by H.E. Mr. G. Ali Khoshroo, Deputy Foreign Minister for Legal and International Affairs, Second Session of the Prepcom for the 2005 NPT Review Conference, April 29, 2003.

³ "Iran Denies It's Building Nuclear Bomb," *Associated Press*, August 7, 2003.

⁴ Leonard S. Spector, "Iran's Secret Quest for the Bomb." *YaleGlobal*, May 16, 2003.

⁵ A November 2002 CIA white paper on North Korea's enrichment capabilities said North Korea had recently begun constructing a centrifuge facility and began seeking in 2001 large quantities of centrifuge-related equipment. Iran, according to the IAEA's report, is constructing a commercial scale plant (built for 50,000 centrifuges) and has an operational pilot plant. See CRS Report RL31900, *Weapons of Mass Destruction: Trade Between North Korea and Pakistan*.

Third, the National Council of Resistance of Iran (NCR) has been quite active in exposing nuclear facilities in Iran.⁶ The NCR, which has been on the State Department's list of foreign terrorist organizations since 1997, held three press conferences in the last year to reveal alleged covert nuclear weapons-related sites. On August 14, 2002, the NCR described the nuclear sites at Natanz and Arak, which were shown in satellite photographs later that year. On May 27, 2003, the NCR revealed information about sites thought to be used for laser enrichment of uranium: the Lashkar-Abad site near Hashtgerd and a site near Ramandeh village. On July 8, 2003, the NCR revealed two more sites, including the Kolehdoz Complex (related to centrifuge enrichment) and Ardekan Nuclear Fuel Site.

The NCR and other exiled groups have a mixed record of providing accurate information, but their revelations have given the International Atomic Energy Agency (IAEA) leverage to investigate claims.⁷ Following the August 2002 NCR press conference, Iran's Vice President Reza Aghazadeh informed the IAEA about its nuclear fuel cycle activities; according to the IAEA, Director General ElBaradei asked Aghazadeh to confirm media reports of the facilities at Natanz and Arak at the September General Conference.⁸

What Inspections Revealed

The IAEA conducted additional inspections beginning in spring of 2003 and reported its findings at the June and September 2003 Board of Governors meetings.⁹ In June, it identified three major concerns for implementing nuclear safeguards: Iran's failure to report uranium imported from China in 1991; questions about the centrifuge enrichment program; and questions about the heavy water program. By September, further details emerged. Environmental sampling revealed particles of highly enriched uranium at several sites, and Iran's centrifuges appear to be based on a European design. Information provided by Iranian officials clarified some details and obscured others.

The use of undeclared uranium may have allowed Iran to experiment with processes that could have relevance for a nuclear weapons program. Had such processes been under safeguards, they would have been closely scrutinized. Inspections revealed that Iran imported, but did not declare, 1800 kilograms of natural uranium in different forms: uranium hexafluoride (UF₆), which is used in centrifuge enrichment; uranium tetra fluoride (UF₄); and uranium oxide (UO₂). Iran converted the UF₄ into uranium metal and used the UO₂ in various processing experiments, including isotope production and purification and conversion processes. Some of these processes are also used in

⁶ The NCR, according to its web site, was established in 1981 and is based in Paris. It has been described as the political arm or umbrella for other Iranian resistance groups, including the People's Mujahedin of Iran and the Muhahedin-e Khalq organization (MEK or MKO).

⁷ In February 1992, the People's Mujahedin of Iran revealed two "secret Iranian" nuclear sites — Darkhouin and Gurgan — which had been sites for terminated French and Russian power reactor projects. See Mark Hibbs, "IAEA Explores Iran's Intentions, Minus Evidence of Weapons Drive," *Nucleonics Week*, February 13, 1992.

⁸ "Iran's Nuclear Policy," H.E. Mr. Reza Aghazadeh, May 6, 2003.

⁹ "Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran, Report by the Director General, GOV/2003/40," June 6, 2003 (released June 19, 2003).

plutonium reprocessing (e.g., dissolution in nitric acid and separation in a pulse column). Prior to the September IAEA Board meeting, Iran admitted it had conducted “bench scale” uranium conversion experiments a decade ago, which should have been declared under its safeguards agreement. Iran suggested that its “uranium metal experiments could be considered as a process to gain know-how in nuclear material production,” in light of Iran’s decision to pursue a heavy-water-moderated reactor that would not use uranium metal as fuel.¹⁰ Uranium metal plates can be used to produce medical radioisotopes, but it is not clear whether Iran pursued this.

Reports that the containers of UF₆ were lighter than declared raised the question of whether some UF₆ was used to perform tests of the centrifuge equipment. Iranian officials initially countered that their program began in 1985 but experienced so many difficulties that they did not conduct experiments with inert or process gas. Evidence of highly enriched uranium from environmental sampling at the Natanz pilot plant later in the summer also contributed to speculation about enrichment, since few believed Iran would have produced centrifuges and constructed facilities without tests.¹¹ The presence of highly enriched uranium on the centrifuges installed for single machine tests was, according to Iranian officials, contamination from imported centrifuge components. In fact, the IAEA’s report for the November Board meeting, according to one source, reveals that Iran acknowledged enriching uranium at the Kalaye electric plant, although only to low levels of enrichment.¹² More importantly, the latest IAEA report apparently also reveals that Iran also successfully used laser enrichment techniques to enrich uranium.

The two enrichment plants detected by satellite imagery have drawn the most attention.¹³ The pilot fuel enrichment plant began to operate in June (although not all centrifuges have been installed), despite requests by the IAEA to delay operations, and the commercial-scale plant is still under construction. The pilot facility eventually will have about 1000 centrifuges installed. The commercial-scale plant is planned to have 50,000 centrifuges but is not scheduled to introduce nuclear material in the near future. These plants are built partly underground, raising concerns about the transparency of Iran’s program.

The heavy water program also has raised questions about Iran’s intentions. Reportedly, Iran first told the IAEA that it planned to produce heavy water for export, but then told the Agency in May that the heavy water would be used as a coolant and moderator for a planned research reactor for research and development, radioisotope production, and training. Subsequently, Iran’s design information for the facility omitted necessary hot cell equipment for producing radioisotopes. The Agency has asked Iran to clarify this issue, given reports of efforts by Iran to import hot cell equipment.

¹⁰ See IAEA Director General’s Report, *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran*, Report by the Director General, GOV/2003/63. p. 5.

¹¹ IAEA experts have suggested that the centrifuges at Natanz were an early European design and that their sophistication likely indicated process testing with UF₆. See *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran*, GOV/2003/63, August 26, 2003, p. 6.

¹² “Iran Had Secret Nuclear Program, U.N. Agency Says,” *Washington Post*, November 11, 2003.

¹³ See website, [<http://www.isis-online.org>] for satellite photos of the enrichment plant.

From June to November

In June, the IAEA Board of Governors called upon Iran to 1) rectify all safeguards problems identified in the report and resolve open questions; 2) not introduce nuclear material into the Natanz enrichment plant; and 3) sign the Additional Protocol without any conditions.¹⁴ Iran provided some information and began discussions on the Additional Protocol, but began operating the pilot centrifuge enrichment plant in June with process gas (UF₆).

The IAEA Board of Governors adopted a resolution on September 12, 2003 calling on Iran, among other things, to suspend all further uranium enrichment and reprocessing activities and setting an October 31 deadline for Iran's compliance. The IAEA requested that Iran provide details about its contaminated centrifuge equipment, including the origin and date of receipt of the equipment, and where it has been used or stored in Iran, as well as further information about its uranium conversion experiments.¹⁵

With the October 31 deadline looming, Iran invited the foreign ministers of Britain, France, and Germany to visit Tehran. On October 21, 2003, Iran issued a statement declaring the following: that Iran has agreed to sign the IAEA Additional Protocol and decided to suspend all uranium enrichment and "processing activities" and that nuclear weapons have "no place in Iran's defense doctrine." The ministers agreed that once international concerns are fully resolved, that Iran "could expect easier access to modern technology and supplies in a range of areas."¹⁶ There has been some controversy over Iran's commitment to suspend enrichment; although some have seen this as a cessation of enrichment, subsequent statements have made clear that it is a voluntary and, perhaps, temporary suspension.¹⁷

According to the IAEA, Iran provided what it called a complete and accurate declaration of its past nuclear activities.¹⁸ Media reports have suggested, however, that information on centrifuge procurement has been lacking. In particular, the Iranian representative to the IAEA reportedly said the records did not contain information on the origin of components for centrifuges, which could be a critical piece of information if Iran seeks to demonstrate that highly enriched uranium found in its facilities was the result of foreign contamination.¹⁹ However, this omission may pale in comparison to the revelations that Iran has produced "small amounts of low-enriched uranium, using both

¹⁴ See [http://www.iaea.org/worldatom/Press/P_release/2003/med-advise_072.shtml] for text. The protocol, which was developed in response to the failure to detect Iraq's nuclear weapons program in 1991, and is designed to strengthen the IAEA's ability to detect undeclared nuclear activities, will be a key step towards greater transparency.

¹⁵ Dr. Mohammed ElBaradei, Statement to Board of Governors, September 8, 2003 at [<http://www.iaea.org/worldatom/Press/Statements/2003/ebsp2003n019.shtml#Anchor-Iran>]

¹⁶ "Statement by the Iranian Government and visiting EU Foreign Ministers," *Reuters*, October 21, 2003.

¹⁷ "Iran: Khatami Reaffirms Right To Peaceful Nuclear Technology," BBC, November 3, 2003.

¹⁸ [http://www.iaea.org/NewsCenter/MediaAdvisory/Iran/ma_iran_3110.html]

¹⁹ "Iran Discloses Nuclear Activities," *Los Angeles Times*, October 24, 2003.

centrifuge and laser enrichment processes...and a small amount of plutonium.”²⁰ DG ElBaradei has not reported Iran as violating its safeguards agreement, which requires the Board to inform the UN Security Council and General Assembly. The June report stated that “Iran failed to meet its obligations under its Safeguards Agreement with respect to reporting of nuclear material, the subsequent processing and use of that material and the declaration of facilities where the material was stored and processed.” The United States stated in September 2003 that “the facts already established would fully justify an immediate finding of noncompliance by Iran with its safeguards obligations.”²¹ It remains to be seen whether the latest revelations will trigger a chain of events leading to UN Security Council resolutions.

Significance for a Nuclear Weapons Program

Nuclear safeguards are fundamentally accounting procedures to ensure that material is not diverted to weapons uses. Therefore, failures to report material can be significant, but some failures are more significant than others. Iran has stated that “The failures...are minor, and are only on the order of the gram or milligram.”²² A discrepancy in accounting for large quantities of weapons-grade plutonium or highly enriched uranium would certainly be more significant for a nuclear weapons program than a discrepancy for smaller quantities or for other materials like natural uranium. However, some argue that a pattern of deception is significant. In part, a principle underlying strengthened safeguards is the evolution from a strict accounting approach (seeing the “trees”) to evaluating the program in its entirety (seeing the “forest”). The latest IAEA report seems to indicate that Iran has pursued two different methods for uranium enrichment and that it sought experience in reprocessing plutonium. Although Iran is years away from producing quantities of fissile material (highly enriched uranium or plutonium) that it could use in nuclear weapons, the steady accrual over time of expertise in weapons-relevant areas is viewed with concern by many. In the run-up to a Board decision on whether or not Iran has violated its safeguards agreement, a key factor may be whether Board members feel that the enhanced inspections under the Additional Protocol will be enough to keep any potential nuclear weapons ambitions by Iran in check.

²⁰ “Iran Had Secret Nuclear Program, U.N. Agency Says,” *Washington Post*, November 11, 2003.

²¹ Statement of Ambassador Kenneth Brill at September 2003 IAEA Board of Governors Meeting.

²² “After Report, Iran Acknowledges ‘Minor’ Breach of Nuclear Pact,” *Washington Post*, November 12, 2003.