



Iran's Nuclear Program: Status

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Summary

Although Iran claims that its nuclear program is exclusively for peaceful purposes, it has generated considerable concern that Tehran is pursuing a nuclear weapons program. Indeed, the UN Security Council has responded to Iran's refusal to suspend work on its uranium enrichment and heavy-water nuclear reactor programs by adopting several resolutions which imposed sanctions on Tehran.

Despite this pressure, Iran continues to enrich uranium, install and operate additional centrifuges, and conduct research on new types of centrifuges. Tehran has also continued to produce centrifuge feedstock, as well as work on its heavy-water reactor and associated facilities.

Whether Iran is pursuing a nuclear weapons program is, however, unknown. A National Intelligence Estimate made public in December 2007 assessed that Tehran "halted its nuclear weapons program," defined as "Iran's nuclear weapon design and weaponization work and covert uranium conversion-related and uranium enrichment-related work," in 2003. The estimate, however, also assessed that Tehran is "keeping open the option to develop nuclear weapons" and that any decision to end a nuclear weapons program is "inherently reversible." Intelligence community officials have reaffirmed this judgment on several occasions. Iranian efforts to produce fissile material for nuclear weapons by using its known nuclear facilities would almost certainly be detected by the IAEA.

Although Iran has cooperated with the International Atomic Energy Agency (IAEA) to an extent, the agency says that Tehran has not gone far enough to alleviate all of the IAEA's concerns about Iran's enrichment and heavy-water reactor programs. The IAEA continues to investigate the program, particularly evidence that Tehran may have conducted procurement activities and research directly applicable to nuclear weapons development.

This report expands and replaces CRS Report RS21592, *Iran's Nuclear Program: Recent Developments*, by Sharon Squassoni, and will be updated as necessary.

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Background

Iran's nuclear program began during the 1950s. Construction of a U.S.-supplied research reactor began in 1960; the reactor went critical in 1967.¹ During the 1970s, Tehran pursued an ambitious nuclear power program; according to contemporaneous U.S. documents, Iran wanted to construct 10-20 nuclear power reactors and produce more than 20,000 megawatts of nuclear power by 1994. Iran actually began constructing a light-water nuclear power reactor near the city of Bushehr. Tehran also considered obtaining uranium enrichment and reprocessing technology.²

Iran also took steps to demonstrate that it was not pursuing nuclear weapons. For example, Tehran signed the nuclear Nonproliferation Treaty (NPT) in 1968 and ratified it in 1970. Iran also submitted a draft resolution to the UN General Assembly in 1974 that called for establishing a nuclear-weapons-free zone in the Middle East. Nevertheless, the United States was even then concerned that Iran could pursue a nuclear weapons program, as evidenced by U.S. intelligence reports from the mid-1970s.³

Iran cancelled the nuclear program after the 1979 revolution, but "reinstated" the program in 1982, according to a 1988 CIA report.⁴ A 1985 National Intelligence Council report, which cited Iran as a potential "proliferation threat," stated that Tehran was "interested in developing facilities that ... could eventually produce fissile material that could be used in a [nuclear] weapon." The report, however, added that it "would take at least a decade" for Iran to do so.⁵

The Iranian government says that it plans to expand its reliance on nuclear power in order to generate electricity. This program will, Tehran says, substitute for some of Iran's oil and gas consumption and allow the country to export its fossil fuels.⁶ Currently, a Russian contractor is

¹ The United States and Iran signed a nuclear cooperation agreement in 1957; it entered into force in 1959. The two countries negotiated another such agreement during the 1970s, but it was never concluded. For a summary of these negotiations, see William Burr, "A Brief History of U.S.-Iranian Nuclear Negotiations," *Bulletin of the Atomic Scientists*, January/February 2009.

² For example, the United States was willing to supply Iran with reprocessing technology, according to 1975 and 1976 National Security Council documents. Tehran also had a 1976 contract for a pilot uranium-enrichment facility using lasers (see *Iran*, Report by the Director General, GOV/2007/58, November 15, 2007). Additionally, Iran had contemplated building its own enrichment facility, according to a 1976 State Department cable (U.S. Embassy Tehran Airgram A-76 to State Department, "The Atomic Energy Organization of Iran," April 15, 1976).

³ *Prospects for Further Proliferation of Nuclear Weapons*, Special National Intelligence Estimate, August 23, 1974. A 1975 Department of State memorandum referred to the "uncertainty over" Iran's "long-term objectives despite its NPT status." ("Memorandum for the Assistant to the President for National Security Affairs: Department of State Response to NSSM 219 (Nuclear Cooperation with Iran)," April 18, 1975). A 1988 CIA report (*Middle East-South Asia: Nuclear Handbook*) indicated that Iran conducted nuclear weapons "design work," before the 1979 revolution.

⁴ *Middle East-South Asia: Nuclear Handbook*, Central Intelligence Agency, May 1988.

⁵ *The Dynamics of Nuclear Proliferation: Balance of Power and Constraints*, National Intelligence Council, September 1985.

⁶ Iran's previous regime also made these arguments for pursuing nuclear power. For example, according to a 1976 State Department cable, the head of the Atomic Energy Organization of Iran cited them as reasons for starting an ambitious nuclear program. (U.S. Embassy Tehran Airgram A-76 to State Department, "The Atomic Energy Organization of Iran," April 15, 1976). Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency, has explained that nuclear power will only meet "perhaps a small portion" of the projected national electricity demand. "Interview with Iran's Ambassador to IAEA," Campaign Against Sanctions and Military Intervention in Iran, June 29, 2008 (published July 2, 2008). <http://www.campaigniran.org/casmii/index.php?q=node/5439>.

completing the Bushehr reactor, and Iran says it intends to build additional reactors to generate 20,000 megawatts of power within the next 20 years.⁷ Iranian officials say that Tehran has begun design work on its first indigenously produced light-water reactor, which is to be constructed at Darkhovin.⁸ According to an official associated with the project (plans for which predate the 1979 revolution), Iran anticipates that “foreign experts” will be involved.⁹

Iranian officials have repeatedly asserted that the country’s nuclear program is exclusively for peaceful purposes. For example, Supreme Leader Ayatollah Ali Khamene’i declared during a June 3, 2008, speech that Iran is opposed to nuclear weapons “based on religious and Islamic beliefs as well as based on logic and wisdom.” He added, “Nuclear weapons have no benefit but high costs to manufacture and keep them. Nuclear weapons do not bring power to a nation because they are not applicable. Nuclear weapons cannot be used.” Similarly, Iranian Foreign Ministry spokesperson Hassan Qashqavi stated November 10, 2008, that “pursuance of nuclear weapons has no place in the country’s defense doctrine.”¹⁰ President Mahmoud Ahmadinejad asserted during an April 9, 2009, speech that “those who accumulate nuclear weapons are backwards in political terms.”¹¹

However, the United States and other governments have argued that Iran may be pursuing, at a minimum, the capability to produce nuclear weapons. Discerning a peaceful nuclear program from a nuclear weapons program can be difficult because of much of the technology’s dual-use nature. In addition, military nuclear programs may coexist with civilian programs, even without an explicit decision to produce nuclear weapons. Jose Goldemberg, Brazil’s former secretary of state for science and technology, observed that a country developing the capability to produce nuclear fuel

does not have to make an explicit early [political] decision to acquire nuclear weapons. In some countries, such a path is supported equally by those who genuinely want to explore an energy alternative and by government officials who either want nuclear weapons or just want to keep the option open.¹²

Some analysts argue that several past nuclear programs, such as those of France, Sweden, and Switzerland, illustrate this approach.¹³

⁷ “Iran to Follow Nuclear Timetable Regardless of IAEA Reports – Official,” *Islamic Republic of Iran News Network*, February 25, 2009.

⁸ “Iran Nuclear Spokesman Interviewed on Situation,” *E’temad*, November 9, 2008. Iran has stated that construction on the 360 MW reactor is to start in 2013. The reactor is to be completed in 2016. See “Foreign Firms Interested to Build Darkhovin Nuclear Plant - Iran Official,” *Mehr News Agency*, October 19, 2008, and “Bushehr Plant To Be Inaugurated By Mid October 2008 - Iranian Official,” *Islamic Republic of Iran News Network*, January 30, 2008.

⁹ *Mehr News Agency*, October 19, 2008.

¹⁰ “Weekly Briefing of the Foreign Ministry Spokesman,” November 10, 2008.

¹¹ *Islamic Republic of Iran News Network*, April 9, 2009.

¹² Jose Goldemberg, “Looking Back: Lessons From the Denuclearization of Brazil and Argentina,” *Arms Control Today*, April 2006.

¹³ See James Acton, “The Problem with Nuclear Mind Reading,” *Survival*, February-March 2009, pp. 119-42; Paul M. Cole, “Atomic Bombast: Nuclear Weapon Decisionmaking in Sweden 1945–1972,” The Henry L. Stimson Center, 1996; “Neutral States: Sweden and Switzerland,” in T.V. Paul, *Power Vs. Prudence: Why Nations Forgo Nuclear Weapons* (Montreal: McGill University Press), 2000, pp. 84-98; and Bruno Tertrais, “Has Iran Decided to Build the Bomb? Lessons from the French Experience,” January 30, 2007, available at <http://www.carnegieendowment.org/publications/index.cfm?fa=view&id=18993>.

The main source of proliferation concern is Tehran's construction of a gas-centrifuge-based uranium-enrichment facility. Iran claims that it wants to produce low-enriched uranium (LEU) fuel for its planned light-water nuclear reactors. Although Iranian officials have expressed interest in purchasing nuclear fuel from other countries, they assert that Tehran should have an indigenous enrichment capability as a hedge against possible fuel supply disruptions.¹⁴

Gas centrifuges enrich uranium by spinning uranium hexafluoride gas at high speeds to increase the concentration of the uranium-235 isotope. Such centrifuges can produce both LEU, which can be used in nuclear power reactors, and highly enriched uranium (HEU), which is one of the two types of fissile material used in nuclear weapons. HEU can also be used as fuel in certain types of nuclear reactors.¹⁵ Iran also has a uranium-conversion facility, which converts uranium oxide into several compounds, including uranium hexafluoride.¹⁶

A heavy-water reactor, which Iran is constructing at Arak, has also been a source of concern. Although Tehran says that the reactor is intended for the production of medical isotopes, it is a proliferation concern because its spent fuel will contain plutonium well suited for use in nuclear weapons. Spent nuclear fuel from nuclear reactors contains plutonium, the other type of fissile material used in nuclear weapons. In order to be used in nuclear weapons, however, plutonium must be separated from the spent fuel—a procedure called “reprocessing.” Iran has said that it will not engage in reprocessing.

In addition to the dual-use nature of the nuclear programs described above, Tehran's interactions with the International Atomic Energy Agency (IAEA) have contributed to suspicions that Tehran has a nuclear weapons program.¹⁷ In the past, Iran has taken actions that interfered with the agency's investigation of its nuclear program, including concealing nuclear activities and providing misleading statements. Although the IAEA has gotten a more complete picture of Iran's nuclear program since its investigation began in 2002, the agency still wants Tehran to provide more information. IAEA Director-General Mohamed ElBaradei explained in a June 2008 interview that

they [the Iranians] have concealed things from us in the past, but that doesn't prove that they are building a bomb today. They continue to insist that they are interested solely in using nuclear power for civilian purposes. We have yet to find a smoking gun that would prove them wrong. But there are suspicious circumstances and unsettling questions. The Iranians' willingness to cooperate leaves a lot to be desired. Iran must do more to provide us with access to certain individuals and documents. It must make a stronger contribution to

¹⁴ “Soltaniyeh: Iran Has No Alternative But To Enrich Uranium,” *Islamic Republic News Agency*, October 2, 2008; Paul Kerr, “U.S. Offers Iran Direct Talks,” *Arms Control Today*, June 2006; “Interview with Iran's Ambassador to IAEA,” 2008.

¹⁵ Highly enriched uranium typically contains over 90% uranium-235, whereas low-enriched uranium used in nuclear reactors typically contains less than 5% uranium-235.

¹⁶ For a detailed description of the nuclear fuel cycle, see CRS Report RL34234, *Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power*, coordinated by Mary Beth Nikitin.

¹⁷ For a detailed description of Iran's compliance with its international obligations, see CRS Report R40094, *Iran's Nuclear Program: Tehran's Compliance with International Obligations*, by Paul K. Kerr.

clarifying the last unanswered set of questions—those relating to a possible military dimension of the Iranian nuclear program.¹⁸

The IAEA reiterated September 17, 2009, that it “has no concrete proof that Iran has or has ever had a nuclear weapons programme.”

Recent Nuclear Controversy

The recent public controversy over Iran’s nuclear program began in August 2002, when the National Council of Resistance on Iran (NCRI), an Iranian exile group, revealed information during a press conference (some of which later proved to be accurate) that Iran had built nuclear-related facilities at Natanz and Arak that it had not revealed to the IAEA. The United States had been aware of at least some of these activities, according to knowledgeable former officials.¹⁹

States-parties to the nuclear Nonproliferation Treaty (NPT) are obligated to conclude a safeguards agreement with the IAEA. In the case of non-nuclear-weapon states-parties to the treaty (of which Iran is one), such agreements allow the agency to monitor nuclear facilities and materials to ensure that they are not diverted for military purposes. However, the agency’s inspections and monitoring authority is limited to facilities that have been declared by the states-parties.²⁰ Additional protocols to IAEA safeguards agreements augment the agency’s ability to investigate clandestine nuclear facilities and activities by increasing the agency’s authority to inspect certain facilities and demand additional information from states-parties.²¹ The IAEA’s statute requires the agency’s Board of Governors to refer cases of non-compliance with safeguards agreements to the UN Security Council. Prior to the NCRI’s revelations, the IAEA had expressed concerns that Iran had not been providing the agency with all relevant information about its nuclear programs, but had never found Iran in violation of its safeguards agreement.

In fall 2002, the IAEA began to investigate Iran’s nuclear activities at Natanz and Arak, and inspectors visited the sites the following February. The IAEA board adopted its first resolution, which called on Tehran to increase its cooperation with the agency’s investigation and to suspend its uranium enrichment activities, in September 2003. The next month, Iran concluded an agreement with France, Germany, and the United Kingdom, collectively known as the “E3,” to suspend its enrichment activities, sign and implement an additional protocol to its 1974 IAEA safeguards agreement, and comply fully with the IAEA’s investigation.²² As a result, the IAEA board decided to refrain from referring the matter to the UN Security Council.

Ultimately, the IAEA’s investigation, as well as information Tehran provided after the October 2003 agreement, revealed that Iran had engaged in a variety of clandestine nuclear-related

¹⁸ “Interview With IAEA Boss Mohamed ElBaradei,” *Der Spiegel*, June 11, 2008.

¹⁹ Gary Samore, Former Senior Director for Nonproliferation and Export Controls on the National Security Council, personal communication June 5, 2008; Director of Central Intelligence George J. Tenet, “DCI Remarks on Iraq’s WMD Programs,” February 5, 2004, available at https://www.cia.gov/news-information/speeches-testimony/2004/tenet_georgetownspeech_02052004.html.

²⁰ The IAEA does have other investigative tools, such as monitoring scientific publications from member-states.

²¹ NPT states are not required to conclude additional protocols. However, applicable UN Security Council resolutions require Iran to conclude such a protocol.

²² The text of the agreement is available at http://www.iaea.org/NewsCenter/Focus/IaeaIran/statement_iran21102003.shtml. Iran signed its additional protocol in December 2003, but has not ratified it.

activities, some of which violated Iran's safeguards agreement. These included plutonium separation experiments, uranium enrichment and conversion experiments, and importing various uranium compounds.

After October 2003, Iran continued some of its enrichment-related activities, but Tehran and the E3 agreed in November 2004 to a more detailed suspension agreement. However, Iran resumed uranium conversion in August 2005 under the leadership of President Mahmoud Ahmadinejad, who had been elected two months earlier. Iran announced in January 2006 that it would resume research and development on its centrifuges at Natanz. In response, the IAEA board adopted a resolution February 4, 2006, that referred the matter to the Security Council. Two days later, Tehran announced that it would stop implementing its additional protocol.

In June 2006, China, France, Germany, Russia, the United Kingdom, and the United States, collectively known as the "P5+1," presented a proposal to Iran that offered a variety of incentives in return for Tehran taking several steps to assuage international concerns about its enrichment and heavy-water programs.²³ The proposal called on the government to address the IAEA's "outstanding concerns ... through full cooperation" with the agency's ongoing investigation of Tehran's nuclear programs, "suspend all enrichment-related and reprocessing activities," and resume implementing its additional protocol.

European Union High Representative for Common Foreign and Security Policy Javier Solana presented a revised version of the 2006 offer to Iran in June 2008.²⁴ Representatives from the P5+1 discussed the new proposal with Iranian officials in July 2008. Iran provided a follow-up response the next month, but the six countries deemed it unsatisfactory.²⁵ Tehran has told the IAEA that it would implement its additional protocol "if the nuclear file is returned from the Security Council" to the agency.²⁶ It is, however, unclear how the council could meet this condition.

The 2006 offer's requirements have also been included in several UN Security Council resolutions, the most recent of which, Resolution 1835, was adopted September 27, 2008.²⁷ However, an August 2009 report from ElBaradei to the Security Council and the IAEA board indicated that Tehran has continued to defy the council's demands by continuing work on both its

²³ The proposal text is available at http://armscontrol.org/pdf/20060606_Iran_P5+1_Proposal.pdf. Prior to late May 2006, the United States refused to participate in direct talks with Iran about its nuclear program. In March 2005, Washington had offered some limited incentives for Iran to cooperate with the E3. (See Kerr, *Arms Control Today*, June 2006). For more information about the state of international diplomacy with Iran, see CRS Report RL32048, *Iran: U.S. Concerns and Policy Responses*, by Kenneth Katzman.

²⁴ The revised proposal text is available at <http://www.auswaertiges-amt.de/diplo/de/Aussenpolitik/Themen/Abbruestung/IranNukes/Angebot-e33-080614.pdf>.

²⁵ Iran had also presented a proposal to the P5+1 in May 2008. See Peter Crail, "Proposals Offered on Iranian Nuclear Program," *Arms Control Today*, May 2008. The proposal text is available at <http://www.iaea.org/Publications/Documents/Infcircs/2008/infcirc729.pdf>.

²⁶ *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007) and 1803 (2008) in the Islamic Republic of Iran*, Report by the Director General, GOV/2008/4, February 22, 2008.

²⁷ The resolution text is available at <http://un.org/News/Press/docs/2008/sc9459.doc.htm>. The resolutions also require Iran to suspend work on its heavy water-related projects.

uranium enrichment program and heavy-water reactor program.²⁸ Iranian officials maintain that Iran will not suspend its enrichment program.

Iran's Cooperation with the IAEA

Iran and the IAEA agreed in August 2007 on a work plan to clarify the outstanding questions regarding Tehran's nuclear program.²⁹ Most of these issues,³⁰ which had contributed to suspicions that Iran had been pursuing a nuclear weapons program, have essentially been resolved, but ElBaradei told the IAEA board June 2, 2008, that there is "one remaining major [unresolved] issue," which concerns questions regarding "possible military dimensions to Iran's nuclear programme." Iran maintains that it has not conducted any work on nuclear weapons.

Iran and the IAEA have had a series of discussions regarding these issues; the last meeting was held August 18-20, 2008, based on recent reports from ElBaradei. The agency has provided Iran with documents or (in some cases) descriptions of documents, which themselves were provided to the IAEA by several governments, indicating that Iranian entities may have conducted studies related to nuclear weapons development. The subjects of these studies included missile reentry vehicles for delivering nuclear warheads, uranium conversion, and conventional explosives used in nuclear weapons.³¹ Iranian officials have claimed that the documents are not authentic,³² but ElBaradei told the IAEA Board of Governors June 17, 2009, that, nevertheless, "there is enough in these alleged studies to create concern in the minds of our professional inspectors." ElBaradei reported in May 2008 that Iranian officials have acknowledged the accuracy of some of the information in the documents, but the activities described were, the Iranians said, exclusively for non-nuclear purposes. Tehran has provided some relevant information about these matters to the IAEA, but ElBaradei reported in August that the government still should "provide more substantive responses" to the IAEA, as well as "the opportunity to have detailed discussions with a view to moving forward on these issues, including granting the Agency access to persons, information and locations identified in the documents."

The IAEA has asked Tehran about other information suggesting that the country may have pursued nuclear weapons, such as

²⁸ *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran*, Report by the Director General, GOV/2009/55, August 28, 2009.

²⁹ The text of the work plan is available at <http://www.iaea.org/Publications/Documents/Infocircs/2007/infocirc711.pdf>.

³⁰ These issues included plutonium experiments, research and procurement efforts associated with two types of centrifuges, operations of a uranium mine, and experiments with polonium-210, which (in conjunction with beryllium) is used as a neutron initiator in certain types of nuclear weapons.

³¹ For more information about Iran's ballistic missile program, see CRS Report RS22758, *Iran's Ballistic Missile Programs: An Overview*, by Steven A. Hildreth.

³² In a September 28, 2008 letter to the IAEA, Iran described some characteristics of the documents discussed above. The letter stated that some of the information from the United States was shown to Iranian officials as PowerPoint presentations. Additionally, some of the documents are "in contradiction with typical standard Iranian documentation" and lack "classification seals," the letter said. See, Permanent Mission of the Islamic Republic of Iran, *Explanatory Comments by the Islamic Republic of Iran on the Report of the IAEA Director General to the September 2008 Board of Governors* (GOV/2008/38), September 28, 2008. INFCIRC/737. Iran has complained that the IAEA has not provided Tehran with original versions of some documentation related to the alleged "military dimensions" of Iran's nuclear program. Several reports from ElBaradei have stated that the agency has not had permission to provide this documentation from the governments which provided it. In his August 2009 report, ElBaradei again called on such governments to authorize the IAEA to share additional information with Iran.

- “information about a high level meeting in 1984 on reviving Iran’s pre-revolution nuclear programme”;
- “the scope of a visit by officials” associated with Iran’s Atomic Energy Organization “to a nuclear installation in Pakistan in 1987”;
- information on 1993 meetings between Iranian officials and members of a clandestine procurement network run by former Pakistani nuclear official Abdul Qadeer Khan; and
- information about work done in 2000 which apparently related to reprocessing.³³

The agency also wants Iran to provide more information on nuclear-related procurement, production, and research activity by entities linked to Iran’s military and defense establishments. These included attempts to obtain items, such as spark gaps, shock wave software, and neutron sources, which could be useful for developing nuclear weapons.³⁴ In addition, ElBaradei’s May 2008 report notes that “substantial parts” of Iran’s centrifuge components “were manufactured in the workshops of the Defence Industries Organization.”

Furthermore, the IAEA has asked Tehran to provide additional information about the manner in which it acquired a document “describing the procedures” for reducing uranium hexafluoride to uranium metal, as well as “machining ... enriched uranium metal into hemispheres,” which are “components of nuclear weapons.”³⁵ Tehran has previously told the agency that it was offered equipment for casting uranium but never actually received it. According to Iran, its nuclear suppliers, many of whom were affiliated with the Khan network, provided the document in 1987 at their own initiative, rather than at Tehran’s request. Islamabad has confirmed to the IAEA that “an identical document exists” in Pakistan.³⁶

ElBaradei’s November 2008 report points out that the IAEA, with the exception of the document related to uranium metal, has “no information ... on the actual design or manufacture by Iran” of components (nuclear or otherwise) for nuclear weapons.

That report, as well as subsequent reports from ElBaradei, also suggests that Iran and the IAEA are at an impasse; Tehran has not cooperated with the agency on these matters since ElBaradei’s September 2008 report. Iranian officials have indicated that Tehran will not provide any further information to the agency.³⁷ Nevertheless, Iran has been cooperating with the agency in other respects, albeit with varying consistency. The IAEA has been able to verify that Iran’s declared nuclear facilities and materials have not been diverted for military purposes. And Tehran has provided the agency with “information similar to that which Iran had previously provided pursuant to the Additional Protocol,” ElBaradei reported in February 2008, adding that this information clarified the agency’s “knowledge about Iran’s current declared nuclear programme.”

³³ For a detailed discussion of this information, as well as the documents concerning Iran’s nuclear weapons related studies, see *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007), and 1803 (2008) in the Islamic Republic of Iran*, Report by the Director General, GOV/2008/15, May 26, 2008.

³⁴ GOV/2008/4.

³⁵ GOV/2008/15.

³⁶ GOV/2008/15.

³⁷ “Iran not to Answer Calls Beyond NPT,” *Fars News Agency*, November 20, 2008; “Tehran Will Have Comprehensive Interaction with IAEA: Official,” *Islamic Republic News Agency*, November 19, 2008; INFCIRC/737.

Iran, however, provided this information “on an ad hoc basis and not in a consistent and complete manner,” the report said.³⁸ Indeed, the IAEA requested in April 2008 that Iran provide “as a transparency measure, access to additional locations related ... to the manufacturing of centrifuges, R&D on uranium enrichment, and uranium mining.” But Tehran has not yet agreed to do so.

ElBaradei’s February 2008 report underscored the importance of full Iranian cooperation with the agency’s investigation, as well as Tehran’s implementation of its additional protocol:

Confidence in the exclusively peaceful nature of Iran’s nuclear programme requires that the Agency be able to provide assurances not only regarding declared nuclear material, but, equally importantly, regarding the absence of undeclared nuclear material and activities in Iran ... Although Iran has provided some additional detailed information about its current activities on an ad hoc basis, the Agency will not be in a position to make progress towards providing credible assurances about the absence of undeclared nuclear material and activities in Iran before reaching some clarity about the nature of the alleged studies, and without implementation of the Additional Protocol.

The IAEA has also asked Iran to “reconsider” its March 2007 decision to stop complying with a portion of the subsidiary arrangements for its IAEA safeguards agreement. That provision, to which Iran agreed in 2003, requires Tehran to provide design information for new nuclear facilities “as soon as the decision to construct, or to authorize construction, of such a facility has been taken, whichever is earlier.” Previously, Iran was required to provide design information for a new facility only 180 days before introducing nuclear material into it. If Tehran does not alter this decision, the agency will receive considerably later notice about the construction of future Iranian nuclear facilities. Indeed, invoking its March 2007 decision, Iran has refused to provide the IAEA with “preliminary design information” for the planned Darkhovin reactor. The IAEA first requested the information in December 2007.

Iran had also refused to allow IAEA officials to conduct an inspection of the Arak reactor in order to verify design information that Tehran provided to the agency. ElBaradei argued in his June 2009 report that this continued refusal “could adversely impact the Agency’s ability to carry out effective safeguards at that facility,” adding that satellite imagery is insufficient because Iran has completed the “containment structure over the reactor building, and the roofing for the other buildings on the site.” However, IAEA inspectors visited the reactor facility in August 2009 to verify design information, according to ElBaradei’s report issued the same month. IAEA inspectors had last visited the reactor in August 2008.

In addition, Iran failed to notify the IAEA until September 2009 that it was constructing a uranium enrichment facility near the city of Qom, although the decision to begin construction on that facility had apparently been made prior to Iran’s March 2007 decision (see the “Qom Facility” section below).

³⁸ GOV/2008/4.

Status of Iran's Nuclear Programs

Some non-governmental experts and former U.S. officials have argued that, rather than producing fissile material indigenously, Iran could obtain such material from foreign sources.³⁹ A National Intelligence Estimate (NIE) made public December 3, 2007, states that the intelligence community “cannot rule out that Iran has acquired from abroad—or will acquire in the future—a nuclear weapon or enough fissile material for a weapon.”⁴⁰ Similarly, during a press briefing that same day, a senior intelligence official characterized such acquisition as “an inherent option” for Iran. However, Tehran’s potential ability to produce its own HEU or plutonium is a greater cause of concern; the official explained that “getting bits and pieces of fissile material from overseas is not going to be sufficient” to produce a nuclear arsenal.

Fuel Manufacturing Plant

Iran is continuing work on a fuel manufacturing plant that, when complete, is to produce fuel for the Arak and Darkhovin reactors.⁴¹ The plant has produced fuel rods and appears to be nearly complete.⁴²

Uranium Enrichment

Iran has a pilot centrifuge facility and a larger commercial facility, both located at Natanz. The latter is eventually to hold more than 47,000 centrifuges.⁴³ Former Vice President Gholamreza Aghazadeh, who also headed Iran’s Atomic Energy Organization until this past July, explained in February 2009 that Iran’s goal is to install all of them by 2015.⁴⁴ Iran began enriching uranium in the facility after mid-April 2007; as of May 31, 2009, Tehran had produced an estimated total of 1,430 kilograms of LEU containing less than 5% uranium-235.⁴⁵ This quantity of LEU, if further enriched, could theoretically produce enough HEU for a nuclear weapon.⁴⁶ However, an Iranian

³⁹ See, for example, then-Undersecretary of State for U.S. Arms Control And International Security Robert Joseph’s testimony before the Senate Committee on Foreign Relations, February 9, 2006; and then-Director of Research Institute for National Strategic Studies National Defense University Stephen Cambone’s testimony before the Senate Committee on Governmental Affairs, September 21, 2000.

⁴⁰ Available at http://odni.gov/press_releases/20071203_release.pdf.

⁴¹ “Aqazadeh: Iran Heralds Peaceful Nuclear Program,” *Islamic Republic News Agency*, April 8, 2008.

⁴² *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran*, Report by the Director General, GOV/2009/35, June 5, 2009.

⁴³ GOV/2008/15. According to this report, Iran is planning to install 16 cascade units, each containing 18 164-centrifuge cascades. Tehran has previously told the agency that it intends to install over 50,000 centrifuges; see *Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran*, Report by the Director-General, GOV/2004/83. Gholamreza Aghazadeh, who headed Iran’s Atomic Energy Organization, also said in February 2009 that Iran would install 50,000 centrifuges (“Iran to Follow Nuclear Timetable Regardless of IAEA Reports – Official,” *Islamic Republic of Iran News Network*, February 25, 2009).

⁴⁴ *Islamic Republic of Iran News Network*, February 25, 2009.

⁴⁵ GOV/2008/55.

⁴⁶ The IAEA term for this amount of uranium is “significant quantity,” defined as “[t]he approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded.” That amount is 25 kilograms of uranium-235. Some types of weapons could be developed using less uranium-235.

attempt to enrich this LEU would likely be detected by the IAEA. (This point is discussed in greater detail below.)

Individual centrifuges are linked together in cascades; each cascade in the commercial facility contains 164 centrifuges. Currently, Iran is feeding uranium hexafluoride into 28 cascades (4,592 centrifuges) of first generation (IR-1) centrifuges and is operating at least another 8 cascades (1,312 centrifuges) without feedstock. Tehran is also installing and testing additional IR-1 centrifuges in the facility,⁴⁷ as well as testing two other types of more-advanced centrifuges which could increase the Natanz facility's enrichment capacity.⁴⁸ However, the research on new centrifuges has apparently been less successful than Tehran's development of its IR-1 centrifuge.⁴⁹ Aghazadeh indicated this past February that at least one new type of centrifuge would be installed in the "near future."⁵⁰ The current head of Iran's Atomic Energy Organization, Ali Akbar Salehi, suggested in a September 22 press conference that Iran would slow down its installation of centrifuges at Natanz and "focus on research and development dimension in order to improve the quality of our productions."⁵¹

In addition to its centrifuge work, Tehran is continuing to produce uranium hexafluoride; as of February 9, 2009, Iran had produced approximately 546 metric tons since March 2004.⁵² Prior to 2009, Tehran apparently improved its ability to produce centrifuge feedstock of sufficient purity.⁵³

A senior U.S. intelligence official said December 3, 2007, that a country needs to be able to "operate large numbers of centrifuges for long periods of time with very small failure rates" in order to be able to "make industrial quantities of enriched uranium." The NIE stated that Iran still "faces significant technical problems operating" its centrifuges. Since then, however, Iran's ability to operate its centrifuges appears to have improved, although its IR-1 centrifuges continue to run below design capacity.⁵⁴ A report to Congress submitted by the Deputy Director for National Intelligence described the amount of LEU that Iran produced in 2008 as a "significant improvement" over the amount it had produced in 2007.⁵⁵ Indeed, data from IAEA reports demonstrate that the Natanz facility's rate of LEU production increased significantly between January and May 2008. Other reports have reached similar conclusions. For example, a

⁴⁷ GOV/2008/55.

⁴⁸ GOV/2009/55. ElBaradei's June 2009 report stated that Iran was testing four other more-advanced centrifuges.

⁴⁹ Analyst interview with U.S. official, June 25, 2009.

⁵⁰ *Islamic Republic of Iran News Network*, February 25, 2009.

⁵¹ "Iran Scientists Build New Generation of Centrifuges - Nuclear Official," *Islamic Republic News Agency*, September 22, 2009.

⁵² *Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran*, Report by the Director General, GOV/2009/8, February 19, 2009.

⁵³ IISS Strategic Comments, "Nuclear Iran: How Close Is It?," September 2007, available at <http://www.iiss.org/publications/strategic-comments/past-issues/volume-13-2007/volume-13-issue-7/nuclear-iran/>; Paul Kerr, "Iran Continues Security Council Defiance," *Arms Control Today*, June 2007; Analyst interview with State Department official October 28, 2008.

⁵⁴ Analyst interview with U.S. official, June 25, 2009.

⁵⁵ Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, Covering 1 January to 31 December 2008. Available at <http://www.dni.gov/reports/Unclassified%20Report%20to%20Congress%20WMD%20Covering%201January%20to%2031%20December%202008.pdf>.

September 15, 2008, report from the Institute for Science and International Security (ISIS) says that Tehran's centrifuges "appear to be running at approximately 85 percent of their stated target capacity, a significant increase over previous rates."⁵⁶ A senior UN official reportedly offered a similar assessment that same month.⁵⁷ Moreover, a June 2009 ISIS report points out that, based on data from ElBaradei's June report, Iran has improved its daily rate of LEU production by 20%.⁵⁸ That rate has since remained the same, according to data from ElBaradei's August report.⁵⁹

The extent to which Iran's progress is sustainable is open to question. Former Pakistani nuclear official Abdul Qadeer Khan described Pakistan's first-generation centrifuges as "unsuccessful" in a 1998 interview.⁶⁰ Furthermore, Mark Fitzpatrick of the International Institute of Strategic Studies observed that "[i]t can be years before it is clear whether and enrichment programme is working well," noting that centrifuges at a Japanese enrichment facility "started to crash seven years after installation."⁶¹

It is also worth noting that Iran's ability to produce additional feedstock for centrifuges may be hindered by its dwindling supply of uranium oxide; Tehran is apparently running out of foreign-supplied uranium oxide and, although Iran is producing more of the material from indigenously mined uranium,⁶² it has not yet transferred any indigenously produced uranium oxide to its uranium conversion facility.⁶³

A senior intelligence official explained during the December press briefing that the "acquisition of fissile material ... remains the governing element in any timelines in which they'd have a nuclear device." Stating that "centrifuge enrichment is how Iran probably could first produce enough fissile material for a weapon," the 2007 NIE adds that "the earliest possible date Iran would be technically capable of producing enough HEU for a weapon is late 2009."⁶⁴ This date, however, "is very unlikely," the estimate says, adding that "Iran probably would be technically capable of producing enough HEU for a weapon sometime during the 2010-2015 time frame." But the State Department Bureau for Intelligence and Research, the estimate says, judges that

⁵⁶ David Albright, Jacqueline Shire, and Paul Brannan, *IAEA Report on Iran: Centrifuge Operation Significantly Improving; Gridlock on Alleged Weaponization Issues*, September 15, 2008, available at http://www.isis-online.org/publications/iran/ISIS_Report_Iran_15September2008.pdf. The report compares data from the previous IAEA reports about the amount of uranium hexafluoride fed into Iran's centrifuges.

⁵⁷ Peter Crail, "ElBaradei Says Iran Stalls IAEA Inquiry," *Arms Control Today*, October 2008.

⁵⁸ David Albright and Jacqueline Shire, *IAEA Report on Iran: Centrifuge and LEU Increases; Access To Arak Reactor Denied; No Progress on Outstanding Issues*, June 5, 2009. Available at http://isis-online.org/publications/iran/Iran_IAEA_Report_Analysis_5June2009.pdf.

⁵⁹ David Albright, Paul Brannan, and Jacqueline Shire, *IAEA Report On Iran: Centrifuges Increase; Rate of LEU Production Steady; Progress on Inspection Requests at Arak and Natanz; No Progress on Possible Military Dimensions*, August 28, 2009. Available at http://www.isis-online.org/publications/iran/Analysis_IAEA_Report.pdf.

⁶⁰ "A Talk with A.Q. Khan: Pakistan's Top Nuclear Scientist Talks About Nuclear Weapons," *Jane's Foreign Report*, July 24, 1998.

⁶¹ Mark Fitzpatrick, *The Iranian Nuclear Crisis: Avoiding Worst-Case Outcomes*, Adelphi Paper 398, International Institute of Strategic Studies, May 2008, p. 50.

⁶² David Albright, Jacqueline Shire and Paul Brannan, *Is Iran Running Out of Yellowcake?*, Institute for Science and International Security, February 11, 2009. Available at http://isis-online.org/publications/iran/Iran_Yellowcake.pdf; Barak Ravid, "Israel Slams Clinton Statement on Nuclear Iran," *Haaretz*, July 22, 2009; Mark Fitzpatrick, Statement before the Senate Committee on Foreign Relations, March 3, 2009.

⁶³ Analyst interview with U.S. official, June 25, 2009.

⁶⁴ This time frame describes the point at which Iran could have enough HEU for a weapon, rather than when Iran could start producing HEU.

Tehran “is unlikely to achieve this capability before 2013”⁶⁵ and all intelligence agencies “recognize the possibility that this capability may not be attained until *after* 2015.”⁶⁶ Some independent experts have published estimates for the amount of time necessary for the Natanz facility to produce enough HEU for a weapon—a process that would require Iran to reconfigure the cascades, which are not currently configured to produce HEU, and further enrich the uranium.⁶⁷

As noted, the above time frame assesses Tehran’s capability to produce HEU from its Natanz facility. However, the 2007 NIE states that Iran would “probably would use covert facilities—rather than its declared nuclear sites—for the production of highly enriched uranium for a weapon.” Indeed, it is very difficult to divert without detection significant amounts of nuclear material from centrifuge facilities under IAEA safeguards. A 2004 CIA report concluded that “inspections and safeguards will most likely prevent Tehran from using facilities declared to the IAEA directly for its weapons program as long as Iran remains a party to the NPT.”⁶⁸ Moreover, it would be extremely difficult to reconfigure the cascades in the Natanz facility without detection.⁶⁹ Although Tehran could end its cooperation with the IAEA and use its declared centrifuge facilities to develop fissile material, such an action would be virtually unprecedented.⁷⁰

A senior intelligence official explained that Iran could use knowledge gained from its Natanz facilities at covert enrichment facilities. According to the NIE, a “growing amount of intelligence indicates Iran was engaged in covert uranium conversion and uranium enrichment activity,” but Tehran probably stopped those efforts in 2003.

Qom Facility⁷¹

Despite the intelligence assessment described in the previous paragraph, Iran revealed that it was constructing a new gas-centrifuge-based enrichment facility in September 2009. Tehran provided some details about the facility to the IAEA in a September 21, 2009, letter. Four days after the IAEA received the letter, officials from the United States, Britain, and France revealed that they

⁶⁵ In responses to Questions for the Record from the Senate Select Committee on Intelligence, which were made public in August 2009, the Director for National Intelligence stated that the Bureau continues to stand by this estimate.

⁶⁶ The time frame described in the 2007 NIE is the same as one described in a 2005 NIE.

⁶⁷ See, for example, R. Scott Kemp and Alexander Glaser, “Statement on Iran’s Ability to Make a Nuclear Weapon and the Significance of the 19 February 2009 IAEA Report on Iran’s Uranium-Enrichment Program,” March 2, 2009 (available at <http://www.princeton.edu/~rskemp/can-iran-make-a-bomb.pdf>); R. Scott Kemp, “Update On Iran’s Ability to Make a Nuclear Weapon and the Significance of the 5 June 2009 IAEA Report on Iran’s Uranium-Enrichment Program,” June 17, 2009; Albright and Shire, June 5, 2009; and David Albright, Paul Brannan, and Jacqueline Shire, *Nuclear Weapon Breakout Scenarios: Correcting the Record*, March 18, 2009 (available at http://www.isisnucleariran.org/assets/pdf/Correcting_the_Record.pdf).

⁶⁸ Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, January 1-December 31, 2004, available at http://www.odni.gov/reports/2004_unclass_report_to_NIC_DO_16Nov04.pdf.

⁶⁹ For more details about cascade configuration, see Houston G. Wood, Alexander Glaser, and R. Scott Kemp, “The Gas Centrifuge and Nuclear Weapons Proliferation,” *Physics Today*, September 2008; International Institute for Strategic Studies, *Iran’s Strategic Weapons Programmes: A Net Assessment*, (UK: Routledge, 2005), pp. 53-54.

⁷⁰ No state in good standing with the IAEA has ever used this tactic. North Korea restarted its nuclear weapons program after announcing its withdrawal from the NPT in 2003, but the IAEA has never completed an assessment of that country’s nuclear activities.

⁷¹ Unless otherwise noted, this section is based on Iran’s September 21, 2009 letter to IAEA and September 25 background briefings from U.S. officials, along with associated talking points.

had previously developed intelligence on the facility. The three governments provided a detailed intelligence briefing to the IAEA after the agency received Iran's letter. U.S. officials have said that, despite its letter to the agency, Iran intended for the facility to be kept secret. Tehran is to supply additional information to the IAEA. Salehi said in a September 29 television interview that Iran would soon provide the IAEA with a "timetable for inspection" of the facility.⁷²

The United States has been "observing and analyzing the facility for several years," according to September 25, 2009, Obama administration talking points, which added that "there was an accumulation of evidence" earlier in 2009 that the facility was intended for enriching uranium. Some of this evidence apparently indicated that "Iran was installing the infrastructure required for centrifuges earlier this year." U.S. officials have not said exactly when Iran began work on the facility, which is "located in an underground tunnel complex on the grounds of an Islamic Revolutionary Guard Corps" base near the Iranian city of Qom.⁷³ But Majlis speaker Ali Larijani, who was formerly Iran's lead nuclear negotiator, indicated September 27 that Iran had been constructing the facility for approximately three years.⁷⁴

The facility, is designed to hold approximately 3,000 centrifuges, but the United States does not know which type Iran plans to install. Iranian officials have stated that no centrifuges have yet been installed⁷⁵ and that no nuclear material has been introduced into the facility. Iran is also constructing support buildings at the facility. According to the United States, Tehran will not be able to begin enriching uranium in the facility before 2010. Iranian officials have given a slightly longer timeframe of between one and two years.⁷⁶

President Obama stated September 25 that "the size and configuration of this facility is inconsistent with a peaceful program." But the administration's talking points were somewhat more vague, stating that the facility "is too small to be viable for production of fuel for a nuclear power reactor," although it "could be used" for centrifuge research and development or "configured to produce weapons-grade uranium." The facility "would be capable of producing approximately one weapons worth" of HEU per year, depending on the type and performance of the installed centrifuges.

Iranian officials have said that the facility is for peaceful purposes and that Tehran has met its international obligations. The letter to the IAEA described the facility as a "new pilot fuel enrichment plant" that would produce uranium enriched to no higher than 5% uranium-235. As for the facility's secret nature, Iranian officials have argued that Tehran was not previously obligated to disclose it to the IAEA.⁷⁷ Furthermore, Salehi, citing unspecified "threats" to Iran's nuclear program, explained during a September 25 television interview that Iran had concealed

⁷² "Iran to Schedule for IAEA Inspection of New N. Plant," *Fars News Agency*, September 29, 2009.

⁷³ Despite its location, the United States assess that Iran's Atomic Energy Organization is responsible for the facility's "development."

⁷⁴ "Iran Speaker Says Country has Fully Mastered Nuclear Technology," *Islamic Republic News Agency*, September 27, 2009.

⁷⁵ "West Reaction to Iran's Nuclear Enrichment Plant 'Ludicrous' – Official," *Vision of the Islamic Republic of Iran Network* 2, September 26, 2009.

⁷⁶ *Ibid.* "Press Conference with Mahmoud Ahmadinejad," September 25, 2009.

⁷⁷ For more information, see CRS Report R40094, *Iran's Nuclear Program: Tehran's Compliance with International Obligations*, by Paul K. Kerr.

the facility in order to preserve its ability to continue the program even if work at Natanz were somehow stopped.⁷⁸

No British, French, or U.S. officials disclosed evidence of other undisclosed enrichment-related facilities in Iran, although UK Foreign Secretary David Miliband suggested in a September 28 television interview that Iran is engaged in other secret nuclear activities.⁷⁹

Plutonium

Iran acknowledged to the IAEA in 2003 that it had conducted plutonium-separation experiments—an admission which aroused suspicions that Iran could have a program to produce plutonium for nuclear weapons. The IAEA, however, continued to investigate the matter, and ElBaradei reported in August 2007 that the agency has resolved its questions about Iran's plutonium activities.⁸⁰

The 2007 NIE stated that “Iran will not be technically capable of producing and reprocessing enough plutonium for a weapon before about 2015.” But, as noted above, Iran says that it does not plan to engage in reprocessing, and numerous reports from ElBaradei have noted that the IAEA has found no evidence that Iran is engaging in any such activities.

Arak Reactor

Iran says that its heavy-water reactor, which is being constructed at Arak, is intended for the production of medical isotopes. According to a May 5, 2008, presentation by Ambassador Ali Asghar Soltanieh, Iran's Permanent Representative to the International Atomic Energy Agency, the reactor is to substitute for an “outdated” LEU-fueled research reactor in Tehran that has been in operation since 1967.^{81 82} However, the reactor is a proliferation concern because its spent fuel will contain plutonium better suited for nuclear weapons than the plutonium produced by light-water moderated reactors, such as the Bushehr reactor. In addition, Iran will be able to operate the reactor with natural uranium, which means that it will not be dependent on supplies of enriched uranium. Salehi stated September 26, 2009, that the reactor would be “operational” within the next three or four years.⁸³

Iran also has a plant for producing heavy water. According to ElBaradei's June 2009 report, satellite imagery indicates that the plant has been “operating intermittently” since February 2009. ElBaradei's report from that month stated that the plant was “in operational condition,” but his August report stated that the plant “seems not to have been operating since the last report.”

⁷⁸ “Iran Nuclear Chief Slams Western Leaders Stance on New Enrichment Plant,” *Islamic Republic of Iran News Network*, September 25, 2009.

⁷⁹ “UK Condemns Iran Missile Test,” September 28, 2009. Available at <http://www.fco.gov.uk/en/news/latest-news/?view=News&id=20915346>.

⁸⁰ Iran, Report by the Director General, GOV/2007/48, August 30, 2007.

⁸¹ “Iran's Exclusively Peaceful Nuclear Programs and Activities,” Briefing for NGOs, May 5, 2008, available at http://www.reachingcriticalwill.org/legal/npt/prepcom08/WP/iran_briefing.pdf

⁸² Despite this claim, Iranian officials stated in September 2009 that Iran needs to obtain more LEU fuel for the reactor. See “Iran Scientists Build New Generation of Centrifuges,” September 22, 2009.

⁸³ *Vision of the Islamic Republic of Iran Network 2*, September 26, 2009.

Bushehr Reactor

Iran is also constructing near the city of Bushehr a 1,000-megawatt nuclear power reactor moderated by light water. The original German contractor, which began constructing the reactor in 1975, abandoned the project following Iran's 1979 revolution. Russia agreed in 1995 to complete the reactor, but the project has since encountered repeated delays. In February 2005, Moscow and Tehran concluded an agreement stating that Russia would supply fuel for the reactor for 10 years. At the time, the director of the Russian Federal Agency for Atomic Energy said the reactor would begin operating in late 2006. Loading fuel into the reactor is scheduled to take place during October and November 2009, according to the IAEA; Iranian and Russian officials have said that the reactor would begin by the end of 2009.⁸⁴ Russia has blamed financial and technical issues for delaying the project's completion. However, it had been widely believed that Moscow may have been delaying fuel shipments in order to increase political pressure on Iran to comply with the Security Council resolutions.

In any case, Atomstroyexport sent the first shipment of LEU fuel to Iran on December 16, 2007, and the reactor received the last shipment near the end of January. The fuel, which is under IAEA seal, will contain no more than 3.62% uranium-235, according to an Atomstroyexport spokesperson.⁸⁵

The United States had previously urged Moscow to end work on the project, citing concerns that it could aid an Iranian nuclear weapons program by providing the country with access to nuclear technology and expertise.⁸⁶ However, U.S. officials said in 2002 that Washington would drop these public objections if Russia took steps to mitigate the project's proliferation risks; the 2005 deal requires Iran to return the spent nuclear fuel to Russia.⁸⁷ This measure is designed to ensure that Tehran will not separate plutonium from the spent fuel. Moscow also argues that the reactor will not pose a proliferation risk because it will operate under IAEA safeguards. It is worth noting that light-water reactors are generally regarded as more proliferation-resistant than other types of reactors.

Although the UN Security Council resolutions restrict the supply of nuclear-related goods to Iran, they do permit the export of nuclear equipment related to light-water reactors.

⁸⁴ "Envoy: Bushehr N. Plant to Go on Stream in Winter," *Fars News Agency*, July 21, 2009; "Russia Confirms Launch of Iranian Nuclear Reactor by Year End," *RIA Novosti*, July 22, 2009.

⁸⁵ "Atomstroyexport Completes Latest Shipment of Fuel to Bushehr Nuclear Plant," *Interfax*, December 28, 2007.

⁸⁶ For example, then-Deputy Assistant Secretary of Defense Marshall Billingslea testified before the Senate July 29, 2002, that the United States was "concerned that the Bushehr nuclear power project is, in reality, a pretext for the creation of an infrastructure designed to help Tehran acquire atomic weapons." Similar concerns are expressed in a 2005 State Department report (Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments, U.S. Department of State, August 2005, p.77.) Then-Undersecretary of State for International Security and Arms Control John Bolton told the House International Relations Committee in June 2003 that Iran could build "over 80 nuclear weapons" if it had access to sufficient fuel, operated the reactor for five to six years, and chose to withdraw from the nuclear Nonproliferation Treaty (NPT). This estimate assumes that Iran possesses a reprocessing facility.

⁸⁷ Estimates for the length of time the spent fuel will have to stay in Iran to cool range from two to five years. See Paul Kerr, "Iran, Russia Reach Nuclear Agreement," *Arms Control Today*, April 2005.

Does Iran Have a Nuclear Weapons Program?

In addition to the possible nuclear weapons-related activities discussed above, Iran has continued to develop ballistic missiles, which could potentially be used to deliver nuclear weapons. It is worth noting, however, that Director of National Intelligence Dennis Blair indicated during a March 10, 2009, Senate Armed Services Committee hearing that Iran's missile developments do not necessarily indicate that the government is also pursuing nuclear weapons, explaining that "I don't think those missile developments ... prejudice the nuclear weapons decision one way or another. I believe those are separate decisions." Iran is developing missiles and space launch vehicles "for multiple purposes," he added.

In any case, Tehran's nuclear program has also raised concerns for various other reasons. First, Iran has been secretive about the program. For example, Tehran hindered the IAEA investigation by failing to disclose numerous nuclear activities, destroying evidence, and making false statements to the agency.⁸⁸ Moreover, although Iran's cooperation with the agency has improved, the IAEA has repeatedly criticized Tehran for failing to provide the agency with timely access to documents and personnel.

Second, many observers have questioned Iran's need for nuclear power, given the country's extensive oil and gas reserves. The fact that Tehran resumed its nuclear program during the Iran-Iraq war has also cast doubt on the energy rationale. Furthermore, many countries with nuclear power reactors purchase nuclear fuel from foreign suppliers—a fact that calls into question Iran's need for an indigenous enrichment capability, especially since Russia has agreed to provide fuel for the Bushehr reactor. Moreover, although Tehran plans to develop a large nuclear power program, the country lacks sufficient uranium deposits—a fact acknowledged by Iranian officials.⁸⁹

However, Iran maintains that its enrichment program has always been exclusively for peaceful purposes. Tehran argues that it cannot depend on foreign suppliers for reactor fuel because such suppliers have been unreliable in the past.⁹⁰ Iran also says that it has been forced to conceal its nuclear procurement efforts in order to counter Western efforts to deny it nuclear technology—a claim that appears to be supported by a 1997 CIA report.⁹¹ Aghazadeh has also argued that, although Iran does not need to produce fuel for the Bushehr reactor, the Natanz facility needs to be completed if it is to be able provide fuel for the planned Darkhovin reactor.⁹²

⁸⁸ For example, Iran sanitized a facility where Iranian scientists had enriched uranium, falsely told the IAEA that it had not enriched uranium, and falsely claimed that it had not procured any foreign components for one of its centrifuge programs.

⁸⁹ *Iranian Students News Agency*, April 17, 2007; Thomas W. Wood, Matthew D. Milazzo, Barbara A. Reichmuth, and Jeffrey Bedell, "The Economics Of Energy Independence For Iran," *Nonproliferation Review*, Vol. 14, No. 1, March 2007.

⁹⁰ Paul Kerr, "News Analysis: Behind Iran's Diplomatic Behavior," *Arms Control Today*, June 2006. Perhaps significantly, Iranian officials argued for an independent fuel production capability during the 1970s; see U.S. Embassy Tehran Airgram A-76 to State Department, "The Atomic Energy Organization of Iran," April 15, 1976.

⁹¹ The report says that Iran had responded to "Western counterproliferation efforts by relying more on legitimate commercial firms as procurement fronts and by developing more convoluted procurement networks."

⁹² *Islamic Republic of Iran News Network*, February 25, 2009.

Although few experts argue that there is no evidence that Iran has pursued a nuclear weapons program, some have documented Tehran's projected difficulty in exporting oil and natural gas without additional foreign investment in its energy infrastructure.⁹³ And at least one expert has described Iran's inability to obtain nuclear fuel from an international enrichment consortium called Eurodif. During the 1970s, Iran had reached an agreement with Eurodif that entitled Iran to enriched uranium from the consortium in exchange for a loan.⁹⁴

Iran's stated rationale for its Arak reactor has also been met with some skepticism. Tehran says it needs the reactor to produce medical isotopes and to replace the Tehran research reactor. However, that reactor is capable of producing such isotopes and has unused capacity. In addition, non-proliferation experts have argued that the reactor is unnecessary for producing such isotopes.⁹⁵

The 2007 National Intelligence Estimate

According to the 2007 NIE, "Iranian military entities were working under government direction to develop nuclear weapons" until fall 2003, after which Iran halted its nuclear weapons program "primarily in response to international pressure." The NIE defines "nuclear weapons program" as "Iran's nuclear weapon design and weaponization work and covert uranium conversion-related and uranium enrichment-related work." It adds that the intelligence community also assesses "with moderate-to-high confidence that Tehran at a minimum is keeping open the option to develop nuclear weapons."⁹⁶ The NIE also states that, because of "intelligence gaps," the Department of Energy and the National Intelligence Council "assess with only moderate confidence that the halt to those activities represents a halt to Iran's entire nuclear weapons program."

The NIE also states that "Tehran's decision to halt its nuclear weapons program suggests it is less determined to develop nuclear weapons than we have been judging since 2005."⁹⁷ The change in

⁹³ See, for example, "U.S.-Iranian Engagement: The View from Tehran," International Crisis Group, June 2, 2009; Roger Stern, "The Iranian Petroleum Crisis and United States National Security," *Proceedings of the National Academy of Sciences of America*, January 2007; and George Perkovich and Silvia Manzanero, "Plan B: Using Sanctions to End Iran's Nuclear Program," *Arms Control Today*, May 2004. Projections of Iranian oil depletion are not new. A 1975 U.S. government report stated that "Iran has decided now to introduce nuclear power to prepare against the time – about 15 years in the future – when Iranian oil production is expected to begin to decline sharply." ("Report of the NSSM 219 Working Group Nuclear Cooperation Agreement with Iran," April 1975).

⁹⁴ Oliver Meier, "Iran and Foreign Enrichment: A Troubled Model," *Arms Control Today*, January/February 2006.

⁹⁵ Robert J. Einhorn, "Iran's Heavy-Water Reactor: A Plutonium Bomb Factory," November 9, 2006, available at http://www.armscontrol.org/pressroom/2006/20061109_Einhorn.asp?print.

⁹⁶ Prior to the NIE, some non-governmental experts had argued that Iran had stopped its nuclear weapons program. See, for example, Paul Kerr, "Divided From Within," *Bulletin of the Atomic Scientists*, November/December 2006; Jeffrey Lewis, "Iran Roundup: Negotiations and Wonkporn," July 27, 2005, available at <http://www.armscontrolwonk.com/703/iran-roundup-negotiations-and-wonkporn>; and George Perkovich, *Changing Iran's Nuclear Interests, Policy Outlook*, Carnegie Endowment for international Peace, May 2005, available at <http://www.carnegieendowment.org/files/PO16.perkovich.FINAL2.pdf>.

⁹⁷ Although the 2005 NIE stated that "Iran currently is determined to develop nuclear weapons despite its international obligations and international pressure," that assessment was somewhat qualified. Titled "Iran's Nuclear Program: At A Crossroads," the estimate stated that Iran was not "immovable" on the question of pursuing a nuclear weapons program and also addressed the possibility that Tehran may not have had such a program. Moreover, the word "determined" was used in lieu of "pursuing" a nuclear weapon because the authors believed the latter to be a stronger term. The NIE was issued as a Memorandum to Holders of NIE 2001-15HC, "Iran's Nuclear Weapons Program: Multifaceted and Poised to Succeed, But When?"

assessments, a senior intelligence official said December 3, 2007, was the result of “new information which caused us to challenge our assessments in their own right, and illuminated previous information for us to be able to see it perhaps differently than we saw before, or to make sense of other data points that didn’t seem to self-connect previously.”

According to press accounts, this information included various written and oral communications among Iranian officials which indicated that the program had been halted.⁹⁸ The United States may also have obtained information from Iranian officials who defected as part of a CIA program to induce them to do so,⁹⁹ as well as from penetration of Iran’s computer networks.¹⁰⁰ Additionally, the NIE also incorporated open-source information, such as photographs of the Natanz facility that became available after Iran allowed a tour by members of the press.

According to the 2007 NIE, the intelligence community assesses “with moderate-to-high confidence that Iran does not have a nuclear weapon.” The community assesses “with low confidence that Iran probably has imported at least some weapons-usable fissile material,” but still judges “with moderate-to-high confidence” that Tehran still lacks sufficient fissile material for a nuclear weapon.

On several occasions, the U.S. intelligence community has reaffirmed the 2007 NIE’s assessment that Iran halted its nuclear weapons program but is keeping its options open.¹⁰¹ For example, Leon Panetta, Director of the Central Intelligence Agency, did so in May 2009.¹⁰² More recent press accounts have also reported that the community does not believe that Tehran has restarted its weapons program.¹⁰³ Moreover, administration talking points made public September 25, 2009, stated that the community still assesses that “Iran halted its nuclear weapons program in 2003.”

Other factors also suggest that Iran may not have an active nuclear weapons program. First, the IAEA has resolved several of the outstanding issues described in the August 2007 Iran-IAEA work plan and has apparently not found additional evidence of a nuclear weapons program. Indeed, the agency has not discovered significant undeclared Iranian nuclear activities for several years (although, as noted above, the IAEA’s ability to monitor Iran’s nuclear facilities has decreased). Second, Tehran, beginning in 2003, has been willing to disclose previously

⁹⁸ Dafna Linzer and Joby Warrick, “U.S. Finds that Iran Halted Nuclear Arms Bid in 2003,” *Washington Post*, December 4, 2007; Greg Miller, “Iran’s Nuclear Ambitions on Hold, U.S. Agencies Conclude,” *Los Angeles Times*, December 4, 2007; David E. Sanger and Steven Lee Myers, “Details in Military Notes Led to Shift on Iran, U.S. Says,” *New York Times*, December 6, 2007; Peter Baker and Dafna Linzer, “Diving Deep, Unearthing a Surprise; How a Search for Iran’s Nuclear Arms Program Turned Up an Unexpected Conclusion,” *Washington Post*, December 8, 2007.

⁹⁹ Greg Miller, “CIA Has Recruited Iranians to Defect; The Secret Effort Aims to Undermine Tehran’s Nuclear Program,” *Los Angeles Times*, December 9, 2007.

¹⁰⁰ David Sanger and William Broad, “U.S. and Allies Press Iran over Nuclear Plant ‘Deception,’” *The New York Times*, September 26, 2009.

¹⁰¹ See also the 2008 report to Congress submitted by the DDNI; February 12, 2009 testimony before the Senate Intelligence Committee by Director of National Intelligence Dennis Blair; “Annual Threat Assessment of the Intelligence Community for the Senate Intelligence Committee,” February 12, 2009; and March 10, 2009 testimony before the Senate Armed Services Committee by Director of the Defense Intelligence Agency Michael Maples.

¹⁰² “Remarks of Director of Central Intelligence Agency, Leon E. Panetta, at the Pacific Council on International Policy,” May 18, 2009.

¹⁰³ Mark Hosenball, “Intelligence Agencies Say No New Nukes in Iran: Secret Updates to White House Challenge European and Israeli Assessments,” *Newsweek*, September 16, 2009; David E. Sanger, “U.S. Says Iran Could Expedite Nuclear Bomb,” *The New York Times*, September 10, 2009.

undeclared nuclear activities to the IAEA (though, as previously discussed, Iran has not been fully cooperating with the agency). Third, Iran made significant changes to the administration of its nuclear program in fall 2003—changes that produced greater openness with the IAEA and may have indicated a decision to stop a nuclear weapons program.¹⁰⁴

Fourth, as noted above, Iranian officials have stated numerous times that Tehran is not seeking nuclear weapons, partly for religious reasons—indeed, Khamenei has issued a fatwa against nuclear weapons, according to Iranian officials.¹⁰⁵ A change in this stance could damage Iranian religious leaders' credibility. Moreover, Mark Fitzpatrick of the International Institute of Strategic Studies argued in May 2008 that “given the pervasive religiosity of the regime, it is unlikely that Iran’s supreme leader would be secretly endorsing military activity in explicit contradiction of his own religious edict.”¹⁰⁶

Fifth, Iranian officials have argued that nuclear weapons would not improve the country’s national security because Iran would not be able to compete with the arsenals of larger countries, such as the United States.¹⁰⁷ Moreover, the U.S.-led spring 2003 invasion of Iraq, which overthrew Iraqi leader Saddam Hussein and thereby eliminated a key rival of Iran, may also have induced Tehran to decide that it did not need nuclear weapons.

Living with Risk

Other findings of the NIE indicate that the international community may, for the foreseeable future, have to accept some risk that Iran will develop nuclear weapons. According to the 2007 NIE, “only an Iranian political decision to abandon a nuclear weapons objective would plausibly keep Iran from eventually producing nuclear weapons—and such a decision is inherently reversible.” The estimate also asserted that “Iran has the scientific, technical and industrial capacity eventually to produce nuclear weapons if it decides to do so,” adding that, “since fall 2003, Iran has been conducting research and development projects with commercial and conventional military applications—some of which would also be of limited use for nuclear weapons.”

This is not to say that an Iranian nuclear weapons capability is inevitable; as noted above, Iran does not yet have such a capability. But Tehran would likely need to accept additional constraints on its nuclear program in order to provide the international community with confidence that it is not pursuing a nuclear weapon.

Other Constraints on Nuclear Weapons Ambitions

Although the production of fissile material is widely considered to be the most difficult step in nuclear weapons development, Iran would, even with the ability to produce HEU, still face

¹⁰⁴ This argument is explained in more detail in Kerr, *Bulletin of the Atomic Scientists*, 2006. For an in-depth discussion of Iran’s nuclear decision-making process, see Abbas William Samii, “The Iranian Nuclear Issue and Informal Networks,” *Naval War College Review*, Winter 2006.

¹⁰⁵ Statement by H.E. Dr. M. Javad Zarif, Permanent Representative of the Islamic Republic of Iran Before the Security Council, December 23, 2006.

¹⁰⁶ *The Iranian Nuclear Crisis*, p. 13.

¹⁰⁷ Soltanieh, June 29, 2008.

challenges in producing nuclear weapons, such as developing a workable physics package and effective delivery vehicles. A 1978 CIA report points out that there is a

great difference between the development and testing of a simple nuclear device and the development of a nuclear weapons system, which would include both relatively sophisticated nuclear designs and an appropriate delivery system.¹⁰⁸

Although developing and producing HEU-based nuclear weapons covertly would probably be Tehran's preferred option, such a path would present additional challenges. A 2005 report from the International Institute for Strategic Studies concluded that "an Iranian planner would have little basis for confidence that significant nuclear facilities could be kept hidden."¹⁰⁹ Tehran would need to hide a number of activities, including uranium conversion, the movement of uranium from mines, and the movement of centrifuge feedstock.¹¹⁰ Alternatively, Tehran could import uranium ore or centrifuge feedstock, but would also need to do so covertly. Furthermore, Iran could produce only fairly simple nuclear weapons, which are not deliverable by longer-range missiles, without conducting explosive nuclear tests. Such tests, many analysts argue, would likely be detected.¹¹¹ It is also worth noting that moving from the production of a simple nuclear weapon to more sophisticated nuclear weapons could take several additional years.¹¹²

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¹⁰⁸ Available at [http://www.fqs.org/cia/docs/44/0000107983/\(UNTITLED\)-RE.html](http://www.fqs.org/cia/docs/44/0000107983/(UNTITLED)-RE.html). For a more detailed discussion, see Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction* (OTA-BP-ISC-115), December 1993.

¹⁰⁹ International Institute for Strategic Studies, p. 57.

¹¹⁰ The 2005 IISS report also explains that concealing a plutonium-based nuclear weapons program would be even more difficult (pp. 62-63).

¹¹¹ For a detailed discussion of this issue, see Steven A. Hildreth, statement before the House Committee on Oversight and Government Reform, Subcommittee on National Security and Foreign Affairs, March 5, 2008, available at <http://nationalsecurity.oversight.house.gov/documents/20080305141600.pdf>.

¹¹² *Iran's Nuclear and Missile Potential: A Joint Threat Assessment by U.S. and Russian Technical Experts*, EastWest Institute, May 2009. pp. 5-6.