ACA
THE ARMS CONTROL ASSOCIATION

Iran Nuclear Brief
Analysis from the "Solving the Iranian Nuclear Puzzle" Briefing Series

Assessing Iran's Nuclear Program Without Exaggeration or Complacency

BY MARK FITZPATRICK
IISS
OCTOBER 3, 2011

Shortly after the early September release of the International Atomic Energy Agency's report on Iran's nuclear program, the Arms Control Association assembled a panel of top experts to assess the status of Iran's nuclear effort and examine strategies to address it. The September 19 briefing for Congressional staffers was part of an ongoing series of briefings organized by ACA and its partners on "Solving the Iranian Nuclear Puzzle."

Along with nuclear terrorism, the potential acquisition of nuclear weapons by states not yet in possession of them is at the forefront of U.S. national security concerns. Iran dominates the field.

The following *Iran Nuclear Brief* by Mark Fitzpatrick, Director of the Nonproliferation and Disarmament Program at the International Institute for Strategic Studies (IISS) in London, is based on his presentation at the September 19 briefing. It provides a status report on Iran's nuclear and missile programs and an evaluation of their potential as a nuclear weapons threat. *—ACA STAFF*

HIGHLIGHTS

- We can have high confidence that Iran does not today have a nuclear weapon and that it won't have one tomorrow or next week or next month or a year from now. To claim otherwise on the basis of an amalgamation of worst-case assumptions borders on the irresponsible.

- It would also be irresponsible to be complacent about Iran's nuclear program because in all the key aspects of what it takes to be able to have a nuclear weapon, Iran has made recent progress. I have no confidence that Iran won't have a nuclear weapon two years from now. If they wanted to go for it and if everything went right, maybe they could.

- Clarity is needed when we talk about a "nuclear Iran." Iran is already nuclear-capable, but a nuclear-armed Iran is not inevitable. A combination of US policy tools can keep Iran from crossing the line from nuclear-capable to nuclear-armed.

Questioning the Assumptions in Worst-Case Analyses

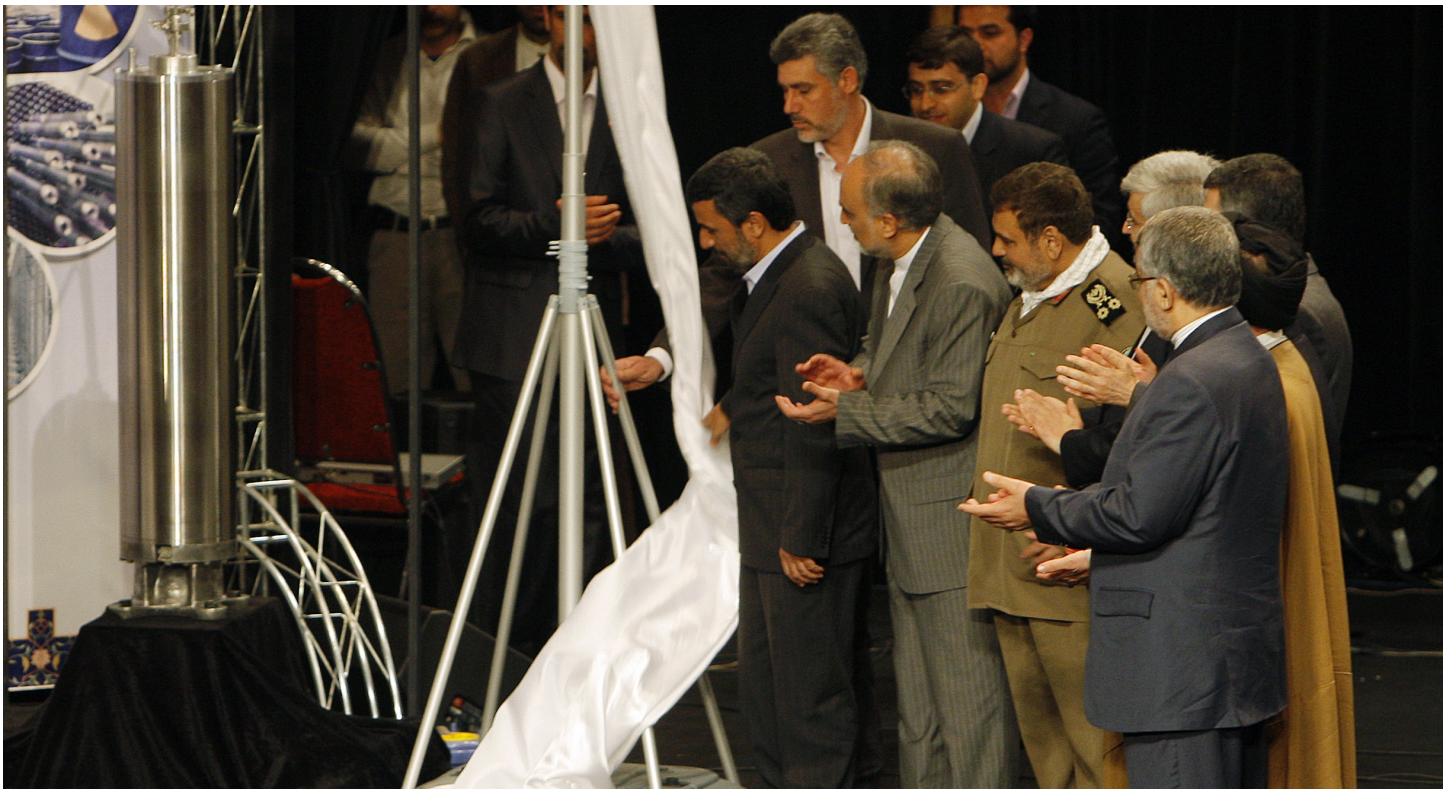
Some assessments of the timeline for Iran producing a nuclear weapon have been published recently that string together a series of improbable worst-case assumptions.[1] Five such assumptions are questionable:

1) The assumption that Iran would use an untested "batch recycling" method in which the stockpile of 3.5% enriched uranium would simply be re-run through the existing centrifuges without the need for any re-piping. This method works in theory, but it has never been used in practice. As far as what is known in unclassified materials, all the nuclear-armed states have used a staged process. Pakistan used a four-stage method which A.Q. Khan sold on the black market and which is available through the Internet. If Iran were to attempt to produce highly enriched uranium (HEU) for a bomb, undertaking the huge risk of being caught and sparking a pre-emptive strike, it is more likely that Iran would use a tried-and-true process for which it has the designs rather than an untested method it cannot be sure will work. The staged process would require a reconfiguration of the centrifuges at Natanz, which would take at least three months.

2) The assumption that Iran would be able to produce enough HEU before it was caught. This worst-case analysis assumes that Iran would not need to reconfigure piping and thus could start HEU production immediately after one IAEA visit. The assumption is that Iran would be able to predict when inspectors would come again and would gamble that it could finish the job in time before then. This would be a huge gamble, and not only because it would require flawless production – a near impossibility even when a nation is not producing HEU for the first time. It is also a gamble because while the average window of time between IAEA inspections is about one month, the visits are scheduled randomly and thus not predictable.

3) The assumption that the amount of low enriched uranium (LEU) that is necessary in order to produce a bomb's worth of highly enriched uranium is static. It is not hard to calculate how much LEU is needed for one weapon's worth of HEU: 1,290kg according to a recent analysis by my institute.[2] But experts who have actually produced HEU for weapons say that more than double this amount is needed for the first weapon because of two kinds of "wastage": in the cold traps during the production of the gasified HEU and during the fashioning of the metal pit. This "wastage" can be recovered in the production of the second bomb, but it has to be factored into the timeline for the first one.

4) The assumption that once Iran produces enough HEU for a weapon, this could quickly be formed into a



Behrouz Mehri/AFP/Getty Images

Iranian President Mahmoud Ahmadinejad unveils a sample of the country's third-generation centrifuge during a ceremony in Tehran on April 9, 2010.

bomb. The assumption is that Iran would be able to carry out most of the steps for weaponization concurrently with producing HEU. In theory, this may be correct, but probably not for a country that's never done it before. To accomplish the conversion from gas to metal, the shaping of the metal, the assembly of the bomb, and all the other steps needed to produce a workable nuclear weapon with a limited number of experts (some of whom have defected or been assassinated) would take at least six months, according to most unclassified estimates. These months should be added to the time line.

5) The assumption that Iran would go for broke to produce just one weapon. Almost all the assessments ask how long it would take for Iran to get one weapon. But what country would take all of the risks of breaking out of the NPT, including the likelihood of inviting airstrikes, to produce just one weapon? The bomb might not work. One might need to be tested. One might be needed for a second-strike capability. It would not make sense to risk the retaliation unless a handful of weapons could be produced, the way North Korea did.

Avoiding complacency

The above cautions notwithstanding, one must not be complacent about Iran's nuclear program. Tehran is moving ahead in all of the areas necessary for a deliverable nuclear weapon. Three things are needed for a nuclear weapon: a) producing enough fissile material; b) weaponizing the fissile material; and having a means of delivering it. Iran has made recent advances in all three areas.

Fissile material. The first component is easiest to calculate because the IAEA keeps close track of Iran's reported production. According to the latest IAEA report, Iran has produced over 4,500 kilograms of 3.5% LEU, some portion of which has been further enriched to 20%. This stockpile of 3.5% LEU is enough for at least two weapons if further enriched. Some analysts assess that it is enough for four weapons, but they do not take into account the larger amount needed for the first bomb.

The IAEA report also showed that Iran is moving ahead with putting centrifuges into its enrichment facility at Fordow, which is protected inside a mountain where it is hard to bomb, and that Iran is continuing 20% enrichment well beyond any justifiable civilian purpose. Iran has no justifiable purpose to produce any 20% enriched uranium, because it cannot today make the fuel for the Tehran Research Reactor. Even if the Iranians could produce the fuel, they've got more than enough 20% for seven years for that reactor. Yet Iran is still producing more.

Iran is also introducing larger numbers of second-generation centrifuges that can produce enriched uranium two to three times faster. Each one of these developments is worrisome. Together, they move the problem to a different level of a challenge. These more advanced centrifuges, plus the larger number of centrifuges now operating at Natanz would reduce the timeline for weapons production.

Weaponization. Assessing Iran's progress in being able to produce a weapon from the fissile material is the hardest factor to assess because bomb-making is classified and Iran's work on it is off-limits to the IAEA. But the IAEA has received a lot of information from member states about Iranian development work. The latest IAEA report said the agency has increasing concern about possible military dimensions behind Iran's nuclear activity. The report did not detail any new information beyond the serious examples cited earlier in the year, but Secretary General Amano indicated that more details would soon be forthcoming.

It will be interesting to see if the new information parallels recent press reports. An August 24 story in the Munich-based *Süddeutsche Zeitung* said North Korea in the spring delivered dual-use US software that could simulate neutron flows. The unclassified computer program has many civilian applications, but its export is strictly controlled, because it can be used to calculate chain reactions for the development of nuclear explosives. Previous reports of North Korean nuclear cooperation with Iran lacked credibility. This one, while unconfirmed, is generally consistent, at least in terms of developmental level, with other reports that the IAEA has assembled.

Delivery vehicle. Iran has a fleet of ballistic missiles under development, the most capable of which, the Sajjil-2, is solid-fuel propelled and has a reach of at least 2,200km (about 1400 miles). It can reach US bases in

Getty Images

Men work inside Iran's Isfahan uranium-conversion facility on March 30, 2005.

the region and Israel and can be launched quickly from deep within Iran's territory, making it less susceptible to pre-emption. In May 2010, the IISS assessed that the Sajjil-2 still required two years of testing before it could be deployed operationally.[3] There were no tests in 2010, and, until recently, none reported in 2011. This summer, however, Iran said it conducted a launch in February 2011 that flew into the Indian Ocean. Iran's ability to monitor the test flight in the ocean is a new capability.

I do not want to be alarmist about Iran's nuclear program. For example, the 70kg of 20% enriched uranium that Iran has produced to date is very close to being weapons usable and some analysts predict that at expected rates of production, Iran will soon have enough 20% product for a weapon. But if one considers the additional amount of HEU needed for the first weapon, 70kg is about one-sixth the necessary amount. The 300 advanced centrifuges Iran has installed are certainly worrisome. But it is not clear whether Iran has the raw material to be able to manufacture large numbers of these machines. Iran's ability to produce carbon fiber for the rotors is thought to be limited, for example.

Nuclear capable ≠ nuclear armed.

In sum, a nuclear-armed Iran is not inevitable. Iran already is nuclear capable. Persuading Iran to give up enrichment entirely is a desirable goal, but probably not achievable given the strong support for enrichment across the political spectrum in Iran. Enrichment is seen as a national right and has become wrapped up in Iran's sense of national sovereignty.

Four elements of a policy response can help keep Iran from crossing the line from weapons capability to weapons production:

Containment. Sanctions, export controls, industrial sabotage and other measures can restrict Iran's ability to expand the nuclear program exponentially.

Deterrence. Iran can be dissuaded from crossing the line if the decision makers know – and they surely do know – that doing so would invite pre-emptive military action.

Intrusive inspections. The IAEA is able only to monitor what has been reported, and Iran refuses to abide by IAEA rules to report new nuclear facilities at the planning stage. Iran probably already has unreported nuclear facilities under development. To date, Iran has not been able to keep its nuclear facilities secret, thanks to poor operational security on its part and good intelligence on the part of Western nations. More intensive IAEA inspections would provide greater confidence that Iran is not engaging in secret uranium enrichment-related activity.

In sum, a nuclear-armed Iran is not inevitable.

Engagement. Any peaceful solution will require negotiations and positive incentives. Sanctions alone will not dissuade Iran to ignore national pride and bow to pressure. A positive alternative must be presented. The main purpose of sanctions is to persuade Iran to come to the negotiating table. How will we know if they are ready for real negotiations if we are not talking with them? Discreet discussions are necessary to probe intentions and possibilities for compromise. The head of Iran's atomic energy agency said Iran would be willing to put its facilities under IAEA control for five years, but it is not at all clear what he meant. It is necessary to find out.

In short, if Iran theoretically could go for broke and obtain a nuclear weapon in less than two years, this time must be used wisely. Iran may not be ready for any negotiations, but we need to at least pull every diplomatic string to try to find out.

ENDNOTES

1. See "The undimmed danger of Iran's nuclear program," *Washington Post*, September 6 2011; Greg Jones "No More Hypotheticals: Iran Already is a Nuclear State," *New Republic*, September 9, 2011; and " Iran's Nuclear Program Status and Breakout Timing" staff paper of the Bipartisan Policy Center, September 2022, all of which draw from an analysis by Greg Jones produced for the Nonproliferation Policy Education Center on August 9, 2011.

2. International Institute for Strategic Studies, *Iran's Nuclear, Chemical and Biological Capabilities: A net assessment* (London: IISS, 2011), p. 72.

3. International Institute for Strategic Studies, *Iran's Ballistic Missile Capabilities: A net assessment (London: IISS, 2010), p. 63.*

The Arms Control Association (ACA) is an independent, membership-based organization dedicated to providing authoritative information and practical policy solutions to address the dangers posed by the world's most dangerous weapons. The "Solving the Iranian Nuclear Puzzle" briefing series is made possible with the support of the Ploughshares Fund and contributions from individual ACA members.