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Iran: Time Is Running Out

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In successive public appearances during the month of September 2012, Prime Minister Benjamin Netanyahu laid out what he believed was the timeline for Iran to cross the nuclear threshold and acquire an atomic bomb. In a September 16 interview with CNN's Candy Crowley, he stated that the Iranians were moving into the final phase of their nuclear work, saying that they were entering a "red zone" in which they were coming extremely close to achieving their goal. He specified during the interview that this meant that within six months the Iranians will have accumulated a sufficient quantity of uranium at a level of enrichment that is 90 per cent of the way to completing an atomic bomb.

The prime minister restated this same idea during his address to the UN General Assembly on September 27, when he said that after this 90 per cent point, what he characterized as the final phase of enrichment would only require "a few months, possibly a few weeks." Looking at the trends in the Iranian nuclear program as a whole, he warned during his address: "the hour is getting late, very late." For that reason, he declared that a clear red line needed to be drawn in front of the leadership in Tehran before the Iranian program entered into this final phase of enrichment and was still within the second phase of enrichment.

To understand the phases of the Iranian program, to which Prime Minister Netanyahu referred, it is important as background to recall that nuclear scientists have long explained the levels of enrichment as follows. Uranium comes in several isotopes: U-235-which can undergo nuclear fission thereby releasing the explosive energy of an atomic bomb and U-238 which is not usable for this purpose. But natural uranium is made up of only an infinitesimal amount of the potentially explosive U-235, approximately 0.7 per cent and a much larger proportion of U-238, approximately 99.3 per cent. Enrichment involves increasing the percentage of U-235 isotope in uranium, usually by spinning uranium as a gas in thousands of centrifuges, and taking away the less useful U-238.

What did the prime minister mean when he said that Iran had reached level of enrichment with its uranium that is 90 per cent of the way to a bomb?

When uranium is enriched to the 3.5 per cent level, in the first phase of enrichment, it is called low-enriched uranium and is mainly a suitable fuel for a civilian nuclear reactor producing electricity. Given the low starting point of U-235 in natural uranium, the amount of energy required to reach even this first level of low-enrichment is about 70 per cent of the total energy needed to get to weapons-grade uranium. In other words, when Iran enriches uranium to the 3.5 per cent level it has essentially advanced 70 per cent of the way to the weapons-grade level.

More alarmingly, when Iran reaches the second level of enrichment, meaning 20 per cent enriched uranium, it is essentially advancing 90 per cent of the way to weapons-grade uranium. By beginning the last sprint to weapons-grade uranium from feedstock that is already at the 20 per cent level, Iran could cut in half the time needed to undertake the same enrichment if it started with only 3.5 per cent uranium. In short, a stock of 20 per cent enriched uranium is ideally suited for what security experts call “nuclear breakout”—a rapid move by a state with what it declares to be a civilian nuclear industry if it wants to move to a nuclear weapon, in violation of its commitments to the international community.

In his UN address, Prime Minister Netanyahu was saying that the international community must warn Iran that it will not be allowed to complete the production of enough 20 per cent enriched uranium for its first atomic bomb. Like in his CNN interview, he stated during his UN address that Iran might cross this threshold by next spring or at the latest by next summer, but he carefully conditioned this assessment on the assumption that Iran maintains its current enrichment rates, leaving open the possibility that they could be accelerated.

For example, if Iran outfitted its uranium enrichment facilities with large numbers of more advanced centrifuges, that operate at four or six times the speed of the current IR-1 model they mostly use, then the rate of Iranian enrichment could be dramatically accelerated. Alternatively, and far more likely, if Tehran installed and began to operate many more IR-1 centrifuges, then the volumes of uranium that the Iranians could process would also increase substantially. Under either scenario, Iran could cross the nuclear threshold that Prime Minister Netanyahu defined at an earlier point in time during the first half of 2013.

The Failure of Past International Pressures on Iran

The world was not supposed to be in this kind of position at present. Since 2002, when the Iranian clandestine nuclear program was first revealed by the Iranian opposition, the main diplomatic assumption held across the international community was that a mixture of international sanctions and negotiations would force Iran to give up its military nuclear program. Subsequently, it was also thought that the threat of the use of force would compel Iran to halt its nuclear work. Iran's concealment of its nuclear activities, particularly its work on uranium conversion, uranium enrichment and plutonium separation constituted outright breaches of its international obligations under its 1974 Safeguards Agreement that had been concluded in accordance with the 1968 Nuclear Non-Proliferation Treaty. Attention was particularly drawn at this time to the large uranium enrichment facility at Natanz.¹

Iran's violations of its treaty obligations were serious. As a result, diplomatic pressures were placed on Iran that appeared to be impressive. From 2006, onward six UN Security Council Resolutions were adopted that called on Iran to halt all uranium enrichment activity. Moreover, just like the resolutions adopted against Iraq under Saddam Hussein in the 1990's, these resolutions against Iran were adopted under Chapter VII of the UN Charter making them binding international law.

Yet this global effort against Iran clearly failed for the resolutions plainly had no impact on Iranian decision-making. After UN sanctions were first imposed under Resolution 1737, in late 2006, the Iranians began enriching uranium anyway in February 2007 in ever growing quantities.

It was also at this time that, despite UN pressures, Iran constructed a second secret enrichment facility, which was dug deeply into the side of mountain at Fordow, near the city of Qom.

By 2009, Iran's stocks of low enriched uranium first went above 1500 kilograms – the minimal amount for producing the quantity of weapons-grade uranium needed for a single atomic bomb. A little less than a year later, in February 2010, despite ongoing UN sanctions, Iran for the first time produced at its Natanz facility uranium enriched to the 20 per cent level, which, as noted earlier, could be converted to weapons grade uranium in half the time in comparison with uranium at the low enriched level. The Iranians began to enrich uranium to the 20 per cent level at their Fordow facility in December 2011.

The Iranian regime also used these years to unilaterally alter the rules affecting the involvement of the International Atomic Energy Agency (IAEA) in its nuclear program in order to erode some of its most important its restrictions. For example, Iran is required to notify the IAEA that it has decided to construct a new nuclear facility the moment such a decision is taken. In other words even when construction begins for a new nuclear facility the IAEA should be fully informed. In the technical jargon of the IAEA this obligation is known as “modified Code 3.1” and was formally accepted by Iran in an exchange of letters between Iran and the IAEA in February 2003.²

But in March 2007, Iran suddenly declared that it was suspending its acceptance of this obligation and going back to earlier IAEA rules that only required Tehran to declare a new nuclear facility six months before it receives nuclear material for the first time. This was not just a technicality. For having loosened the IAEA’s restrictions, the Iranians then argued that their formerly secret enrichment facility at Fordow, which was revealed in 2009, did not violate their legal obligations to the IAEA. Clearly the pressures placed on Iran by the UN Security Council during 2006 and 2007 were insufficient to prevent Tehran from taking such actions.

In the meantime, Tehran has come up with a myriad of excuses for its nuclear program that convinced many in the West to hold back the scale of economic pressures on Iran that have only been employed recently. First, Iranian officials argued that they needed to enrich uranium to the 3.5 per cent level to fuel nuclear reactors that produce electricity. Of course Iran had only one reactor of this sort at Bushehr, whose uranium fuel was being supplied by Russia in any case. Most states which use nuclear reactors to generate electricity actually import their uranium fuel rather than build costly enrichment infrastructures by themselves.

Then Tehran came up with the excuse that it needed 20 per cent uranium for manufacturing medical isotopes at the Tehran Research Reactor. But the quantities of 20 per cent uranium produced have by the admission of Iranian officials themselves exceeded their own domestic requirements for this purpose. The latest transparent excuse for further enrichment has been an Iranian proposal that they might have to enrich up to 90 per cent uranium for powering nuclear reactors for future nuclear submarines in the future.

Time Line to an Iranian Bomb

If the countervailing pressures of the international community against Iran do not get it to halt its 20 per cent enrichment, then when is it likely to obtain sufficient quantities of uranium at this level of enrichment that allow it to move quickly to the weapons-grade level and subsequently assemble its first nuclear bomb? According to the August 2012 IAEA Report, Iran has produced a total of 189.4 kilograms of 20 per cent uranium since it began to enrich to this level in February 2010.

Yet between December 2011 and August 2012, Iran drew down from its 20 per cent stock by 96.3 kilograms which it used to manufacture other uranium products, like uranium oxide powder for fuel plates. As a result, the net stock of 20 per cent uranium has been reported by the IAEA to be 91.4 kilograms. It should be noted that Iran could reconvert its uranium oxide powder back to uranium gas for injecting into its centrifuges for further enrichment. It must always be remembered that Iran also has a huge stock of 3.5 per cent enriched uranium, which according to the last IAEA report reached 5,308 kilograms (after subtracting the uranium that was enriched to 20 per cent). This stock alone could provide enough weapons-grade uranium for at least 3 to 4 atomic bombs, after further enrichment. But enriching from the 20 per cent level would be the fastest way for the Iranians to break out and establish a *fait accompli*.

To produce its first atomic bomb from 20 per cent enriched uranium, According to the Institute for Science and International Security (ISIS), headed by David Albright, Iran would need a stockpile of 225 kilograms, which upon further enrichment to the weapons-grade level would yield the 25 kilograms of uranium metal for a nuclear warhead.³

How long would it take the Iranians to increase their stock of 20 per cent uranium to a total quantity of 225 kilograms? In the last IAEA report, Iran was producing 20 per cent enriched uranium at the highest level ever, using both its enrichment facilities at Natanz and Fordow: the combined rate of production was 14.8 kilograms per month. At this rate, Iran should accumulate enough 20 per cent uranium for a single bomb by May 2013. As stated earlier, this could happen several months earlier if Iran manages to increase the rate of enrichment especially if it utilizes centrifuges that have been installed but are not yet operational.⁴

For example, Iran installed 1,076 centrifuges in its Fordow facility between May and August 2012, bringing the number of centrifuges in Fordow alone to 2,140. Of that total only 646 centrifuges were actually operating. But Iran could substantially accelerate its production of 20 per cent uranium in the months ahead if it decides to utilize all the new centrifuges it is in the process of installing. This would cut the time needed in half to produce enough 20 per cent uranium that could be further enriched to the weapons-grade level, perhaps as early as January or February 2012.

It is important to note that there are further steps that Iran must undertake to reach a nuclear weapon, whenever it amasses enough 20 per cent uranium for its first bomb, and enriches that stock to the weapons-grade level. Most estimates of the time needed to make this leap to weapons-grade uranium are between two and four months. All uranium enrichment requires uranium in a gaseous form: by spinning the gas at high speeds in a centrifuge the heavier U-238 can be separated from the lighter U-235, which is needed for a fission bomb. But once Iran has weapons-grade uranium as a gas, it needs to convert it into a metal for fashioning a nuclear warhead, which takes additional time.

The problem with precisely calculating time lines is also made complicated by the size of the weapon that Iran decides ultimately to make. As noted earlier, the IAEA established that further enrichment of this uranium must yield 25 kilograms of weapons-grade uranium that are needed for a nuclear explosive device. Yet critics charge that this number should be far lower. Even 15 kilograms of weapons grade uranium would be sufficient for a bomb (historically, the US conducted a nuclear test in 1951 with only six kilograms of high enriched uranium).⁵

The Iranian timeline to an atomic bomb would thus be influenced by whether they seek to produce 25 kilograms of weapons-grade uranium or decide to settle on an initial device with less nuclear material and a smaller nuclear explosive yield. This difference could bring Iran much closer to crossing the nuclear red line already in only the next few months.

Why Does Iran Persist with Its Nuclear Drive?

Iran's audacity in violating its international obligations has surprised many in the West. The Iranian government has paid a steep economic price in terms of international sanctions, but nevertheless continues its drive to obtain nuclear

weapons. It is impossible to separate Iran's determination to acquire nuclear weapons from its broader ambitions to become the preeminent power in the Middle East. A few years after he assumed the position of Supreme Leader of Iran, Ayatollah Ali Khamenei gave a revealing interview to the Iranian daily *Ressalat*, in which he asked a rhetorical question: "Do we look to preserve the integrity of our land, or do we look to expansion." He then answered himself saying "We must definitely look to expansion." Khamenei is the commander-in-chief of the Iranian armed forces and hence his definitions of Iranian national strategy are essential to follow.⁶ In the last five years, Iranian spokesmen close to Khamenei have voiced expansionist goals for the Islamic Republic, insisting that Bahrain is an Iranian province reminding the other Arab Gulf states that they used to be part of Iranian territory.

In terms of the Iranian nuclear program, this distinction that Khamenei made means that an Iranian nuclear weapons capability would not be for the purpose of deterrence alone, as with many other regimes, but for serving its drive to achieve regional hegemony and improve its power position vis-a-vis its Arab neighbors and the US. Ali Larijani, who once served as the National Security Advisor of Iran and as its chief nuclear negotiator, made this very point asserting that "if Iran becomes atomic Iran, no longer will anyone dare challenge it because they would have to pay too high a price." In short, nuclear weapons secure Iran's status as a great power that does not have to accept the demands of any other power.⁷

Larijani's remark is important for understanding another feature of Iran's drive to cross the nuclear threshold. Recent history demonstrates that once a state like North Korea conducted its first nuclear test, then the US and its western allies became reluctant to challenge its nuclear status. In contrast, once Libya gave up its nuclear weapons program, the US and its NATO allies felt free to back the revolt in 2011 against the regime of Muammar Qaddafi. Thus advances in the Iranian nuclear program could put it in a position in the near future that it will be able to deter even the US from taking action against its nuclear facilities because of the risks involved.

Clearly, there are a number of benchmarks that Iran must traverse on its way to a full nuclear weapons capability. First, there is the completion of the minimal quantity of 20 per cent enriched uranium needed for manufacturing an atomic bomb after it is enriched further to weapons-grade uranium. Second, there is the manufacture of uranium metal that is used in a nuclear warhead. Third, then there is the production of the warhead itself and it being outfitted on a ballistic missile, like the Shahab-3, that can strike

Israel, Saudi Arabia, or Turkey, as well as Western forces deployed in those countries. Of course a nuclear explosive device does not have to be placed on a missile, but can be also delivered on a cargo ship or even a truck.

The Final Stages of the Iranian Nuclear Program

As Iran advances in its nuclear program, it undoubtedly acquires a great degree of deterrence even before it has a fully operational weapon. Looking at the example of North Korea, it removed IAEA surveillance equipment and evicted its nuclear inspectors in December 2002, while telling US officials that it had nuclear weapons in April 2003. The North Koreans only conducted their first nuclear test in 2006 and a second test in 2009. From their experience, the North Koreans probably raised concerns in the West about their having an impending nuclear weapons capability even before their first nuclear test. Two US analysts have written that the US already began adjusting its military planning on North Korea in the late 1990's when intelligence analysts concluded that North Korea was capable of assembling a nuclear weapon. The point is that rogue states began acquiring strategic advantages from nascent nuclear programs even before they make the final assembly of a nuclear warhead for their missiles.⁸

How would this work in the case of Iran? As the indications mount in 2013 that Iran is making its final preparations to cross the nuclear threshold and become a nuclear weapons state, there will be a renewed debate in the West over the question of the use of military force. But that debate will be clouded with the question of whether Iran already has nuclear weapons. Presumably those who will assert that Iran already has nuclear weapons will argue that any preventive strike will be too risky at this point in time. The main problem is that at this stage intelligence agencies will be operating largely in the dark.

This point has been made occasionally even by senior levels in the US. Appearing on NBC's Meet the Press, on April 11, 2011, former Secretary of Defense Robert Gates made this very point: "If they--if their policy is to go to the threshold but not assemble a nuclear weapon, how do you tell that they have not assembled? So it becomes a serious verification question, and I, I don't actually know how you would verify that." Gates' assessment was particularly significant given the fact that he served as the Director of the CIA in the 1990s and understood better than most officials the true limits of Western intelligence agencies when it comes to the detection of weapons of mass destruction programs.

This explains the enormous risks of letting the Iranian nuclear program progress to its final stages, when Western knowledge about how far Iran has progressed will be problematic. Indeed, Prime Minister Netanyahu made this very point during his UN address. He noted that the Iranian enrichment facilities containing thousands of spinning centrifuges were “very big industrial plants.” That meant they were both visible and vulnerable. However, he added that once the Iranian weapons program has moved on to the next stage involving the production of a nuclear detonator, then it would no longer be reliant on large plants but rather could be completed in a small workshop that is the size of a classroom. At the very final phase of Iran’s nuclear activity, it would be far less visible to Western surveillance and hence it would be far less vulnerable.

It is for this reason that Israel has had to draw its red line on Iran’s drive for nuclear weapons on the enrichment phase of the program and not wait for the weaponization phase which would be too late. In summary, it is difficult to say with precision when Iran will acquire enough 20 per cent uranium that can be enriched further to the weapons-grade level for the manufacture of an atomic bomb. But what is clear is that this moment in time is fast coming close and Iran must be halted well before it arrives.

Notes

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5. Thomas B. Cochran and Christopher E. Paine, “The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons,” Natural Resources Defense Council, Washington, DC, Revised April 13, 1995. For a comparison of Iranian timelines regarding the production of 15 kilograms of high-enriched uranium versus 25 kilograms of high-enriched uranium, see Maseh Zarif, “The Iranian Nuclear Program: Timelines, Data, and Estimates,” American Enterprise Institute, September 2012.
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7. Ray Takyeh, “Introduction: What Do We Know?” in Robert D. Blackwill (ed.), *Iran: The Nuclear Challenge* (New York: Council on Foreign Relations, 2012), p. 10.
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