

Verifying Iran for the Longer Term

By Olli Heinonen, March 2015

P5+1 negotiators are reportedly nearing an agreement with Iran that would dismantle some elements of Iran's nuclear program while only providing limits on all other parts of the program. It also would maintain meaningful parameters that assure—at a minimum—a one-year breakout capability.¹ The Iran Task Force has raised concerns about numerous aspects of the current trajectory of negotiations and the P5+1's concessions to Iran throughout the negotiations. The following memo addresses one such area of concern, namely the “sunset” of enhanced verification requirements.

Although we don't yet know what a final deal will look like, a robust and intrusive verification regime, and in particular the details about the inspections conducted by the International Atomic Energy Agency (IAEA), is of utmost importance. ***And these international verification efforts in Iran cannot simply end when the comprehensive agreement sunsets.***² Supplementary safeguards measures that extend beyond the Additional Protocol (called AP-plus) are essential if the IAEA is to monitor verifiably a comprehensive nuclear agreement. The IAEA can only return to “routine” inspections under the AP when the IAEA is certain that all nuclear material and activities in Iran are being used exclusively for peaceful purposes. Since AP-plus access is negotiated by the P5+1, and enforced by a U.N. Security Council (UNSC) resolution, the UNSC also has to conclude that Iran has fully restored its non-proliferation credentials before these supplementary safeguards measures are reduced.

The elements of the deal currently being negotiated appear to include, inter alia, about 6,000 operating IR-1 centrifuges, or an equivalent enrichment capacity of Separative Work Units (SWU); capping stocks of enriched uranium remaining in Iran; continued research and development on advanced centrifuges; and a research-reactor reconfiguration for Arak, which will irreversibly reduce its plutonium production capacity.³

THE ILLOGIC OF 6,000 CENTRIFUGES

Six thousand operating centrifuges is—when looking from a technical perspective, given the known enriched uranium needs of Iran—an excessive and odd number.

With current IR-1 centrifuge performance, Iran's 6,000-plus machines could produce annually

.....
1. Breakout time is the time required to produce enough weapons grade uranium (WGU) for one or more nuclear weapons. The amount of WGU needed for a nuclear weapon is one significant quantity (SQ), which is commonly defined as 25 kilograms of 90 percent enriched uranium.

2. For more information on the “sunset” of a comprehensive agreement, see “The Significance of the Sunset Clause,” *Iran Task Force*, July 2014. (http://taskforceoniran.org/pdf/Sunset_Clause_Significance.pdf)

3. David Albright, Olli Heinonen, & Andrea Stricker, “The Six's' Guiding Principles in Negotiating with Iran,” *Institute for Science and International Security*, June 3, 2014. (http://www.isisnucleariran.org/assets/pdf/Principles_and_Compromises-july_22_2014-final1.pdf)

about two metric tons of low-enriched uranium hexafluoride, that is, 3.5% U-235. However, to fuel the Bushehr reactor for one year, it would take 15 times that amount. At the same time, Iran has secured a long-term agreement to purchase fuel for Bushehr from Russia. Moscow has also offered those services for future Iranian reactors. It would be less expensive for Iran to purchase enriched uranium and nuclear fuel from international markets than to build an enrichment program of the scale needed to fuel Bushehr and future nuclear power plants.⁴

On the other hand, if the argument is that Iran needs 6,000 IR-1 centrifuges to produce 20% enriched research reactor fuel, which serves for medical purposes, the number of centrifuges is way too high. Iran may make a patriotic argument for domestic production, but the fact remains that the international market currently supplies the world's needs for enriched uranium required to produce radioisotopes for medical purposes. Both developed and developing countries buy their medical isotopes on the international market because it is easiest and most cost effective. In addition, there is currently a significant excess of highly enriched uranium stocks left over from the Cold War, which can be blended down for reactor fuel for the international market. There really is no need for additional uranium enrichment of 20% U-235 for decades to come.

Third, Iran might want enrichment in order to maintain domestic knowledge and skills regarding the front end of the fuel cycle. However, operating 6,000 IR-1 centrifuges is too large for an enrichment demonstration plant, which typically houses some 1,000 centrifuges or half a dozen parallel cascades.

Concerning proliferation, such a number is troubling. It takes a year with 5,000 SWU to enrich enough uranium for one nuclear device from natural uranium hexafluoride to weapons-grade.⁵ If the starting point is, as is the case with Iran, low-enriched UF₆ at 3.5% U-235, the breakout time is cut to half a year. Some proposals reportedly being negotiated include altering the operating parameters of centrifuges and cascades in order to lengthen breakout time while keeping 6,000 IR-1 centrifuges operable. Under such a scenario, it will, however, remain difficult to attain a one-year breakout time that is meaningful. The technical means necessary to reverse the cascade or centrifuge reconfiguration will not be hard and could be effected fairly rapidly, and once it is done, the breakout time could shrink significantly.⁶ ***The international community would be staring at a scenario where the re-imposition of sanctions would be meaningless and the only option to an American president would be military strikes, undertaken at a speed that politically, if not militarily, may not be feasible.***

Of note, the A.Q. Khan network offered a system of 6,000 centrifuges to Libya for its nuclear weapons program. The Libyan enrichment scheme (illustrated in Fig.1) processed natural uranium (0.7%) to 3.5%, then to 20%, 60%, and finally to 90% enriched uranium.

Iran had implemented in Natanz and Fordow similar steps up to produce 20% U-235, but agreed to halt the production of 20% enriched uranium as part of the JPOA (Joint Plan of Action).

.....
4. Armin Rosen, "An Iran Nuclear Deal is Coming into Focus, but There's One Glaring Problem," *Business Insider*, February 20, 2015. (<http://www.businessinsider.com/status-of-iran-nuclear-negotiations-2015-2>)

5. Olli Heinonen, "Key Limitations on Iran's Uranium Enrichment Program," *Iran Task Force*, October 2014. (http://taskforceoniran.org/pdf/Enrichment_Memo.pdf)

6. Olli Heinonen, "Changing the Operating Parameters of Centrifuges is Not a Credible Solution to Gain Time," *Iran Task Force*, February 2015. (http://taskforceoniran.org/pdf/Operating_Parameters_Memo.pdf)

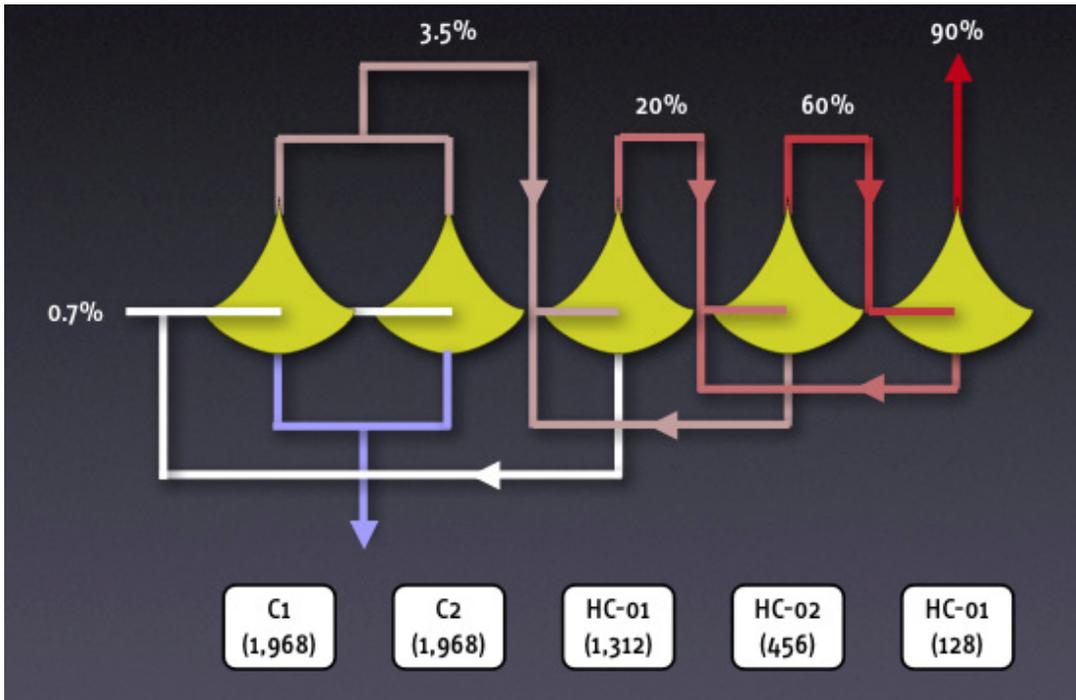


Figure 1: Scheme crafted by the A.Q. Khan network to produce weapon grade, 90% U-235, uranium hexafluoride.⁷

THE SCOPE AND DURATION OF THE VERIFICATION REGIME

For verification purposes, a larger program has more moving parts and larger uncertainties. It also increases the risks coming from the unknowns about Iran’s nuclear program that, by definition, are not included in one-year breakout times, whose calculations are based solely on known nuclear material inventories and facilities. That is, the estimate of a one-year breakout time assumes that Iran chooses to enrich to weapons-grade uranium at a known nuclear site rather than “sneak out” at a yet to be detected, clandestine facility. The more efficient Iran’s centrifuges become, the greater the danger that Iran can develop a “sneak out” capacity, which needs to be addressed by capping the manufacturing capabilities and implementing a robust verification regime.

The negotiators have stated that the objective of any comprehensive deal is to effectively cut off all the pathways Iran could take to obtain enough fissile material, uranium and/or plutonium, for a nuclear weapon. This necessitates tight constraints and strict curbs on Iran’s nuclear facilities and related infrastructure. It additionally requires robust monitoring and transparency measures to maximize the international community’s ability to detect quickly any attempt by Iran to divert material or equipment to break out or sneak out.

7. Olli Heinonen & Simon Henderson, “Nuclear Iran: A Glossary of Terms,” *The Washington Institute for Near East Policy & Belfer Center for Science and International Affairs*, May 2013. (<http://belfercenter.ksg.harvard.edu/files/PolicyFocus121NuclearGlossary.pdf>)

Thus, the IAEA verification regime must go further than the Additional Protocol (AP). Contrary to what is commonly understood, the AP does not provide the IAEA with unfettered access. Currently, the IAEA does not have access to Iran's sensitive nuclear information. For years, inspectors have been stonewalled. A verifiable agreement would require unfettered access to all key facilities, personnel, documentation, and other information being sought. The AP, by itself, does not fully oblige this.

The P5+1 negotiators have rightly recognized these weaknesses and acknowledged the need to have added nuclear transparency requirements in Iran beyond the Additional Protocol. For such transparency requirements to be effective:

- *The extent, scope, and tools needed for effective verification and access in Iran cannot be used as a bargaining chip in negotiations; and*
- *AP-plus verification activities cannot end upon the expiration of an arbitrary period of time, but rather only when the IAEA has concluded that all nuclear material and activities in Iran are in peaceful use, that there are no undeclared activities, and the U.N. Security Council is able to conclude that Iran has fully restored international confidence in the peaceful nature of its nuclear program.*

Specifically, the IAEA needs “go anywhere, anytime” access to sites, material, equipment, persons, and documents and to oversee a single procurement channel to be established to ensure Iran is not secretly importing elements for a nuclear-weapons program.⁸

It is vital that the inspection, monitoring, and verification regime agreed to as part of a comprehensive agreement not be bound by time limits set by the agreement. Only when the IAEA can conclude with a high certainty that Iran's nuclear program is entirely peaceful should the international community consider reducing the verification regime from AP-plus, to AP, and return to the “normal” inspections regime to which all Nuclear Non-Proliferation Treaty members are obligated.

THE IMPORTANCE OF CLARIFYING PAST NUCLEAR ACTIVITIES

Safeguards tools, however, also need to be read and understood in the context of what can and cannot be achieved. The IAEA is not able to verify the current or even future intentions of a state. A state can run both its civilian nuclear enrichment and military-weaponization programs in parallel. It can vary the pace and methods for developing these programs, one open and the other clandestine, allowing the civilian program to master the enrichment technology for later use in a clandestine nuclear-weapons program. *If the IAEA's increased monitoring and*

.....
8. For more information on verification requirements, see “Requirements for Detecting Covert Iranian Nuclear Weapons Activity,” *Iran Task Force*, November 3, 2014. (http://taskforceoniran.org/pdf/Verification_Memo.pdf)

inspection regime in Iran were to have an artificially determined deadline, Iran could choose to wait it out. At this stage, Iran's nuclear know-how would remain intact together with substantial uranium-enrichment infrastructure. Iran could then open the floodgates when the limitations on uranium enrichment are lifted and the verification regime returns to the routine implemented for "safe" countries. In light of this, *Iran needs to explain its past nuclear program and the verification regime should not merely concentrate on the verification of future activities.*⁹

*As pointed out by General Michael V. Hayden, former director of the CIA, if the objective is to put distance between where Iran is today and where the government needs to be in order to have a nuclear weapon, there needs to be a full accounting of its work.*¹⁰ *Until Iran provides a full accounting of its past and present possible military dimension activities, the international community cannot have confidence that it knows either how far Iran is along the path to nuclear weapons or that Iran's nuclear weapons-related activities have effectively ceased.*

In this context, *it is important to recognize that current monitoring and verification systems, particularly for covert activities, have shortcomings. It will take time to develop new technologies and approaches that will detect, early enough, undesirable nuclear activities.*¹¹ *These gaps have to be taken into account in a full assessment of the IAEA's monitoring and verification work.*

AN "UNPRECEDENTED" VERIFICATION REGIME

Much has also been made out of how the verification activities under the JPOA in Iran are "unprecedented." They are unprecedented only in the sense that Iran has, for years, limited IAEA inspectors from doing their work and now allows IAEA inspectors to see some additional things more regularly. The necessary verification regime should be measured not against what existed previously in Iran or what other countries have undergone. Instead, a more accurate assessment of the current state of inspection in Iran would be to acknowledge that Iran has been and remains a nuclear non-compliant case, and IAEA verification needs to be enhanced accordingly.

9. Olli Heinonen & David Albright, "A New Approach to Resolve Military Aspects of Iran's Nuclear Program," *Institute for Science and International Security*, November 5, 2014. (http://belfercenter.ksg.harvard.edu/files/Heinonen_New%20Approach.pdf)

10. Michael V. Hayden, "Examining what a Nuclear Iran Deal Means for Global Security," *Testimony before the House Committee on Foreign Affairs*, November 20, 2014, page 3. (<http://docs.house.gov/meetings/FA/FA13/20141120/102758/HHRG-113-FA13-Wstate-HaydenM-20141120.pdf>)

11. U.S. Department of Defense, Defense Science Board, "Assessment of Nuclear Monitoring and Verification Technologies," January 2014. (<http://www.acq.osd.mil/dsb/reports/NuclearMonitoringAndVerificationTechnologies.pdf>)

Even then, there is precedent for the IAEA to carry out additional verification measures alongside the Additional Protocol, as was the case in South Africa.¹² South African authorities adopted, in the early 1990's, an open, completely transparent policy of IAEA inspections "any time—any place, with a reason." Although South Africa ratified the AP in 2002, the IAEA continued to conduct such additional transparency measures parallel to its implementation of the AP until South Africa was given a clean bill of health in 2010. *The rationale for the approach and extended monitoring was that enrichment and weapons-related know-how remained after the dismantlement of the actual infrastructure.*

While the South Africa case is a model for what the IAEA can do in terms of AP-plus activities, other elements would need to be tailored to Iran under a comprehensive deal. For instance, expanding safeguarding procurement to include single-¹³ and dual-use¹⁴ items (not covered by the AP), and proliferation-sensitive goods to reduce Iran's ability to fuel an illicit nuclear program.¹⁵ Proliferation-sensitive goods are those needed for a nuclear-weapons program and nuclear-weapon delivery systems, including ballistic missiles. At the same time, this also means creating an appropriate procurement channel for Iran's permitted nuclear program. For this to work, tight controls and a transparent nuclear program are needed so long as there is domestic enrichment in Iran.

CONCLUSION

Given Iran's history, there is also legitimate concern of continued prevarications or limited cooperation under and after the deal. These concerns are likely to grow should international leverage be seen to diminish. Therefore, Iran's obligations under a robust verification regime must be legally binding and a vigilant enforcement scheme is needed to keep the deal in place. This includes stepwise lifting of sanctions only after Iran complies with its obligations¹⁶ so as not to overly rely on the ability to "snapback" sanctions if Iran does not comply.¹⁷

12. Olli Heinonen, "Verifying the Dismantlement of South Africa's Nuclear Weapons Program," in *Nuclear Weapons Materials Gone Missing*, ed. Henry Sokolski, (Carlisle, Pennsylvania: Strategic Studies Institute of the United States Army War College, 2014), pages 88-99. (<http://npolicy.org/books/2014muf/Nuclear%20Weapons%20Materials%20Gone%20Missing.pdf>)

13. International Atomic Energy Agency, "Communication Received from the Permanent Mission of the Czech Republic to the International Atomic Energy Agency Regarding Certain Member States' Guidelines for the Export of Nuclear Material, Equipment and Technology," INFCIRC/254/Rev.12/ Part 1, November 13, 2013. (<http://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc254r12p1.pdf>)

14. International Atomic Energy Agency, "Communication Received from the Permanent Mission of the Czech Republic to the International Atomic Energy Agency Regarding Certain Member States' Guidelines for Transfers of Nuclear-Related Dual-use, Equipment, Material, Software and Related Technology," INFCIRC/254/Rev.9/Part 2, November 13, 2013. (<http://www.iaea.org/sites/default/files/publications/documents/infcircs/1978/infcirc254r9p2.pdf>)

15. Olli Heinonen & David Albright, "Provisions to Limit Future Iranian Illicit Procurements for Its Nuclear Program," *Institute for Science and International Security*, November 20, 2014. (<http://isis-online.org/isis-reports/detail/provisions-to-limit-future-iranian-illicit-procurements-for-its-nuclear-pro/>)

16. "Smart Sanctions Enforcement and Relief," *Iran Task Force*, July 2014. (http://taskforceoniran.org/pdf/Smart_sanctions_Memo.pdf)

17. "The 'Snapback' Sanction as a Response to Iranian Non-compliance," *Iran Task Force*, January 2015. (http://taskforceoniran.org/pdf/Snapback_Memo.pdf)

The IAEA inspection regime is expected to be front and center in detecting breakout, sneak out, and determining whether all nuclear activities in Iran are peaceful in nature. This entails a clear understanding of the strengths and limitations of the IAEA's verification and monitoring procedures and capacities—and for the case in Iran, substantially enhanced *IAEA inspection authorities that will remain in place not just for an arbitrary period of time, but until Iran has fully restored international confidence in the peaceful nature of its nuclear program*. Further, this verification and monitoring regime must be coupled with an enforcement regime necessary to counteract deficiencies.

The Iran Task Force's goal is to lend expertise on Iran's internal politics, nuclear science, and sanctions regime to the legislative branch. By providing the necessary intellectual capital, this group can help to strengthen Congress's role in a potential final nuclear agreement with Iran. This group of former government officials and nuclear, legal, and sanctions experts provides advice and recommendations to policymakers in order to ensure that any final deal prevents Iran's uranium and plutonium pathways to a nuclear weapon.

Elliott Abrams
Sen. Evan Bayh
Eliot Cohen
Michael Doran
Mark Dubowitz
Amb. Eric Edelman
Reuel Marc Gerecht

Chris Griffin
John Hannah
Gen. Michael Hayden
Olli Heinonen
Amb. Robert Joseph
Alan Makovsky
Emanuele Ottolenghi

Chip Poncy
Stephen Rademaker
Mitchell Reiss
David Rivkin
Ray Takeyh
William Tobey
Juan Zarate