Verifying a Final Nuclear Deal with Iran

By Olli Heinonen, June 2015

Summary: Unfettered access to sites, facilities, material, equipment, people, and documents is imperative to the credible long-term verification of any nuclear agreement with Iran. This "anywhere, anytime" access and short notice inspections must not be subject to a dispute resolution mechanism, which would delay the International Atomic Energy Agency's (IAEA) access. Procedures in a final deal, which provide Iran with the ability to define or control access, undermine the verifiability of the agreement and affect the IAEA's ability to reach timely conclusions. Additionally, the resolution of the IAEA's outstanding concerns regarding the possible military dimensions of Iran's program must be resolved prior to the provision of substantial sanctions relief.

The Emerging Terms of a Final Agreement

To close off all pathways to a bomb, the United States has emphasized that a nuclear deal with Iran will include an effective verification regime that will provide necessary transparency.[1] Currently, the details, definitions, and modalities of safeguards implementation—all crucial elements that can make the difference between a durable agreement and a weak agreement—are being worked out between the P5+1 and Iran. ***A durable agreement with Iran will be heavily reliant on the quality of verification mechanisms that are put in place.*** However, in public statements, Iranian officials, including the Supreme Leader, have already proclaimed certain areas off-limits to inspections, rejected any "unusual" monitoring, and issued their government's own understanding of what the Joint Comprehensive Plan of Action (JCPOA) will include.[2] These statements indicate that the P5+1 and Iran are far apart on these critical issues. With the negotiating caveat that nothing is agreed until everything is agreed, there are a few elements that have emerged from the negotiations that are unlikely to significantly shift. Creating the needed verification scheme will have to take these features into account. The following summary of the features of the final nuclear deal is based on the U.S. fact sheet on the Parameters for a JCPOA.[3]

1. "Parameters for a Joint Comprehensive Plan of Action Regarding the Islamic Republic of Iran's Nuclear Program," *The White House*, April 2, 2015. (https://www.whitehouse.gov/sites/default/files/docs/parametersforajointcomprehenisveplanofaction.pdf)
2. "Exclusive: Iranian Parliament Releases 'Factsheet' for Revision of Lausanne Statement," *Fars News Agency* (Iran), April 15, 2015; (http://english.farsnews.com/newstext.aspx?nn=13940126000866). "Leader remarks in The Leader in Imam Hussein Military Academy," *The Office of the Supreme Leader Sayyid Ali Khamenei*, May 20, 2015; (http://www.leader.ir/langs/en/index.php?p=contentShow&id=13231). "Interview with Supreme Leader's Advisor on Foreign Affairs about the Nuclear Negotiations," *The Center for Preserving and Publishing the Works of Grand Ayatollah Sayyid Ali Khamenei*, May 17, 2015; (http://english.khamenei.ir/index.php?option=com_content&task=view&id=2070). & Ali Alfoneh & Behnam Ben Taleblu, "Khamenei Breaks Silence Over Nuclear Framework," *FDD Policy Brief*, April 9, 2015. (www.defenddemocracy.org/media-hit/ali-alfoneh-khamenei-breaks-silence-over-nuclear-framework/)
3. "Parameters for a Joint Comprehensive Plan of Action Regarding the Islamic Republic of Iran's Nuclear Program," *The White House*, April 2, 2015. (https://www.whitehouse.gov/sites/default/files/docs/parametersforajointcomprehenisveplanofaction.pdf)

First, according to the Parameters, the final nuclear deal will allow Iran to operate a nuclear program that exceeds its current and reasonable future needs. A final nuclear deal will include restrictions for ten years that, the Obama administration asserts, will put Iran at least one year away from being able to produce enough weapons-grade uranium for one nuclear device. ***Under this arrangement, Iran, however, remains a nuclear threshold state.***

Second, the one-year breakout time calculation is based on keeping the permitted stocks of uranium at 300 kg of low enriched uranium and unlimited natural uranium and installed centrifuges at ca. 5,000 IR-1s in Natanz and another 1,000 IR-1s in Fordow. The rest of Iran's currently installed centrifuges will be removed and placed in storage, monitored by the IAEA, and excess enriched uranium would presumably be shipped out of the country or diluted to natural uranium, however Iranian officials have stated that no enriched uranium will be shipped out of Iran. ***All of this will require stringent regulation to ensure that the numbers are kept within the agreed parameters.***

Third, the Arak heavy water reactor (IR-40) will presumably be converted to a smaller light water moderated reactor, using low enriched uranium fuel. With this reconfiguration, Arak's capability to produce weapons grade plutonium would shrink substantially. Iran is also prohibited from building new heavy water reactors for fifteen years.[4] The plutonium path to the bomb will remain blocked under both scenarios if Iran, as per the Parameters, ships out the spent fuel and does not construct reprocessing facilities.

Fourth, ***although Iran's nuclear program would be capped, restricted, and monitored, the changes—apart from the conversion of the Arak reactor—are reversible.*** Iran would continue to mine uranium even as its mines and uranium milling facilities would now be subject to inspections. The production of centrifuge components and the assembly of centrifuges would not stop although they would have to be accounted for. R&D on more modern centrifuges is permitted, although these advanced centrifuges may not be deployed during the first ten years. Iran would also be permitted to build additional front-end fuel cycle installations for uranium conversion or fuel fabrication. However, these facilities cannot be used to process enriched uranium.

In other words, a final nuclear agreement would seek to detect, delay, and deter use by Iran of its existing[5] nuclear infrastructure to manufacture a nuclear weapon. Assuming that Iran has not and will not change its nuclear course and ambitions, sustained rigor, attention, and effective mechanisms are required to fulfill the agreement's stated goals. ***Removed centrifuges can, as a practical matter, be reinstalled, and once many restrictions are lifted after ten years, Iran's breakout capability could fall back down to a few weeks.[6] This also means that the verification approach has to be adaptive and intuitive both during the lifetime of the agreement as well as after it.***

4. "Parameters for a Joint Comprehensive Plan of Action Regarding the Islamic Republic of Iran's Nuclear Program," *The White House*, April 2, 2015. (https://www.whitehouse.gov/sites/default/files/docs/parametersforajointcomprehenisveplanofaction.pdf)
5. The existing infrastructure includes not only those 6,000 centrifuges installed in Natanz and Fordow, but also capabilities to manufacture centrifuges, to mine uranium, acquire other key raw materials and to continue with the uranium enrichment R&D.
6. Josh Lederman, "Obama Says Iran Could Cut Nuke Time to Near Zero in 13 Years," *Associated Press*, April 7, 2015. (http://news.yahoo.com/obama-says-iran-could-cut-nuke-time-near-092325050.html)

Verification work entails identifying potential weaknesses and addressing them. ***Since Iran's nuclear program will remain sizable and the focus of a nuclear agreement will be on restrictions that are intended to keep Iran one year away from making enough weapons-grade uranium for a bomb, several key vulnerabilities will have to be considered and identified risks will have to be mitigated.***

Calculations of the one-year breakout time are largely based on the assumptions that Iran would choose to enrich to weapons-grade uranium (WGU) at known nuclear sites rather than "sneak out" at a yet-to-be detected, clandestine facility. ***This Task Force assesses that it is more likely that if Iran decides enrich to WGU, it will do so at a clandestine facility, but take advantage of the remaining infrastructure. The more efficient Iran's centrifuges become, the greater the danger that Iran can develop a "sneak out" capacity. This concern could be addressed by capping Iran's centrifuge manufacturing capabilities and implementing a robust verification regime, which verifies flows of nuclear material from cradle to grave, and monitors the production and imports of nuclear-related equipment and raw materials to ascertain the absence of clandestine nuclear activities.***

It is worth noting, however, that these monitoring mechanisms do not extend Iran's breakout time[7] but rather are intended to improve the prospects of detecting violations to Iran's obligations under a nuclear agreement.

Centrifuge R&D

The April 2, 2015 U.S. fact sheet on the Parameters for a JCPOA indicated that the limitations on Iran's centrifuge research and development (R&D) program were not yet but would be agreed upon by June 30, 2015. There are two elements to the R&D issue. The first is the status of current R&D on centrifuges operating in Iran, and the second is the scope and extent of R&D on more advanced centrifuges. On the former, Iran has R&D on centrifuges running with uranium feed (IR-1s, IR-2s, and IR-4s) at its Pilot Fuel Enrichment Plant (PFEP) in Natanz.[8] These R&D centrifuges at PFEP have an annual enrichment capacity equivalent to 1300-2000 SWU installed. As the centrifuges used for the R&D are currently omitted from the JCPOA's allocated 5,000 centrifuges at Natanz and the 1,000 in Fordow, the final number of installed centrifuges—including these higher performance R&D centrifuges—needs to fit into the one-year timeline.

On the issue of R&D and testing of advanced centrifuges, there are reports of discussions on various options that call for technical restrictions on the scope, type, and deployment of these

7. For more information on why one year may be insufficient to detect and prevent an Iranian breakout, see Michael Hayden, Olli Heinonen, & Ray Takeyh, "The Iran Time Bomb," *The Washington Post*, March 22, 2015. (http://www.washingtonpost.com/opinions/a-one-year-time-bomb-on-iran/2015/03/22/14cc497e-cdbc-11e4-8c54-ffb5ba6f2f69_story.html)

8. International Atomic Energy Agency, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran," February 19, 2015. (https://www.iaea.org/sites/default/files/gov2015-15.pdf)

centrifuges.[9] ***Any R&D on more powerful centrifuges, even on a limited scale, will improve skill sets. This in turn has consequences both in reducing breakout time after the ten-year restrictions expire and in facilitating a potential clandestine enrichment facility powered by higher-performance centrifuges that are smaller in scope and more difficult to detect.*** Verification work is relatively inapplicable when it comes to R&D skills acquired, but it can reduce opportunities for a clandestine scenario.

Inventory of Centrifuges

Breakout time also depends on the inventory of centrifuges Iran has and how many it will be permitted to manufacture for R&D purposes in the future. Thus the starting point for monitoring is a fully verified declaration by Iran of its total number of centrifuges as well as the manufacturers of their key components, current locations of centrifuge production, and key raw materials acquired. In 2003, Iran agreed to such verification procedures[10] lasting until early 2006.[11] There are two reasons for such a requirement: 1) Monitoring of dismantled centrifuges from Natanz and Fordow alone provides a picture only of those locations but not beyond; and 2) Advanced centrifuges such as IR-2ms and IR-4 can be installed in quantities of concern fairly quickly, making the stated one-year breakout margin hard to meet. While such installation will be noticed, this scenario must nonetheless be included under breakout times. ***Restricting the inventories of nuclear materials and accounting for all centrifuges, their key components, and raw materials will provide important impediments to such new installations.***

The importance of the accounting of centrifuges can also be concluded from a statement by Under Secretary Wendy Sherman, who recently noted that "without this [agreement], Iran would expand its enrichment program to 100,000 centrifuges in the next few years."[12] In practical terms, for Iran to achieve this, it would have had to already acquire or produce substantial amounts of maraging steel, carbon fiber, and/or high strength aluminum. Under Secretary Sherman's statement indicates that the United States assumes that Iran has done so. Iran's procurement of these materials from black markets and through sanctions evasion has continued, parallel to the talks with the P5+1.[13]

Uranium Mines and Milling Facilities

Both the Joint Plan of Action (JPOA)[14] concluded in November 2013 and the Parameters announced on April 2, 2015 call for IAEA access to uranium mines and milling facilities. Since

9. Ernest Moniz, "A Nuclear Deal That Offers a Safer World," *The Washington Post*, April 12, 2015. (http://www.washingtonpost.com/opinions/a-safer-iran/2015/04/12/ae3a7f78-dfae-11e4-a1b8-2ed88bc190d2_story.html)
10. International Atomic Energy Agency, "Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran," February 24, 2004.
11. Permanent Mission of the Islamic Republic of Iran to the IAEA, "Communication Dated 5 February 2006 from the Permanent Mission of the Islamic Republic of Iran to the Agency," GOV/INF/2006/3, February 6, 2006.
12. Wendy R. Sherman, "Remarks at the Religious Action Center of Reform Judaism Biennial Leadership Policy Conference," *Arlington, VA*, April 27, 2015. (http://www.state.gov/r/pa/prs/ps/2015/04/241148.htm)
13. Louis Charbonneau, "Exclusive: Britain Told U.N. Monitors of Active Iran Nuclear Procurement: Panel," *Reuters*, April 30, 2015. (http://www.reuters.com/article/2015/04/30/us-iran-nuclear-idUSKBN0NL09220150430)
14. International Atomic Energy Agency, "Monitoring and Verification in the Islamic Republic of Iran in Relation to the Joint Plan of Action," January 17, 2014, page 3. (https://www.iaea.org/sites/default/files/gov2014-2.pdf)

January 2014, inspectors have only visited the Gchine and Saghand mines and milling facilities in Ardakan and Gchine once each. While the IAEA has stated that it has received mutually agreed information, it has not disclosed what this information is, whether the information met the IAEA requirements, or the actual amount of yellow cake produced. Part of showing that verification is working is to disclose numbers. ***The IAEA must also have more frequent visits to the mines and milling facilities, as well as press for additional disclosures on the extraction of uranium from other ore processing activities such as the purification of phosphates, which Iran has been testing as a potential source of uranium.***[15]

Possible Military Dimensions (PMDs) of Iran's Nuclear Program

In verification work, all scenarios must be prepared for. ***Iran's poor track record of adherence to the letter and spirit of agreements and to commitments that stand the test of time needs to be taken into account.*** There is evidence that Iran has not met all of its commitments agreed in the JPOA, specifically Iran tested IR-5 centrifuges[16] and has yet to complete the conversion of 3.5 percent[17] and 20 percent[18] enriched uranium hexafluoride into uranium oxides. The May 2015 IAEA report also indicated that Iran has fallen behind schedule on the conversion of newly enriched uranium into uranium oxide and has accumulated 1,106 kg of UF6 above the agreed level of Iran's uranium stocks.[19] IAEA reports also do not reflect how much of the 3.5 percent and 20 percent material is in the conversion process nor how and how often this has been verified.

The picture is even dimmer when it comes to the IAEA-Iran Framework of Cooperation (FOC) of November 11, 2013, that focuses on long outstanding issues including questions regarding the possible military dimensions (PMD) of Iran's nuclear program.[20] Indeed, ***Iran's most serious verification shortcoming remains its unwillingness to address the IAEA's concerns***

15. International Atomic Energy Agency, "Implementation of the NPT Safeguards Agreement in the Islamic Republic of Iran," GOV/2003/75, November 10, 2003. (https://www.iaea.org/sites/default/files/gov2003-75.pdf)
16. Iran started the testing of an IR-5 centrifuge in apparent violation of the terms of the JPOA. The activity was only brought to halt after the incident was brought to the State Department's attention by David Albright and the Institute for Science and International Security. See, David Albright & Andrea Stricker, "Update on IR-5 Centrifuge Issue: Taking Stock," *Institute for Science and International Security*, December 16, 2014. (http://isis-online.org/isis-reports/detail/update-on-ir-5-centrifuge-issue-taking-stock/)
17. According to the April 2015 IAEA report, Iran still had 724 kg 3.5 percent enriched UF6 waiting for conversion to oxide form. See, David Albright & Serena Kelleher-Vergantini, "Comments on the April 20, 2015 IAEA Report on the Status of Iran's Compliance with the Joint Plan of Action," *Institute for Science and International Security*, April 22, 2015, page 1. (http://isis-online.org/uploads/isis-reports/documents/ISIS_Comments_on_JPA_Report_April_22_2015_Final.pdf)
18. David Albright & Serena Kelleher-Vergantini, "The U.S. Fact Sheet's Missing Parts: Iran's Near 20 Percent LEU," *Institute for Science and International Security*, May 4, 2015. (http://www.isisnucleariran.org/assets/pdf/LEU_20_percent_update_May_4_2015_Final.pdf)
19. David Albright, Serena Kelleher-Vergantini, Andrea Stricker, & Daniel Schnur, "ISIS Analysis of IAEA Iran Safeguards Report," *Institute for Science and International Security*, May 29, 2015. (http://isis-online.org/uploads/isis-reports/documents/ISIS_Analysis_IAEA_Report_May_29_2015_Final.pdf); & David Albright and Serena Kelleher-Vergantini, "Iran's Stock of Less than Five Percent Low Enriched Uranium," *Institute for Science and International Security*, June 2, 2015. (http://isis-online.org/uploads/isis-reports/documents/Irans_35_stocks_of_LEU_June_2015_Final.pdf)
20. International Atomic Energy Agency, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran," May 29, 2015, pages 12-13. (https://www.iaea.org/sites/default/files/gov2015-15.pdf)

about the past and possibly on-going military dimensions of its nuclear program. For the IAEA to conclude that all nuclear material is peaceful in use, Iran must satisfy the IAEA's questions in this key area. It is not possible for the IAEA to conclude that Iran's program is peaceful if Iran does not address these outstanding issues. Unless the IAEA concerns are fully and satisfactorily addressed as part of Iran's key compliance obligations, it would be hard to create a meaningful and robust verification regime with credible assurances.

Indeed, to date, PMD issues have been approached as a point for resolution in the future and as a process matter rather than a prerequisite to entering into the JCPOA. ***Since PMD issues will apparently not be resolved before the entry into force of the JCPOA, it will create an increased burden on international inspectors to verify the peaceful nature of Iran's program. As part of the enforcement mechanisms, the agreement should only grant significant sanctions relief after Iran has addressed and satisfied IAEA concerns.***

Access for International Inspectors

Transparency arrangements, including the "go anywhere, anytime" visits that allow inspectors to gain the access and information to sites, material, equipment, persons, and documents, have to form part of the verification process. The recent statement of Ayatollah Khamenei, "As it has already been said, no permission will be given to them for inspecting any of the military sites as well as for interviewing nuclear scientists and [scientists in] other sensitive disciplines and encroaching upon their privacy,"[21] demonstrates the challenge P5+1 negotiators are facing. ***Without unfettered access to people and all sites in Iran, and if limitations and sanctuaries are carved out, it will be impossible to convincingly certify that Iran is fully complying with its undertakings. Such measures take on additional salience if not all pathways to a bomb are to be closed off.*** The IAEA's 24-hour advance notice for complementary access provided for under the Additional Protocol (AP) for declared sites should be similarly applied to inspections at suspect sites—an issue being negotiated between P5+1 and Iran as part of an AP-plus. Access request to inspect any site—declared or suspect—with a reason, should be gained in short notice to avoid tampering that could compromise the verification objectives. Such access would be triggered by the IAEA without any consultations with other parties, as implemented with all states with the AP in force.

Other Areas of Concern

In addition, ***a single procurement channel must be established in order to ensure that Iran is not secretly importing elements for a nuclear weapons program or***

21. "Leader Remarks in The Leader in Imam Hussein Military Academy," *The Office of the Supreme Leader Sayyid Ali Khamenei*, May 20, 2015. (http://www.leader.ir/langs/en/index.php?p=contentShow&id=13231)

engaged in parallel, unreported activities.[22] These measures, which should also cut off avenues of outsourcing nuclear activities to other countries, need to be legally binding.

The verification approach should be innovative and adaptive to fit the needs of ongoing monitoring activities. A re-think is also required to run IAEA activities in a manner that will increase the efficacy and deterrence factor of monitoring. IAEA access should also be implemented in an unpredictable and flexible manner that does not tie up resources devoted to predictable daily visits to Natanz and Fordow—which constitute current inspection visits.[23] Other areas should also be stepped up under transparency requirements, such as regular reports to be submitted by Iran at three-month intervals on amounts of uranium-ore concentrates (yellow cake) produced, key raw materials produced and/or imported, as well as acquisition of other single and dual use nuclear items.

To monitor a comprehensive nuclear agreement that not only has many parts but also several lines of reporting responsibilities (UNSC, P5+1, IAEA Board of Governors), IAEA reporting practices need to be detailed and regular so that the IAEA member states and P5+1 can make their own independent conclusions in a timely manner.

Conclusion

The JCPOA Parameters published on April 2, 2015 still require agreement on various fundamental aspects of the verification regime if the JCPOA is to be effective. The administration's goal to keep Iran at least a year away from being able to produce enough fissile material for one nuclear device demands robust and effective verification and monitoring—by no means an easy task given Iran's nuclear infrastructure, capabilities, and history. And in some other areas such as R&D on more advanced centrifuges, attention will have to go into monitoring Iran's manufacturing of centrifuges and acquisition of key raw materials. ***In order to contain Iran within agreed limitations, the provisions worked out on a verification system need to measure up to the task at hand. This involves requiring additional provisions to ensure that Iran's enrichment capacity and stocks of uranium and spent fuel remain capped; unfettered access to all relevant sites, facilities, material, equipment, people, and documents in Iran to maintain a robust verification scheme; ensuring monitoring starts from a well-defined verified baseline, which means the IAEA's questions related to the military dimension and Iran's past and potentially ongoing activities are addressed in advance; and constructing a mechanism to monitor Iran's procurement activities, including any potential outsourcing of activities that should be proscribed.***

22. David Albright & Olli Heinonen, "Provisions to Limit the Future Iranian Illicit Procurements for its Nuclear Programs," *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/)
23. Current IAEA daily visits to Natanz and Fordow provide access only to surveillance records, but do not permit inspections to all parts of those facilities.

As past history demonstrates, small as any future Iranian infractions may seem at the time and however difficult it may be to quantify the impact of these infractions on Iran's breakout time, judicious and corrective actions need to be expeditious in order to prevent slippage and a creep of de facto baselines in Iran's favor. Intelligence will also complement the role of verification and monitoring in providing early indications of things going off-track. ***To garner sufficient confidence on the effectiveness of these systems, they need to be backed by an effective enforcement mechanism.***

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.

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