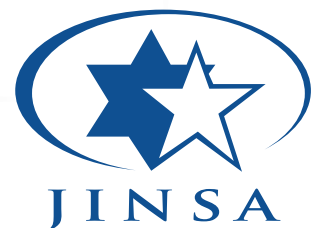


Necessary Safeguards for a Final Deal with Iran

JINSA's Gemunder Center Iran Task Force

Co-Chairs Ambassador Eric Edelman and Ambassador Dennis Ross
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Table of Contents

Overview	7
Enriched-Uranium Breakout	7
<i>Natanz Enrichment Facility</i>	
<i>Fordow Nuclear Research Facility</i>	
<i>LEU Stockpiles</i>	
Plutonium Breakout	10
Sneakout	11
Conclusion: Stronger Safeguards for a Final Deal ...	12
Endnotes	14

Overview

The Obama administration has argued that a primary achievement of any comprehensive agreement would be to increase the transparency of Iran's nuclear program. While certainly a vital element of an acceptable deal, enhanced transparency can only be effective as part of a deal that shuts off all Iran's pathways to nuclear weapons capability: a breakout using enriched uranium, at the declared facilities of Natanz or Fordow; a breakout using plutonium, at the declared facility at Arak; or a sneakout at an undeclared facility. The less that any deal reverses Iran's progress along these pathways, the more stringent the measures that would be required to detect any potential move toward a breakout or sneakout promptly and indisputably.

This report lays out the necessary elements of a verification and monitoring regime to ensure that a final deal closes off these pathways. Our understanding of the prospective comprehensive agreement – referred to officially as the Joint Comprehensive Plan of Action (JCPA) – is based on a factsheet released by the White House on April 2.¹

Enriched-Uranium Breakout

Based on parameters from the White House factsheet, Iran's declared uranium enrichment infrastructure, while being rolled back in several respects, would not preclude a breakout capability. Therefore the International Atomic Energy Agency (IAEA) would require robust inspections and safeguard authorities to reliably detect any Iranian breakout attempt using enriched uranium.

Natanz Enrichment Facility

According to the U.S. factsheet, Natanz would be the only Iranian facility permitted to produce enriched uranium under the JCPA, with prospectively 30 operating centrifuge cascades (5,060 total IR-1 centrifuges). These centrifuges would not enrich uranium beyond 3.67 percent for 15 years.

To ensure Iran would not be able to produce low-enriched uranium (LEU) beyond 3.67 percent – as per the framework agreement – IAEA inspectors would need to be able to verify the removal and continued absence of tubes interconnecting any operating cascades at Natanz. (Prior to the JPA, Iran interconnected cascades in tandem, allowing it to enrich to at least 20 percent LEU.) A similar stricture was included in the Joint Plan of Action (JPA) interim agreement, to make it much more difficult – though not impossible – for Iran to return to enriching LEU to 20 percent.

Additionally, the IAEA would need to monitor continuously the feed, product and waste of every operating cascade, both to verify Iran was not enriching LEU beyond 3.67 percent and to confirm the non-diversion of product and waste to prohibited or undeclared facilities. The verification regime would also need to ensure Iran replaces any operating IR-1 centrifuges only with those from IAEA monitored storage – to help guarantee it cannot increase LEU output – and that it removes and does not reinstall tubing in the six non-operating cascades.

To get to the 5,060-centrifuge ceiling, the framework agreement also states “Iran has agreed to reduce by approximately two-thirds its installed centrifuges.” The nature of this reduction is unclear. As this Task Force laid out in previous reports, credibly rolling back Iran’s nuclear program – and easing the burdens on the IAEA – would require permanent destruction of all excess infrastructure. The factsheet language suggests these centrifuges could merely be disassembled and placed in storage for the duration of the agreement, thereby making it simpler for Iran to reconstitute its enrichment capacity.

Given the magnitude of the proposed disassembly – approximately 10,000 installed centrifuges at Natanz alone (roughly 4,000 of which are currently operating), equivalent to more than half Iran’s total declared centrifuge infrastructure – the JCPA would need stringent safeguards placing the entirety of this equipment permanently in physically remote off-site storage under indisputable IAEA control. The IAEA would have to put advanced centrifuges under similar safeguards to prevent them from enriching uranium; this is a particularly acute concern after Iran fed uranium gas into an IR-5 centrifuge in violation of the JPA.² All these measures would be a necessary element in preventing Iran from expanding its current or latent enrichment capability.

Fordow Nuclear Research Facility

As outlined in the factsheet, Iran would be permitted to retain roughly 1,000 installed IR-1 centrifuges at Fordow – down from more than 2,700 currently – none of which would enrich uranium. Iran would also be prohibited from having fissile material at the facility, and from conducting research and development (R&D) “associated with uranium enrichment” there for 15 years.

As at Natanz, the IAEA therefore would need to safeguard all disassembled cascade infrastructure, including the centrifuges themselves, in off-site storage under its own lock and key. Inspections would be required to confirm on a continuous basis that Iran would neither reconnect the remaining installed centrifuges in cascades, nor install additional cascades. The IAEA would also need continuous access to monitor the removal, and detect immediately the reintroduction, of any and all fissile material at the site. While the term “fissile material” is ambiguous, the prohibition of uranium enrichment at Fordow means inspectors would need to verify the total absence of any such material, even 0.7 percent natural unenriched uranium hexafluoride gas (UF₆) that could be fed into centrifuges.

Related to this, the IAEA would need clear guidelines and authorities to monitor R&D on advanced centrifuges. The prohibition on R&D “associated with uranium enrichment” necessarily would include UF₆, but inspectors would also need to monitor – and ideally detect the presence of – any other gases Iran could insert in centrifuges to ultimately improve their efficiency at enriching uranium. For the IAEA to be able to verify this, clarity is still needed on the specific purpose for operating centrifuges at Fordow, the elements they would be permitted to produce and their potential contribution to Iran’s uranium enrichment capability.

Indeed, beyond calling them “limited,” the factsheet is also vague on overall R&D parameters. However, any comprehensive agreement would need safeguards to prevent Iran from activities whereby it could potentially improve centrifuge performance and manufacture new centrifuges, under both the ten-year sunset and the succeeding R&D plan Tehran will supposedly submit to the IAEA. Because R&D activities could enable Iran to enrich uranium more efficiently, and therefore more easily in covert fashion, such measures would be crucial to preventing a sneakout as well.

LEU Stockpiles

Iran would agree to reduce its LEU stockpile from 10,000 kilograms (kg) to no more than 300 kg of 3.67 percent LEU for 15 years, according to the factsheet. Absent shipping this out of Iran, the most secure step to maintain this stockpile would be to place it, like the dismantled enrichment infrastructure, directly under IAEA safeguards, to prevent Iran enriching it further toward weapons-grade fissile material. At the same time, and again similar to Iran's enrichment infrastructure, inspectors would need to verify and safeguard the effective neutralization of significant excess LEU stockpiles.

The task would be complex. Iran's new facility at Esfahan converts 3.5 and 20 percent LEU stockpiles from UF₆ to a solid uranium oxide (UO₂) form unsuitable for further enrichment. However, this can still be reconverted, and Iran has dragged its feet converting its existing stockpiles as directed by the JPA. To provide assurances these UO₂ stockpiles could not be reconverted, the IAEA would need to verify some combination of: a protected channel for the sale of these stockpiles on the international market; shipping them abroad for conversion to fuel rods for medical and research purposes; and fabricating Iran's entire 20 percent LEU stockpile into fuel plates for the Tehran Research Reactor (TRR).

These last two processes, which would themselves need to be monitored by the IAEA, make the stockpiles much more difficult to reconvert. They would also meet Iran's stated civilian purpose for enriching 20 percent LEU. In the last case, they could be produced at an existing facility (an older site in Esfahan for converting yellowcake to 0.7 percent UF₆). The IAEA would need to verify that Iran also shipped out or converted to fuel plates all scrap and waste 20 percent LEU.

Additionally, Obama Administration officials have suggested Iran might dilute stockpiles in excess of 300 kg of 3.67 percent LEU to unenriched 0.7 percent UF₆.³ As with the conversion process, inspectors would need to verify the non-diversion of any LEU from existing stockpiles prior to dilution, as well as the actual dilution. Further measures would then be necessary to ensure Iran would not divert the 0.7 percent UF₆ from IAEA safeguarded sites for re-enrichment.

This points to an added challenge: Iran's stockpile would be expected to remain static, despite the country being allowed to continue enriching significant quantities of LEU. In fact, depending on how quickly it reduces its current stockpiles, the amount of LEU in Iran could grow under the JCPA, as it has thus far under the interim agreement. Therefore the IAEA would confront the sizable hurdle of verifying the non-diversion and neutralization not only of the vast majority of Iran's existing stockpile, but also all future LEU product.

Because stockpile size is a major determinant of breakout time, it would be vital for the IAEA to monitor continuously LEU production at Natanz, and to place any stockpile in excess of 300 kg under airtight safeguards. One option could be for the IAEA to possess these excess stockpiles as fuel for a new light water reactor at Arak (see below), similar to the safeguarded Bushehr nuclear power plant.

Though often overlooked, Iran's large and growing 0.7 percent UF₆ stockpiles – multiple nuclear weapons' worth – would also need to be kept under strict supervision. This would concern the dilution of LEU stockpiles mentioned above, as well as Iran's ongoing expansion

of these stockpiles through conversion of yellowcake (both processes occur at Esfahan). The IAEA would need to monitor continuously the conversion rate – a parameter missing from the factsheet – so as to detect and report immediately any production in excess of Iran’s requirements for feed for Natanz (excess product could be diverted for a sneakout and/or used for prohibited R&D on advanced centrifuges). It would also have to safeguard Iran’s existing 0.7 percent stockpiles, for the same reasons.

Plutonium Breakout

The parameters in the White House factsheet include the potential for substantial rollback of Iran’s plutonium pathway to nuclear weapons capability. The existing heavy water reactor at Arak, if completed, could produce enough plutonium for multiple nuclear weapons annually. To forestall or preclude this, its core would be destroyed or removed from the country and replaced with one that “will not produce weapons grade plutonium” (according to the factsheet). Iran would also commit to not reprocess spent fuel, build new heavy water reactors or accumulate excess heavy water stockpiles.

Verifying these measures would be an expansive effort. First, the existing core of the heavy water reactor would have to be removed and destroyed under IAEA supervision, either inside Iran or out. Second, prior to construction, the IAEA would need to review the specifications of the redesigned reactor to verify the core would not simply produce less – but still enough – plutonium for a nuclear weapon. In all likelihood, this would entail converting the entire reactor to using light water (similar to Bushehr). Otherwise, Iran could plausibly increase the new reactor’s plutonium production capacity in the future. Inspectors would then need to conduct continuous and direct oversight of every aspect of the construction and operation of the rebuilt reactor.

Third, IAEA inspectors would have to verify a complete and indefinite halt to Iran’s production of heavy water at its relevant declared (and any undeclared) facilities through continual monitoring and safeguards at all such sites. Similar to Iran’s LEU stockpiles, the IAEA would also have to confirm the sale and shipment of all excess heavy water stockpiles abroad.⁴ Fourth, the IAEA would need to establish safeguards for 3.5 percent LEU to fuel the redesigned, light water reactor. This could take the form of a procurement channel similar to that for Bushehr and/or a process under strict IAEA control to use up Iran’s excess LEU stockpiles.

Fifth, and again similar to Bushehr, the IAEA would need to be able to account for all spent fuel produced by the reactor, and to control the entire process of removing spent reactor fuel from the country (since otherwise this could be reprocessed into weapons-grade plutonium). Sixth, inspectors would have to verify that Iran is not conducting reprocessing (it has no declared facility for this purpose) or reprocessing R&D on spent fuel. Taken together, these extensive measures would be necessary to preclude a breakout to nuclear weapons capability using Iran’s declared plutonium-related sites.

Sneakout

As challenging as it would be to verify the shutoff of Iran's known pathways to a bomb under the prospective comprehensive agreement, ruling out the possibility of cheating at undeclared sites would necessitate even more extensive inspections and safeguards.

This is because Iran has a long track record of illicit nuclear behavior. The possible military dimensions (PMD) of its nuclear program, and its uranium enrichment, are in violation of its responsibilities as a Non-Proliferation Treaty (NPT) signatory, and both Natanz and Fordow were built covertly and illegally. Moreover, the IAEA notes regularly in its safeguards reports that it cannot credibly assure the absence of undeclared nuclear material and activities in Iran. The Iranian regime has maintained proliferation relationships of special concern with other rogue actors, including terrorist groups, and it recently violated the JPA and U.N. Security Council resolutions by feeding uranium gas into advanced centrifuges and attempting to procure illicit items for its nuclear program. It also continues to obfuscate and slow-roll the IAEA's PMD inquiry and JPA obligations to convert LEU stockpiles.⁵

For all these reasons, any adequate verification regime would need to account for the very real and myriad possible ways Iran might achieve nuclear weapons capability covertly. Fundamentally, this would mean verifying Iran's pledge (as laid out in the White House factsheet) not to build any new uranium enrichment facilities or heavy water reactors – as well as any other possible new nuclear-related sites – by having the capability to detect, and authority to inspect, suspected undeclared sites anytime and anywhere.

Equally important, Iran would have to provide in short order as part of the conclusion of a deal an accurate, full and complete declaration of its entire nuclear program (past and present), including: all components, sub-components, stockpiles, related material and equipment, R&D facilities, manufacturing sites, imports and exports of proliferation-sensitive items and all outstanding IAEA concerns regarding PMD. Each element of this declaration would then have to be verified before implementation of a comprehensive agreement.

Until this happens, inspectors' ability to detect and report the full array of steps Iran could take toward nuclear weapons capability would be critically incomplete. In essence, they would be in the dark about what and where weaponization activities did or could occur. Therefore the IAEA would need unrestricted access to interview all scientists and regime personnel previously or currently involved in Iran's nuclear program, and to inspect suspected military sites related to Iran's nuclear program (including IRGC and IRGC-Quds Force installations).

Beyond these core provisions, inspectors would also need anytime, anywhere access to all phases of Iran's nuclear supply chain. This would be necessary to determine promptly and indisputably if Iran was diverting or procuring material for a parallel covert program at any step of the process from uranium ore to weapons-grade fissile material. Within the country itself, this would include constant supervision of uranium mines – some of which the IAEA only resumed visiting last year – as well as its existing and any future yellowcake production and uranium conversion plants.⁶ The IAEA would also need to be able to oversee Iran's procurement efforts abroad, to preclude it acquiring material, technology or dual-use goods that could help it develop nuclear-related infrastructure and expand its stockpiles (as detailed in existing U.N. Security Council resolutions). All of this simultaneously would strengthen IAEA efforts to detect potential breakout attempts.

Conclusion: Stronger Safeguards for a Final Deal

As the preceding sections indicate, the IAEA brief for Iran would require wide-ranging inspections and safeguard authorities to certify that its expansive nuclear-related infrastructure – declared and possibly undeclared – is rolled back and unable to progress toward nuclear weapons capability. However, it is uncertain whether the potential monitoring and verification regime adumbrated in the White House factsheet would be remotely sufficient for this task.

According to the factsheet, Iran would implement both the Additional Protocol and Modified Code 3.1 to its existing IAEA Safeguards Agreement. Under its current safeguards agreement, Iran is required only to declare nuclear materials (namely, 0.7 percent unenriched uranium, LEU, and plutonium stockpiles) at declared nuclear facilities (most importantly, Natanz, Fordow, Esfahan, Arak and the TRR). The Additional Protocol would require Iran to declare more activities, including reprocessing and centrifuge manufacturing – activities prospectively prohibited by the JCPA – and would allow inspectors to monitor the expanded list of declared facilities, as well as any suspected undeclared facilities.

This latter provision (officially called “complementary access”) could help verify the completeness of Iran’s declarations regarding its nuclear program, i.e. that its activities at declared sites conform to IAEA safeguards, that it has no undeclared sites, and that it has not diverted nuclear material from declared sites. Until then, the IAEA can verify only the correctness of Iran’s declarations, i.e. its compliance with safeguards at declared sites. In essence, therefore, the Additional Protocol would strengthen inspectors’ ability to detect a potential breakout or sneakout attempt.

However, even the Additional Protocol is far from airtight. Once it accedes, Iran would still be able to claim it is unable or unobligated to provide access to undeclared sites under certain circumstances, and thus that the IAEA would need to substantiate its suspicions before inspectors could visit. The IAEA Director-General would then need to call for a special inspection, mandating in turn approval from the IAEA Board of Governors before verification could even begin to take place.

As this Task Force noted in a previous report, any agreement premised on a one-year breakout window would leave precious little time for extended deliberations to resolve disputes about Iranian compliance, and therefore inspectors must be accorded more expedient authorities – all the more so given that Iran might only implement, and not ratify, the Additional Protocol (something that allowed Tehran to suspend its compliance in the past). Moreover, it is a matter of no small dispute between the IAEA and Tehran whether Iran’s Additional Protocol agreement provides for IAEA interviews of personnel related to Iran’s nuclear activities.

The Modified Code 3.1 would require Iran, like other NPT signatories, to provide information in advance to the IAEA on any new or updated designs for its nuclear facilities. This would authorize the IAEA to detect and monitor many of the design changes Iran might make to its facilities within or beyond the parameters of a comprehensive agreement, such as progress on heavy-water reactor construction, reconfigurations of cascades in uranium enrichment facilities or building new facilities to convert or fabricate UF₆. However, as with the Additional Protocol,

Iran may only be required to implement – as opposed to ratify – these safeguards. This could be problematic, since Iran is the only NPT signatory to have suspended these measures in the past.

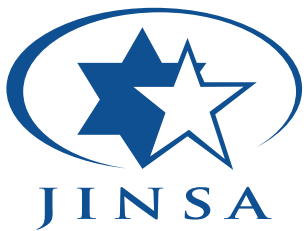
Separately, the factsheet says Iran would “address” PMD concerns. The meaning of “address” was possibly elaborated by Secretary Kerry this month when he said “we’re not fixated on Iran specifically accounting for what they did at one point in time or another. [...] It’s critical to us to know that going forward, those activities have been stopped, and that we can account for that in a legitimate way.”⁷ Halting all such activities – and confirming that halt – would be necessary but insufficient, since most of the IAEA’s PMD portfolio focuses on gaining clarity about the work Iran may already have carried out. Without this knowledge, the IAEA would not truly be able to judge whether Iran has no capability to build a nuclear weapon (even if it would verifiably abstain from any such work in the future).

Given these combined concerns and uncertainties, a comprehensive agreement should mandate Iran ratify both the Additional Protocol and Modified Code 3.1 and resolve the IAEA’s outstanding PMD concerns at the outset. In addition, stricter safeguards would be necessary going forward, including: real-time video monitoring of all nuclear-related facilities; unannounced inspections at declared and undeclared sites anytime and anywhere, including military and IRGC sites suspected of involvement in nuclear activities relating to PMD and ballistic missiles (past, present and future); a single procurement mechanism overseen by the IAEA for all potential dual-use imports and exports; and mandatory access to any facilities, documentation and personnel requested by the IAEA.

To help ensure Iranian adherence to such stringent safeguards, they would need to be given clear legal authority under Chapter VII of any superseding U.N. Security Council resolution tied to a comprehensive agreement, and should allow for enforcement action against material breach – including as necessary the use of force. This would be similar to existing legally-binding resolutions requiring Iran to cooperate fully with IAEA investigations and to ratify the Additional Protocol.

Endnotes

1. White House Office of the Press Secretary, "Parameters for a Joint Comprehensive Plan of Action Regarding the Islamic Republic of Iran's Nuclear Program," April 2, 2015.
2. David Albright & Andrea Stricker, "Update on IR-5 Centrifuge Issue: Taking Stock," Institute for Science and International Security, December 16, 2014.
3. Michael Crowley, "Ernest Moniz: Iran deal closes enrichment loophole," *Politico*, April 7, 2015.
4. According to the White House factsheet, "Iran will not accumulate heavy water in excess of the needs of the modified Arak reactor, and will sell any remaining heavy water on the international market for 15 years." Because Arak would likely need to be converted to a light water reactor, Iran's heavy water needs would be zero, and thus it would sell the entirety of its stocks on the international market.
5. Colum Lynch, "U.S. Accuses Iran of Secretly Breaking U.N. Nuclear Sanctions," *Foreign Policy*, December 8, 2014; 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; Sangwon Yoon, "Countries Don't Report Iran Sanctions Violations, UN Report Says," *Bloomberg*, June 9, 2015.
6. Prohibitions on construction of new yellowcake production or uranium conversion facilities are not included in the White House factsheet.
7. U.S. Department of State, "Secretary Kerry's Press Availability," June 16, 2015.



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