

Changing the Operating Parameters of Centrifuges is Not a Credible Solution to Gain Time

By Olli Heinonen, February 2015

The Joint Plan of Action (JPOA) acknowledged that a comprehensive agreement would involve an Iranian domestic enrichment capability. This concession marked a fundamental change in the negotiations. Instead of a complete suspension of enrichment and reprocessing activities, as called for in multiple Security Council resolutions and a foundational plank of all previous negotiating positions, the P5+1 negotiators are now attempting to reach a comprehensive agreement with Iran that will establish a credible breakout time. The following memo addresses one proposal mentioned in recent press reporting on the negotiations between the P5+1 and Iran. The result of such proposals recognizes Iran as a nuclear threshold state, which status the Task Force rejects.

For additional information and a fuller explanation of limitations on Iran's enrichment capabilities, see Olli Heinonen, "[Key Limitations on Iran's Uranium Enrichment Program](#)," Iran Task Force, October 2014.

The goal of negotiations under the Joint Plan of Action (JPOA) is to reach a long-term, comprehensive solution that ensures Iran's nuclear program is peaceful. It is with this always in mind that we have to assess the negotiations about the actual number of centrifuges currently operating, installed, or manufactured in Iran; the centrifuges' separative power (SWU); and whether any nuclear material stock is permitted. ***These technical discussions should not become bargaining chips. They must be treated holistically: do any concessions made by the P5+1 leave the Islamic Republic with a rapid breakout capacity?***

The U.S. Government has publicly stated that it will, through any means necessary, block Iran from developing a nuclear weapons capability by reducing Iran's uranium enrichment capacity in such a way that Tehran could not achieve a breakout capability¹ of less than one year. This means that Iran could maintain and operate 2000-4000 IR-1 centrifuges and maintain nuclear material stock below one metric ton of UF₆ enriched up to 5%.² In theory, provided the inspections regime was adequate at the sites

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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 irreversible constraints, see 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)

where the IR-1s are operating, these numbers would provide adequate detection and reaction time for the international community. This assumes the West retains, and is willing to apply, all effective enforcement measures available in response to Iranian noncompliance. The remainder of the currently installed centrifuges, around 19,000, should be dismantled and stored under IAEA monitoring.

Since the signing of the JPOA in November 2013 to the current, third round of extended JPOA talks, the media has reported that the P5+1 countries have offered Iran an increasing number of centrifuges. *Some ideas have reportedly included re-arranged centrifuge piping or reducing enrichment-production capacity through a variety of options.³ Due to the process's inherent technical complexities, this is not a game of simple trade-offs where a cut back in one area can easily compensate and allow more "give" in other areas.*

Some of the latest news reports have suggested that talks are now centered around allowing Iran 9,500 spinning centrifuges, justified by reducing the operating parameters of these machines and the enrichment cascades that link the centrifuges together.

As in all considered options, the key question to ask is: Whether this arrangement meaningfully extends breakout time, thereby seriously constraining the possible military application of this nuclear program or whether the constraints are easily reversible and therefore unstable. Under the above scenario, the technicalities of the deals suggested in the press would certainly be unstable and easily reversible.

Let us look at what the scenario actually entails: *There are several parameters affecting the performance of centrifuges. UF6 feed-gas pressure is one of them.* Cutting the UF6 feed-gas pressure (or feed rate) to half, also cuts the enriched UF6 production rate to half. *The gas pressure is easy to monitor. But it is a reversible process.* Pressure can again easily be increased, for example, by changing the temperature of autoclaves generating the UF6 gas. *Even if all the UF6 gas feed and withdrawal stations and piping are modified, the old ones can be reinstalled within several weeks. The reinstallation can certainly be detected, but such a situation does not provide the breakout-time cushion sought by the P5+1.*

Another option to reduce centrifuge performance is to change the rotating speed of centrifuges. This can be easily carried out through the electronic control systems and the separative power will consequently drop. The current performance of an IR-1 centrifuge is about 0.9 SWU. Assuming that the current rotating speed of the centrifuge wall is about 300 m/s, a reduction of the speed to 250 m/s would reduce the separative power to 0.62 SWU. *The rotation speed is, again, easy to monitor, but it is once again reversible, and higher speeds can again be obtained in a short period of time.*

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

In a hypothetical scenario in which Iran had 9,500 IR-1s installed, one metric ton of LEU enriched below 5%, and additional natural UF₆, Iran's breakout time would be no more than six months. If Iran were to reconvert its 20% enriched uranium from oxide form back into UF₆, Iran's breakout time would further decrease.

In sum, there is no silver bullet among these measures—apart from the dismantlement of excess centrifuges—to reach a breakout time of at least one year. The mere reconfiguration of the cascades will not solve the problem of breakout time, which itself is only one of the important metrics of a final agreement's durability, irreversibility, and ability to ensure that Iran's nuclear program is peaceful.

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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