

SWUs/year and Centrifuges

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Summary: Separative power measurements cannot and should not replace clear limitations on numbers and types of centrifuges and LEU stockpiles. The restrictions related to enrichment must include limitations on the number of permitted IR-1 centrifuges, the size of the total LEU stocks, centrifuge manufacturing, uranium mining and conversion, and centrifuge research and development. A comprehensive agreement should also include a range of verification requirements, including: Additional Protocol Plus, tight controls of and IAEA oversight of Iran's procurement process, and a clear accounting of Iran's previous activities including the possible military dimensions of Iran's program.

The Joint Plan of Action (JPOA) anticipates that a comprehensive agreement will allow Iran to have a “mutually defined enrichment programme with mutually agreed parameters consistent with practical needs, with agreed limits on scope and level of enrichment activities, capacity, where it is carried out, and stocks of enriched uranium, for a period to be agreed upon.”

In practice, reports indicate that the initial U.S. position on the number of centrifuges Iran would be permitted to operate under a comprehensive agreement was 1,000 IR-1 centrifuges. Recent press reports indicate, however, that that number may have increased significantly.¹ If these reports are accurate, the comprehensive agreement would likely position Iran with a breakout time of less than six months.

During the interim period, Iran has been permitted to undertake a number of “routine maintenance” procedures which have reportedly improved the efficiency of some of its centrifuges by as much as 25 percent.² Iran has thus been able to reduce the impact of enrichment restrictions on its program without technically violating the terms of the JPOA. Such efficiency enhancements under the guise of “maintenance” must not be allowed to continue.

In addition, Iran's leaders have insisted that they will not dismantle any of their more than 9,000 operating machines or any of the additional 10,000 installed centrifuges that have yet to be placed in operation. Tehran's compromise offer was reported to be an increase to 10,000 operating centrifuges, and only for a limited period until the terms of the comprehensive agreement expire.

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1. Julian Borger, “Iran Nuclear Talks: Gaps Remain As Deadline Approaches,” *The Guardian*, July 18, 2014. (<http://www.theguardian.com/world/2014/jul/18/iran-nuclear-talks-deadline>)

2. Blaise Misztal, “Update on Iran's Nuclear Program,” *Bipartisan Policy Center*, June 5, 2014. (<http://bipartisanpolicy.org/blog/foreignpolicy/2014/06/05/update-iran%E2%80%99s-nuclear-program>)

To break the impasse over centrifuges, some, including Iran, have reportedly considered a different metric to limit Iran's uranium enrichment capability: Separative Work Units per year or "SWU/year," known as separative power. It can be used to measure either the capacity of the enrichment process or the actual amount of enriched uranium produced. If SWU/year is used for the former, the calculation is based primarily on the number, efficiency, and configuration of the centrifuges in operation. However, using this calculation would require the parties to agree to a specific number of centrifuges and, therefore, would not break the current negotiation logjam. In fact, before the concept of SWU/year can be used, the negotiators would need to agree upon an average SWU/year for each centrifuge in the entire set of centrifuges in installed cascades. In practice, arriving at an agreed upon value would be extremely difficult. But such a baseline value should be the average achieved in IR-1 centrifuges in existing cascades at the Fuel Enrichment Plant. Arriving at an agreed upon value for advanced centrifuges will require Iran to provide far more data and information about its advanced centrifuges. In the case of almost all the advanced centrifuges, separative power limits could only be set based on theoretical grounds. In this case, limits would need to be set by an agreed upon separative power determined by only the centrifuge's optimal speed and length. Doing so would result in a maximum separative power that would provide the basis for any conversion of the worth of that type of centrifuge in replacing IR-1 or other centrifuges.

If, on the other hand, SWU/year is used to measure the actual amount of enriched uranium produced, the calculation is affected by other factors, including the amount of feedstock, the rate of spin, and length of time that the centrifuges operate. Any of these, along with the number of centrifuges, can be altered while remaining under the permissible SWU level.

On the surface, separative power provides a politically defensible means to measure output for enrichment. It is a unit of calculation used widely in the nuclear energy industry. But *using SWU/year as a substitute for limiting the number of centrifuges would be a fundamental mistake. To limit how much enriched material Iran can produce and stockpile requires strict and verifiable limits on centrifuges along with additional prohibitions on next generation replacements and effective constraints on maintenance, research, and development.*

Using only separative power as a measure of production instead of a low limit on centrifuge numbers would permit Tehran to install any number of centrifuge cascades including advanced models. Iran could, for example, operate multiple cascades for short periods of time and thereby stay within the permitted SWU limit. While operationally inefficient, this would permit Tehran to maintain a reserve capacity to enrich uranium far in excess of that suggested by the separative power allowance. *Thus, when a decision is made to break out, there would be thousands of centrifuges ready to produce an abundance of material at a high level of enrichment in a short period of time.*

Iran could also deliberately decrease the efficiency of its centrifuges – such as by running them at slower speeds than capable – and could then install and operate a far greater number of centrifuges. Operating centrifuges at very low efficiencies, Iran could build an industrial-scale nuclear program – a program that could be used to quickly produce weapons-grade uranium if Iran decides to begin operating the centrifuges at full efficiency. This could occur without Iran technically violating the terms of an agreement that only addresses separative power.

Using separative power in this manner might make an agreement more achievable as it would render moot the key differences not only on the number of centrifuges, but on next generation replacements and on research and development. However, the agreement would give Iran what Iran has long sought – a nuclear program that could quickly provide the regime with nuclear weapons.

A good agreement should thus include a limit on the number and type of centrifuges, in addition to restrictions on centrifuge research and development, and a whole range of limitations and verification requirements, including: Additional Protocol Plus, tight controls of and IAEA oversight of Iran's procurement process, a clear accounting of Iran's previous activities including the possible military dimensions of Iran's program, and restrictions on Iran's ballistic missiles.

Separative power can play a role in defining enrichment limits but it cannot be the sole limit. The fundamental limits must remain the number of permitted IR-1 centrifuges, the size of the total LEU stocks (including oxide forms), limitations on centrifuge manufacturing, uranium mining and conversion, and the type of centrifuge research and development permitted.

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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