

# Moving the Goal Posts: Iran's Uranium Enrichment Program

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Brief Analysis

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**Although technical obstacles may prevent Tehran from fully deploying its advanced centrifuges, it could still augment its enrichment program in ways that should concern the international community.**

The world's attention may be focused on Iranian attacks against Gulf energy supplies and shipping routes, but the Islamic Republic is also slowly but surely ramping up its nuclear efforts. On September 7, Behrouz Kamalvandi of the Atomic Energy Organization of Iran (AEOI) reiterated that the country plans to develop a uranium enrichment program with five times more output than previously indicated, to deploy advanced centrifuges toward that long-term goal, and perhaps even to reopen its bunker-like enrichment facility at Fordow. He and other officials have repeatedly threatened to take such steps if Europe proves unable to guarantee the economic gains Iran expected under the nuclear deal, and the Islamic Republic has made good on that threat so far.

Kamalvandi also noted that Iran's enriched uranium stockpile would see a significant increase in the next month—a particular concern to U.S., Israeli, European, and Gulf officials because such material, if further enriched, can be used in a nuclear weapon. Although Iran's claims about advanced centrifuges and certain other actions may be part bluster, its known capabilities on the enrichment front are enough to worry the international community.

## WHAT IRAN CAN DO

When the United States canceled a waiver in May that allowed Iran to sell its enriched uranium when it hit limits prescribed by the Joint Comprehensive Plan of Action, the leadership was left with two choices: stop enriching altogether, or stockpile enriched uranium beyond JCPOA limits. Since then, Tehran has defiantly increased its monthly production of enriched uranium and ramped up its level of enrichment from the JCPOA-mandated cap of 3.67% to 4.5% (for a fuller explanation of these enrichment percentages and other technical issues, [see PolicyWatch](#)

The Iranians have several options for building a stockpile that would shorten their breakout time if they later chose to produce weapons-grade uranium:

**Operate more IR-1 centrifuges.** During the heyday of its nuclear program, Iran operated a total of 10,204 first-generation IR-1 centrifuges at its Natanz and Fordow facilities. Under the JCPOA, it has been limited to operating about half that many (5,060), so it has the spare capacity to bring many more back online and thus increase the amount of enriched uranium produced each month.

One limitation is that IR-1 machines are inefficient compared to modern centrifuges, and break often. Since the JCPOA went into force in January 2016, Iran has replaced 546 of them, or an average of 30-plus per month. Factoring in these replacements, it may still have up to 4,600 additional machines available for use (fewer if some have corroded in storage). If Iran ramped up to its pre-JCPOA centrifuge numbers at the Natanz facility, it could have enough replacement machines for a little over a year. This does not include the 8,000-plus IR-1 machines that were installed but not operated prior to the JCPOA, which may be for show or may be useful for parts.

**Increase production of enriched uranium.** Iran could also raise its monthly production volume without more machines. Even with the finite number of centrifuges it is permitted to use under the JCPOA, it has the capacity to produce in excess of 100 kg per month of enriched uranium if it so desires. Instead, its average production under the JCPOA has been about 4 kg per month.

Iran has started to increase this rate already. According to the most recent report by the International Atomic Energy Agency (IAEA), it may now be producing around 30 kg per month—a large increase, but still three times less than the total it could produce without bringing a single extra centrifuge online.

Yet, there is time. The IAEA's August report measured Iran's current stockpile at 241.6 kg of 3.67% and 4.5% enriched uranium, which is only a fraction of what is necessary for a nuclear weapon if that material was further enriched to weapons grade. And at Iran's current rate of 30 kg per month, it would need several years to produce enough material for one weapon—though the timeline will shrink significantly if it ramps up production as expected.

**Use advanced centrifuges.** Iran's preference is to upgrade from the IR-1 to more efficient, less fragile machines. Under the JCPOA, Iran is allowed to test certain centrifuges now, whether singly (the IR-4, IR-5, IR-6, and IR-8) or in ten-centrifuge cascades (the IR-4, IR-6, and IR-8). However, the most recent IAEA update on September 8 indicated that Iran was installing twenty-two IR-4 machines, one IR-5 machine, thirty IR-6 machines, and three IR-6s machines for testing, which would be beyond the JCPOA limits.

The nuclear agreement bars Iran from operating advanced centrifuges to accumulate uranium until January 2027. Yet Tehran has told the IAEA it will soon begin operating its IR-2m machines. Prior to the JCPOA, it had installed but not operated 1,008 of these machines and was testing another 162. The IR-2m can produce about three to five times as much enriched uranium as an IR-1, though Iran's ability to fully operationalize them remains unclear.

Indeed, centrifuges are a tricky technology: they spin at tens of thousands of RPMs to separate isotopes at the atomic level, which can bend and break even the best materials. Iran's IR-1 machines break often, and its more advanced centrifuges come with complications, too. Its technicians have had difficulty sourcing the materials for rotors and working with bellows, the rotor "joints" that allow a centrifuge to flex so that it can spin more quickly, ultimately increasing production. Iran's advanced machines are also experimenting with wider and longer centrifuges—two major challenges that may take years to master.

The IR-8, which Iran describes as its most advanced machine, has all of these features: multiple bellows, longer length, and wider diameter. Only one IR-8 has ever been tested at a time, so it remains unclear if Iran has overcome

any of the difficulties that come with advanced centrifuges. If not, its chain of increasingly higher-numbered machines may simply be a way of giving the illusion of progress.

**Increase enrichment levels and reopen Fordow.** Iran could also boost its enrichment cap from the current 4.5% to 19.75%, the level needed to fuel the Tehran Research Reactor. Kamalvandi even hinted at going beyond that figure, though there is no immediate technical justification for doing so besides inching closer to weapons-grade material and thus pressuring the international community. When Iran enriched to 19.75% pre-JCPOA, it did much of the work at Fordow, a highly fortified facility built inside a mountain. All enrichment activity there was halted under the nuclear deal, but the facility was never fully repurposed as required by the JCPOA. Kamalvandi said Iran would not open Fordow for the time being, implying that this option could be used as future leverage.

## WHAT WASHINGTON SHOULD DO

**T**he JCPOA sought to prevent Iran from achieving a nuclear weapons capability by focusing on enrichment capability and intent. Put simply, the idea was to slow any potential race toward a bomb and give the international community time to strip away Tehran's political incentives for running that race in the first place. This is why the JCPOA placed restrictions on Iran's enrichment activities while seeking to influence its intent through sanctions relief. Supporters of this approach saw it as nuanced; detractors saw it as naive.

In contrast to the JCPOA, the Trump administration's "maximum pressure" campaign assumes that Iran's intentions are less malleable, and that its malign behavior must be curtailed by restricting its financial access. Yet a sanctions-heavy policy does not directly inhibit its enrichment capacity, since Iran can already do much more on that front even if sanctions increase.

In addition, Iran has shown it can make substantial nuclear leaps when it is not restricted by a negotiated framework like the JCPOA, using these opportunities to move the goal posts for future negotiations. For example, during talks with Europe in 2003, Iran was enriching uranium to under 5%, but by the time the JCPOA talks rolled around in 2015, that figure had increased to 19.75%—allowing Iranian negotiators to "compromise" by reducing that figure to around the 2003 baseline rather than taking more drastic steps like eliminating its enrichment program altogether.

Iran is now trying to move the goal posts again by threatening to deploy advanced centrifuges and quintuple its eventual enrichment plans. There is no immediate or even medium-term need for so much additional capacity—the original plans Iran filed with the IAEA called for enough IR-1 centrifuges at Natanz to fuel its Bushehr reactor. The Trump administration must not let itself be fooled by this tactic.

Perhaps most worrisome, if Iran reopens Fordow or increases enrichment beyond 20%, some states may once again consider military action against the program, as they did in 2012. Yet there would be less consensus behind such action today. Among Washington's Gulf allies, Qatar is more reliant on Iranian airspace for Asia-bound flights due to the air blockade against it, while the United Arab Emirates has become extremely cautious about provoking Tehran. Moreover, Russia, China, and some European states see the JCPOA's gradual breakdown as Washington's fault, not the Islamic Republic's, so they are unlikely to support strikes. For his part, President Trump has made clear he does not want another Middle Eastern war.

Since military action does not seem to be in the cards, the only way for the maximum pressure campaign to work is if negotiations become a real possibility. The United States would need to enter those talks holding the best hand possible—one that includes international support. Allowing the Europeans to salvage some parts of the JCPOA would fit both needs, giving the administration an effective way to attract foreign support while still slowing Iran's drive toward dangerous enrichment capabilities.

Ironically, the JCPOA's economic incentives are helping Trump's pressure campaign by keeping Tehran from ramping up too quickly and buying Europe and Washington time to figure out next steps. Yet the longer that takes,

the more opportunity Iran has to change the enrichment reality that its future negotiators will use as their baseline, just as it did between 2003 and 2015.

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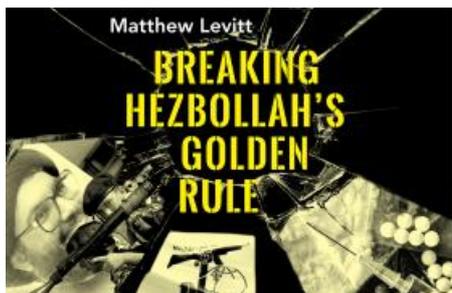
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