

## Iran's Uranium Enrichment Program: September 2022 Update

The information provided by the International Atomic Energy Agency's (IAEA) September 2022 update demonstrates that Iran is continuing to make significant advances toward producing the 90% enriched uranium used for nuclear weapons.<sup>2</sup> Iran's enrichment efforts are accelerating significantly. Iran can now produce sufficient enriched uranium for three nuclear weapons in only about one month, a fourth nuclear weapon in one additional month and a fifth nuclear weapon in two months after the fourth.

The key components of Iran's uranium stockpile are its stocks of 60% enriched uranium, 20% enriched uranium and uranium enriched between 3.5% and 5%. Most of the focus on Iran's enrichment effort has been on its production of 60% enriched uranium. This enriched uranium is dangerously close to the 90% enriched uranium that Iran would likely use to produce nuclear weapons. During this reporting period (May 14, 2022 to August 21, 2022) Iran continued to produce 60% enriched uranium at its Pilot Fuel Enrichment Plant (PFEP). The production rate is 3.8 kilograms per month which is about the same as the production rate in the previous IAEA reporting period (February 19, 2022 to May 14, 2022).<sup>3</sup> As of August 21, 2022, Iran had a stockpile of 55.6 kilograms of 60% enriched uranium.

However, Iran's enrichment program has accelerated its production of 20% enriched uranium. Iran has been producing 20% enriched uranium at the underground Fordow Fuel Enrichment Plant (FFEP). In terms of uranium enrichment effort (separative work), 20% enriched uranium is already 90% of the way to 90% enriched uranium and this uranium can be used to produce the enriched uranium used in nuclear weapons almost as readily as 60% enriched uranium.

Since January 2021, Iran has been using six cascades of its older IR-1 centrifuges at the FFEP, configured as three tandem cascades, to produce the 20% enriched uranium. The production rate was around 13 kilograms per month. In November 2021, Iran brought online a cascade of the more advanced IR-6 centrifuges and the production rate increased to around 20 kilograms of uranium per month. On July 7, 2022, roughly halfway through the current reporting period, Iran brought a second IR-6 cascade online. The production rate averaged over this current reporting period increased to around 29 kilograms per month, which is about a 45% increase. In the next reporting period when this second IR-6 cascade has been operating for the entire reporting period, the production rate will probably be around 35 kilograms per month. On August 21, 2022, Iran's stockpile of 20% enriched uranium was 332 kilograms.

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<sup>1</sup> This paper is the product of the author's personal research and the analysis and views contained in it are solely his responsibility. Though the author is also a part-time adjunct staff member at the RAND Corporation, this paper is not related to any RAND project and therefore RAND should not be mentioned in relation to this paper. I can be reached at [GregJones@proliferationmatters.com](mailto:GregJones@proliferationmatters.com)

<sup>2</sup> Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)," GOV/2022/39, International Atomic Energy Agency, September 7, 2022. <https://www.iaea.org/sites/default/files/22/09/gov2022-39.pdf>

<sup>3</sup> To account for the fact that months have different numbers of days, I use a uniform month length of 30.44 days.

As was discussed in my prior analysis of Iran's enrichment efforts, Iran has been using its stockpile of 3.5% to 5% enriched uranium as feed to produce the 60% and 20% enriched uranium at an unsustainable rate.<sup>4</sup> Iran has been producing 3.5% to 5% enriched uranium using cascades at the Fuel Enrichment Plant (FEP) at Natanz and at the same time, producing 3.5% to 5% enriched uranium at the PFEP by reenriching tails from the production of 60% enriched uranium. Iran has been increasing enriched uranium production at the FEP by adding advanced centrifuge cascades and plans to increase it even more. In the current reporting period, the FEP was producing 3.5% to 5% enriched uranium at the rate of 208 kilograms per month, up from 176 kilograms per month in the prior reporting period. The PFEP has also increased its production of 3.5% to 5% enriched uranium. In the current reporting period, it was producing 69 kilograms per month up from 56 kilograms per month in the prior reporting period.

Nevertheless, the production of 3.5% to 5% enriched uranium has not been able to keep up with its consumption as feed for the production of 60% and 20% enriched uranium and Iran's stockpile of 3.5% to 5% enriched uranium has been declining. Indeed, the rate of decline is increasing. In the prior reporting period, the rate of decline was about 80 kilograms per month. In the current reporting period, it is about 105 kilograms per month. On August 21, 2022, Iran had only 714 kilograms of 3.5% to 5% enriched uranium. If Iran cannot increase its production of 3.5% to 5% enriched uranium fast enough, then Iran could exhaust its stockpile of this enriched uranium by early 2023. If this occurs, Iran will need to slow its production of 60% and 20% enriched uranium by about one third, so as to bring its consumption of 3.5% and 5% enriched uranium into alignment with its production.

Iran's stockpiles of 60% and 20% enriched uranium have now grown so large that using just this enriched material alone, Iran can now produce 60 kilograms of 90% enriched uranium, sufficient material to manufacture three nuclear weapons in less than one month. Using its stockpile of 3.5% to 5% enriched uranium, Iran could produce the 20 kilograms of 90% enriched uranium needed to manufacture a fourth nuclear weapon in about one additional month.

After Iran has produced this 80 kilograms of 90% enriched uranium, it will have used up much of its current stocks of uranium enriched to 3.5% or higher and Iran would need to replenish its stocks of enriched uranium. With its current enrichment capacity, it would require about one month to produce sufficient additional 3.5% - 5% enriched uranium. It would require an additional month to convert this enriched uranium into 20 kilograms of 90% enriched uranium. Therefore, as of August 2022, Iran could produce sufficient enriched uranium for three nuclear weapons in only about one month, a fourth nuclear weapon in one additional month and a fifth nuclear weapon in two months after the fourth.

The world appears to have become increasingly resigned to Iran's acquisition of nuclear weapons. Efforts to revive the Iran nuclear deal (Joint Comprehensive Plan of Action--JCPOA) seem to be dead. Russia's war in Ukraine has placed it at odds with the U.S. and European countries. Therefore, Russia is unlikely to support stern measures against Iran and indeed, it has

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<sup>4</sup> Gregory S. Jones, "Iran Uranium Enrichment Program: June 2022 Update," July 6, 2022, p. 1. <https://nebula.wsimg.com/434992f69e5b61229d066fb8c80f20f4?AccessKeyId=40C80D0B51471CD86975&disposition=0&alloworigin=1>

been reported that Iran has been helping Russia in the Ukraine by supplying it with weapons.<sup>5</sup> Even the Israeli campaign of assassination and sabotage appears to have ended.

That is not to say that I expect Iran to divert nuclear material from IAEA safeguards anytime soon. After all, why should it? It can continue to move ever closer to the HEU required for nuclear weapons with the blessing of the IAEA. Iran would only need to divert nuclear material from safeguards when it wanted to test or use a nuclear weapon. Recall that the U.S. was unable to certify that Pakistan did not have nuclear weapons in 1990, but it was only in 1998 that Pakistan actually tested a bomb. Similarly, though it could be many years before Iran becomes an overt nuclear power, there appears to be little hope of preventing this eventuality.

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<sup>5</sup> David Ljunggren, “Ukraine to slash ties with Iran over ‘evil’ drones supply to Russia,” September 23, 2022, Reuters, <https://www.reuters.com/world/europe/ukraine-says-it-downed-four-iranian-drones-zelenskiy-raps-tehran-2022-09-23/>