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The Iran Nuclear Deal One Year Later Constraints on Iran's Nuclear Program Have Eroded Significantly

January 16, 2017 marked the first anniversary of the Implementation Day of the Joint Comprehensive Plan of Action (JCPOA—the Iran Nuclear Deal). This was the date when the restrictions on Iran's nuclear program took effect and it was also the date when the clock started counting down to the time when all special restrictions on Iran's nuclear program will end. How effective has the JCPOA been in restricting Iran's nuclear program?

Proponents of the JCPOA will cite the fact that Iran has not developed nuclear weapons as an indicator of its success but even without the JCPOA Iran would not have developed nuclear weapons for many years. Gauging the effectiveness of specific restrictions on Iran's nuclear program has been difficult since one of the main “accomplishments” of the JCPOA has been to cut off almost all of the specific information that the International Atomic Energy Agency (IAEA) was providing on Iran's nuclear program. Iran's heavy water stocks are the only aspect of Iran's nuclear program on which the IAEA has continued to provide detailed information.

A Joint Commission consisting of members from the E3+3² and Iran is mandated by the JCPOA to make decisions concerning its implementation. A little noticed document released just before Christmas 2016 contained the text of various Commission decisions that had been made in December 2015 and January 2016, before Implementation Day.³ Official information on the Commission's more recent decisions is lacking.

In the summer of 2015, as the merits of the JCPOA were being debated, the main concern was whether Iran might suddenly breakout of the JCPOA restrictions. I pointed out that a more serious concern was that Iran might erode the JCPOA restrictions and gave specific examples of how this might occur.⁴ One of these examples has come to pass, with the restrictions on Iran's enrichment capacity at the Fuel Enrichment Plant (FEP) being relaxed so that instead of a reduction of 45%, the reduction has only been 25%.

Another erosion of the JCPOA restrictions is related to the size of the hot cells Iran is allowed to possess. This restriction was intended to make it difficult for Iran to place equipment inside of these hot cells that could separate plutonium from spent fuel. The hot cell size restriction was essentially eliminated before the JCPOA even went into effect.

¹ 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 and a faculty member of the Pardee RAND Graduate School, this paper is not related to any RAND project or the Pardee RAND Graduate School and therefore these organizations should not be mentioned in relation to this paper. I can be reached at GregJones@proliferationmatters.com

² China, France, Germany, Russia, US and UK.

³ “Communication dated 21 December 2016 to the Agency sent on behalf of High Representative Mogherini in her capacity as Coordinator of the Joint Commission established under the Joint Comprehensive Plan of Action,” INFCIRC/907, IAEA, December 23, 2016.

⁴ Gregory S. Jones, “An Iran Nuclear Deal that Spreads Nuclear Weapons,” August 10, 2015. [Link](#)

Iran has also been running its heavy water production plant at a high production rate, leading it to twice violate the JCPOA's restriction on the size of Iran's heavy water inventory. Furthermore the heavy water plant's production rate is significantly higher than its reported capacity. This raises questions as to whether Iran provided the IAEA with misleading information and whether the JCPOA's restriction on the size of Iran's heavy water stocks was based on this faulty information.

What is worse, given the limited information available on Iran's nuclear program, it is impossible to know what other concessions the Joint Commission may have granted to Iran, i.e. what other erosions have taken place. The stated purpose of the JCPOA was to make the time required for Iran to obtain the nuclear material for a nuclear weapon (the breakout time) to be at least one year. But with the limited information available (in particular the lack of information about the size of Iran's stocks of low enriched uranium (LEU) and their chemical form) it is impossible to say how long the breakout time is and therefore how effective the JCPOA has been in meeting this goal.

Uranium Enrichment Capacity at the FEP

Before the JCPOA, Iran was producing enriched uranium at the FEP, Iran's main enrichment plant at Natanz. It had 9,166 IR-1 type centrifuges in operation there. As an important step to increase Iran's breakout time, the JCPOA mandated that this number be reduced to only 5,060 IR-1 type centrifuges for ten years, which is a 45% reduction in the number of centrifuges. Writing in the summer of 2015, I pointed out that there was a problem in that the JCPOA did not define what an IR-1 type centrifuge was in terms of its enrichment capacity.⁵ When these centrifuges first started operating at the FEP, they had an enrichment capacity of only 0.5 SWU/centrifuge-year but this capacity had been upgraded to about 0.74 SWU/centrifuge-year in 2010. Furthermore the IR-1 centrifuges at the underground facility at Fordow, which started operation in late 2011, had achieved an enrichment capacity of about 1.0 SWU/centrifuge-year.

Though the centrifuges at Fordow were shut down under the JCPOA, the higher centrifuge performance at Fordow raised the possibility that the centrifuges at the FEP could be upgraded to the Fordow performance level and undermine a key JCPOA restriction. Despite the importance of constraining Iran's enrichment capacity, the Joint Commission gave Iran another concession even before the JCPOA had taken effect and agreed to define an IR-1 centrifuge as having an enrichment capacity of 1.0 SWU/centrifuge-year. This decision means that instead of the enrichment capacity at the FEP being reduced by 45%, it has only been reduced by 25%.

The JCPOA restricts Iran to having no more than 300 kilograms of LEU in the form of UF₆ for 15 years. However, the JCPOA also envisions Iran using LEU to manufacture nuclear reactor fuel and gives the Joint Commission the power to grant exceptions from the 300 kilogram limit. It is not known what Iran's actual stocks of LEU are and what exceptions the Joint Commission may have granted or will grant to Iran. As such it is impossible to determine the current Iranian breakout time and therefore whether the JCPOA is meeting its goal of a one year breakout period.

⁵ *Ibid.*

Hot Cell Volume

To make it difficult for Iran to develop the capability to separate plutonium from spent reactor fuel, the JCPOA placed a 6 cubic meter volume limit on any hot cell in Iran. The presumption was that it would be difficult to place plutonium separation equipment into such a small hot cell. However, before the JCPOA even went into effect, the Joint Commission granted Iran exceptions for 19 preexisting Iranian hot cells which individually had volumes between 9 and 47 cubic meters. Such exceptions clearly negate the JCPOA's 6 cubic meter hot cell volume limit. One must wonder how such a restriction was negotiated in the first place given that Iran apparently had no intention of complying with it and why the E3+3 did not know that Iran already had these large hot cells.

Heavy Water Production

Iran has a plant for the production of heavy water which the IAEA reports has a “nominal” production capacity of 16 metric tons per year. The original purpose of this plant was to supply the moderator and coolant needed to operate a natural uranium fueled plutonium production reactor (euphemistically referred to as a research reactor). Under the terms of the JCPOA this reactor's fuel was changed to LEU to reduce the amount of plutonium that the reactor will produce. Such a reactor has no need for heavy water but the JCPOA allows Iran to continue to produce heavy water and maintain a very large stockpile of 130 metric tons of heavy water. Any excess is to be sold and exported from Iran.

Apparently, before Implementation Day, Iran already had more than 130 metric tons of heavy water and the Joint Commission required Iran to export the excess. Yet only a month later, on February 17, 2016, the IAEA reported that Iran's stockpile of heavy water was 130.9 metric tons which put it in violation of the JCPOA. On February 24, Iran exported 20 metric tons to put it back into compliance. However, on November 8, the IAEA reported that Iran's heavy water stockpile was 130.1 metric tons, again putting it in violation of the JCPOA. On November 9, Iran said that it planned to export 5 metric tons to put it back into compliance.

Since Iran knows what its heavy water production rate is, it can certainly predict when its stockpile will exceed 130 metric tons. Iran could easily take steps to avoid violating the JCPOA. That it has twice violated the JCPOA could indicate that Iran is testing the IAEA and the Joint Commission.

That Iran was able to produce 19.2 metric tons of heavy water in less than 9 months indicates that its annual production rate is approximately 26 metric tons rather than the nominal 16 metric tons. This high production rate could indicate that Iran has provided the IAEA with misleading information about the production capability of its heavy water plant⁶ and that the E3+3 negotiated restrictions on the size of Iran's heavy water stocks based on inaccurate information.

⁶ Iran's heavy water plant is not under IAEA safeguards. However, on December 8, 2013, Iran granted the IAEA “managed access” to the plant. During this access “Iran also provided the Agency with mutually agreed relevant information.” Presumably this included the production capacity of the heavy water plant. See: “Implementation of

Additionally, recent press reports indicate that Iran will be receiving 116 metric tons of natural uranium from Russia in exchange for some of the excess heavy water that Iran has exported. In a sense, Iran is performing a sort of alchemy, converting oil (needed to run the heavy water plant) into uranium. However, Iran's uranium import from Russia just illustrates that the JCPOA places no restrictions on Iran natural uranium stockpile and Iran can import as much natural uranium as it wants. Iran has no need for any large uranium stockpile, yet by accumulating such a stockpile it improves its position for developing nuclear weapons in the future.

Conclusions

The purpose of the JCPOA was to restrict Iran's nuclear program for ten years so as to prevent Iran's breakout time (the time required for Iran to acquire the nuclear material for a nuclear weapon) from being less than one year. The lack of information on Iran's LEU stocks means that it is impossible to determine the current Iranian breakout time and therefore whether the JCPOA is meeting its breakout time goal.

However, it is clear that a significant erosion of the restrictions on Iran's nuclear program took place even before the JCPOA went into effect. In particular the enrichment capacity at the FEP which was supposed to be reduced by 45% was only reduced by 25%. Restrictions on the size of hot cells in Iran, intended to make it more difficult for Iran to separate plutonium from reactor fuel, have been waived.

Since the JCPOA has gone into effect the only aspect of Iran's nuclear program for which there is detailed information is Iran's heavy water stocks and Iran's record of compliance is not encouraging. Twice in less than a year Iran's heavy water stocks exceeded what was permitted by the JCPOA. Since Iran knows its rate of heavy water production, the violations of the JCPOA appear to be deliberate and Iran may be trying to test the IAEA and the JCPOA's Joint Commission. Further Iran's high rate of heavy water production indicates that Iran may have supplied inaccurate information to the IAEA and the E3+3 may have negotiated the restrictions on Iran's heavy water stocks based on this faulty information.

Finally, this anniversary is a reminder that the JCPOA restrictions on Iran's nuclear program are only temporary. The JCPOA is an enormous gamble. The JCPOA granted Iran numerous concessions related to its nuclear program and seriously undermined international nonproliferation standards. In return it was hoped that Iran might give up its desire for nuclear weapons and moderate its international behavior. Thus far the gamble does not appear to be paying off. In the meantime, major restrictions on Iran's centrifuge enrichment program lapse in just nine years and almost all restrictions lapse in fourteen years.

the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran," GOV/2014/10, IAEA, February 20, 2014, p.10.