



Removing Stocks of Near 20 Percent Enriched Uranium

Institute for Science and International Security

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We are releasing a series of reports containing our analysis of specific key issues in the Joint Comprehensive Plan of Action. We are neutral on whether the deal should be implemented. We are using our role as a technical nonproliferation organization to instead highlight strengths as well as potential problems and remediation.

The Joint Comprehensive Plan of Action (JCPOA) commits Iran to reduce its stock of near 20 percent low enriched uranium (LEU). It calls for the removal from Iran or its downblending to an enrichment level of 3.67 percent or less of all near 20 percent LEU that is not in fabricated in usable Tehran Research Reactor (TRR) fuel plates. This reduction must occur prior to Implementation Day (and the lifting of many sanctions). This process needs to be scrutinized to determine that this condition is implemented adequately, and Iran's relatively large domestic stock of near 20 percent LEU in scrap, waste, and process is reduced to near zero kilograms by Implementation Day.

Iran currently has about 228 kilograms (kg) of near 20 percent LEU. It no longer has a stock of near 20 percent LEU in UF_6 form because it has been either downblended or converted into oxide forms. Of the stock that was converted, about 43 kg (uranium mass) remain in oxide powder, only 60 kg (uranium mass) are actually in TRR fuel, and 125 kg (uranium mass) are in scrap, process, or waste.

The deal seems to effectively address the issue of the remaining oxide stock by providing that "All uranium oxide enriched to between 5% and 20% will be fabricated into fuel plates for the Tehran Research Reactor or transferred, based on a commercial transaction, outside of Iran or diluted to an enrichment level of 3.67% or less." This material includes the remaining enriched uranium oxide powder.

One concern is a possible interpretation of the relevant provisions in Annex 1 relating to the near 20 percent LEU in scrap and waste that could potentially leave some of this LEU in Iran. According to Annex 1 of the JCPOA, followed by short commentary:

"Scrap oxide and other forms not in plates that cannot be fabricated into TRR fuel plates will be transferred, based on a commercial transaction, outside of Iran or diluted to an enrichment level of 3.67% or less."

The question, however, is: does this provision cover all 125 kg of the LEU currently in scrap, process, and waste and additional quantities expected as Iran turns the remaining LEU oxide powder into TRR fuel plates? It is reasonable to interpret that this provision covers all of it, and thus Iran is required to eliminate all of this LEU from Iran. This interpretation is further supported by the added limitation that Iran would have to finish the process of fabricating TRR fuel by Implementation Day, which is just months away. Finishing its scrap recovery facilities, recovering the scrap in those facilities, and fabricating the recovered LEU it into usable fuel

assemblies would be extremely difficult to accomplish prior to Implementation Day. This task would be seriously affected by Iran's limited capacity to make TRR fuel plates. Moreover, the agreement, which provides significant sanctions relief, provides little incentive for Iran to delay Implementation Day to recover this LEU from scrap (see also below on Iran being able to buy near 20 percent LEU for TRR fuel). Iran may try to argue that some of the LEU is indeed in fuel plates, even though these plates are rejects and are not of sufficient quality for use in the TRR. But reject plates are not considered fuel and would be subject to removal.

“For 15 years, Iran will not build or operate facilities for converting fuel plates or scrap back to UF₆.” This condition aims to ensure that Iran does not establish a capability that it could use in a breakout to produce LEU hexafluoride for further enrichment to weapons-grade. If Iran were to break out, it would have to build such a capability, delaying its use of this LEU in centrifuges.

On balance, it is expected that most of Iran's near 20 percent LEU will leave the country prior to the lifting of sanctions. Although it is legitimate to assume that Iran would want to recover the relatively large amount of LEU in scrap, it has little incentive or capability to do so by Implementation Day.

Nonetheless, to ensure effective implementation of this provision, we recommend that all of the 125 kg (uranium mass) in scrap and waste be deemed unfit for use in TRR fuel and sent out of Iran prior to Implementation Day, since dilution would likely be overly difficult. The 45 kg in powder form is eligible to stay in Iran until Implementation Day since it can clearly be made into TRR fuel. Much of it, however, will probably end up in scrap, waste, or process forms, and this material should also be sent out of Iran prior to Implementation Day.

According to the agreement, any additional near 20 percent LEU fuel or target material needed for the TRR will be made available to Iran at international market prices.¹ This condition is a recognition that Iran's production of TRR fuel has been highly inefficient and resulted in large quantities of scrap and waste. Moreover, Iran has agreed not to produce near 20 percent LEU for 15 years, which may exceed the lifetime of the TRR. As a result, Iran may not have enough domestically produced LEU fuel or targets for the Tehran Research Reactor. In sum, this commitment to sell LEU reduces Iran's incentive to recycle existing LEU in scrap or enrich more near 20 percent LEU domestically. It also demonstrates that Iran can rely on foreign supply of near 20 percent LEU, which has the added benefit of further integrating Iran into an international fuel system.

This sales arrangement also applies the requirement of eliminating any newly generated LEU in scrap and waste from Iran. The agreement states: “In case of future supply of 19.75% enriched uranium oxide (U₃O₈) for TRR fuel plates fabrication, all scrap oxide and other forms not in plates that cannot be fabricated into TRR fuel plates, containing uranium enriched to between 5% and 20%, will be transferred, based on a commercial transaction, outside of Iran or diluted to an enrichment level of 3.67% or less within 6 months of its production. Scrap plates will be transferred, based on a commercial transaction, outside Iran. The commercial transactions should be structured to return an equivalent amount of natural uranium to Iran.”

¹ According to the JCPOA, “Iran will seek to enter into a commercial contract with entities outside Iran for the purchase of fuel for the TRR and enriched uranium targets. The E3/EU+3 will facilitate, as needed, the conclusion and implementation of this contract. In the case of lack of conclusion of a contract with a fuel supplier, E3/EU+3 will supply a quantity of 19.75% enriched uranium oxide (U₃O₈) and deliver to Iran, exclusively for the purpose of fabrication in Iran of fuel for the TRR and enriched uranium targets for the lifetime of the reactor. This 19.75% enriched uranium oxide (U₃O₈) will be supplied in increments no greater than approximately 5 kg and each new increment will be provided only when the previous increment of this material has been verified by the IAEA to have been mixed with aluminum to make fuel for the TRR or fabricated into enriched uranium targets. Iran will notify the E3/EU+3 within 2 year before the contingency of TRR fuel will be exhausted in order to have the uranium oxide available 6 months before the end of the 2 year period.”