

Institute for Science and International Security

ISIS REPORT

September 21, 2011

Determining the purpose of Iran's growing stock of 19.75 percent enriched uranium: Production should be capped.

by David Albright and Christina Walrond

How will Iran make nuclear weapons, if it decides to do so? There is little consensus on this question. International Atomic Energy Agency (IAEA) inspectors have reported that Iran has assembled the knowledge and experience to be able to fashion a crude nuclear weapon or underground test device, but it lacks a supply of weapon-grade uranium for such a device. The key question is, how will Iran acquire enough weapon-grade uranium for nuclear weapons?

An oft-discussed scenario is that at some point in the future, Iran would break out and use a declared or clandestine uranium enrichment plant to make the weapon-grade uranium. Iran could use its safeguarded stock of low-enriched uranium (LEU) to give itself a significant head start over using natural uranium. This scenario depends on withdrawing LEU from IAEA safeguards and enriching the stock of LEU to weapon-grade at either a covert or declared enrichment plant. During the next few years, this process will likely take many months, allowing time for the IAEA to detect the LEU's diversion and exposing Iran to intense diplomatic pressure and military strikes before it can assemble a nuclear weapon.

To reduce this risk, Iran may pursue another scenario, whereby it produces weapon-grade uranium in a relatively open manner. The success of this method would depend on the slow acceptance of progressively higher enrichment levels by the international community as it produces weapon-grade uranium piecemeal. If the regime decides to make nuclear weapons, it would still need to divert the highly enriched uranium (HEU) from safeguards, but the time before it possesses a nuclear weapon would be significantly less than in the traditional breakout scenario above. Iran has developed the first two steps to making weapon-grade uranium—enriching to 3.5 percent and then to 19.75 percent LEU. To proceed down this path, Iran will need to find a justification to make perhaps 60 percent and eventually 90 percent HEU. To that end, Iran's recent announcement that it intends to re-insert U.S. origin spent HEU fuel into Iran's Tehran Research Reactor (TRR) could be aimed at setting a precedent. Although it told the IAEA that the purpose of using this fuel is "research," it may be seeking to justify the domestic production of HEU in its centrifuges for use either as TRR fuel or targets to make medical isotopes. Iran could very well be in the midst of implementing this scenario.

To better understand these two scenarios, one must develop a familiarity with Iran's current and future stock of 19.75 percent LEU.

Current Stock of 19.75 percent LEU

The September 2, 2011 IAEA safeguards report shows that Iran is increasing its production of 19.75 percent LEU and achieving a greater efficiency in the IR-1 cascades devoted to this enrichment at the Pilot Fuel Enrichment Plant (PFEP). Iran has also started implementing its plan to move all 19.75 percent LEU production to the Fordow enrichment site and increase its production threefold.

Iran maintains that its production of 19.75 percent LEU is for peaceful purposes, justifying its increased enrichment with plans to expand its civil nuclear program. However, Fereydoun Abbasi-Davani, the head of the Atomic Energy Organization of Iran, said in an August 2011 interview published by IRNA that Iran had "already exceeded the required amount" for the TRR. Iran has already produced several years of fuel for the TRR. Moreover, Iran has not yet established a manufacturing line to make the fuel. But Abbasi-Davani added that Iran will continue to produce 19.75 percent LEU.

Abbasi-Davani said that Iran planned to build "four to five research reactors of 10 to 20 megawatts" within the next few years. However, the likelihood that Iran could execute this plan is extremely low. Reactor construction is complicated by Iran's need to procure sensitive goods abroad that, with existing sanctions in place, would be extremely difficult to obtain. Additionally, Iran has no tested capability to build a research reactor, and completing one will likely take years. By any realistic analysis, Iran is making far more 19.75 percent uranium than it needs.

Projected Stock

ISIS has estimated the future stock of 19.75 percent LEU under a range of projections—those that comprise a growth rate that is the same as today, three times today's rate which is Iran's announced intention, and six times the current rate. The mid-projection, or the rate Iran seeks, estimates that by November 2012, Iran would have accumulated more than enough 19.75 percent LEU so that after further enrichment it would have enough weapon-grade uranium for about one nuclear weapon. The worst case estimate is that by mid-2012, Iran would have enough 19.75 percent LEU for a nuclear weapon. The least worrisome case is that Iran would need until late 2013 to accumulate enough 19.75 percent LEU for a weapon. The broad range reflects uncertainties in knowledge about Iran's future intentions and capabilities. Table 1 illustrates a range of scenarios for possible Iranian 19.75 percent LEU production and the corresponding number of bombs that could be produced. Figure 1 illustrates that LEU projection graphically.

Table 1: Projections of 19.75 percent LEU hexafluoride and Weapons Worth²

| Date | | Low | | Medium | | High |
|---------------|------|-----------|-------|-----------|-------|-----------|
| | Mass | # Weapons | Mass | # Weapons | Mass | # Weapons |
| November 2012 | 139 | 0 | 343 | 1 | 669 | 1-2 |
| November 2013 | 193 | 1 | 560.4 | 1-2 | 1,213 | 3-6 |

ISIS REPORT 2 | P a g e

¹ "Iran to build 4 to 5 research reactors." Agence France Presse. April 11, 2011.

² David Albright and Christina Walrond, "Historical and Future Production of 19.75 percent Low Enriched uranium in Iran," forthcoming.

Cumulative 19.75% Enriched Uranium Projections in Iran 1400 1200 KG URANIUM HEXAFLUORIDE 1000 800 ■ 19.75% PRODUCT PROJECTION HIGH 600 ■ 19.75% PRODUCT PROJECTION MID 400 ■ 19.75% PRODUCT PROJECTION LOW 200 0

Figure 1: Projections for 19.75 Percent Enriched Uranium Product in Iran³

Findings

The question inevitably arises over whether Iran is trying to stockpile 19.75 percent LEU to enable it to more quickly make nuclear weapons, if the regime decides to build them. Iran could produce the weapon-grade uranium either via a traditional breakout scenario or by openly making HEU under safeguards.

REPORTING DATE

With a growing inventory of 19.75 percent enriched uranium and deployment of advanced centrifuges, Iran could in a few years dramatically decrease the amount of time it would need to enrich its LEU stock to weapon-grade. But Iran does not yet have this capability. Faced with breakout times of many months, Iran may instead continue producing 19.75 percent LEU and look for an opportunity to make HEU under a civilian justification.

The mid-projection points out a new dimension to the Iranian enrichment program. Iran would be turning nearly all of the 3.5 percent LEU that it produces into 19.75 percent LEU. Iran's enrichment program would no longer appear to be geared towards making 3.5 percent LEU. Rather, the entire visible enrichment program would be better described as for the production of 19.75 percent LEU.

This analysis reinforces the need for vigilance on the part of the international community to prevent Iran from making HEU under a civilian justification. Iran successfully maneuvered to make 19.75 percent LEU when most

ISIS REPORT 3 | P a g e

-

³ David Albright and Christina Walrond, "Historical and Future Production of 19.75 percent Low Enriched uranium in Iran," forthcoming.

believed it would not be possible or acceptable. It should not be permitted to similarly create the conditions for making HEU.

Ahmadinejad, who recently told *The Washington Post* that if the United States sold Iran 20 percent LEU, it would stop its domestic production of this material. This statement contradicts Abbasi-Davani's recent claim to IRNA that Iran has no intention to halt its production of 19.75 percent LEU. Despite the discrepancy between stated intentions, the United States would be wise to consider President Ahmadinejad's offer. To test this offer, the United States could suggest that it would arrange the sale of two-year's worth of TRR fuel in exchange for a two-year halt to any production of uranium enriched over five percent. TRR targets for medical isotope production could also be offered for sale to increase interest in the deal. Such an agreement would be modest and not substitute for an agreement solving the fundamental nuclear issues. As such, a sales and cap agreement should not be expected to lead to any reductions in sanctions on Iran or the type of transparency the IAEA says it requires. Despite the limited nature of such an agreement, capping even temporarily Iran's stock of 19.75 percent LEU would reduce concern that Iran is producing weapon-grade uranium piecemeal. This agreement would also provide humanitarian assistance by increasing Iran's supply of medical isotopes.

ISIS REPORT 4 | P a g e