



September 15, 2008

## **IAEA Report on Iran: Centrifuge Operation Significantly Improving; Gridlock on Alleged Weaponization Issues**

**By David Albright, Jacqueline Shire, and Paul Brannan**

The International Atomic Energy Agency (IAEA) released on September 15, 2008 its [latest report](#) on the implementation of NPT safeguards in Iran and the status of Iran's compliance with Security Council Resolutions 1737, 1747 and 1803. The report, which shows Iran's continued non-compliance with these resolutions, includes two important findings. **The first is that Iran is making significant progress on developing and operating its centrifuges. The second is that Iran continues to resist efforts to address substantively its alleged nuclear weapons-related work, which the IAEA says remains of serious concern.** A senior official close to the IAEA described the current situation as "gridlocked."

In an important new development, the IAEA reports that it has recently obtained information about the possibility of Iran drawing on "foreign expertise" in conducting experiments connected with the symmetrical initiation of a hemispherical high explosive charge suitable for an implosion-type nuclear weapon. The official noted that the IAEA has not linked this expertise to the A.Q. Khan proliferation network.

### **Significant increase in UF<sub>6</sub> consumption; cascade expansion slows:**

The IAEA report states that a total of 7,600 kilograms of uranium hexafluoride have been fed into the cascades at the Natanz Fuel Enrichment Plant (FEP), producing a total of 480 kilograms of low enriched uranium (LEU).

During the most recent reporting period of just under four months, from May 7, 2008 to August 30, 2008, Iran fed a total of 3,630 kilograms of uranium hexafluoride into the

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cascades at the FEP, a significant increase over previous rates.<sup>1</sup> At Iran's stated goal for feeding uranium hexafluoride into P-1 centrifuges, and assuming continuous operation, the centrifuges now appear to be running at approximately 85 percent of their stated target capacity, a significant increase over previous rates.<sup>2</sup>

Iran produced an estimated 200-250 kilograms of LEU during this latest reporting period, roughly doubling the amount produced prior to this period. Its rate during this current reporting period is close to an average of 2 kilograms of LEU per day, more than a 50 percent increase from the previous reporting period during which Iran was enriching at an average rate of approximately 1.2 kilograms per day. A senior official close to the IAEA said that Iran was now producing at a rate of about 2.5 kilograms per day, some of this output attributable to the addition of more cascades enriching uranium.

In the past, Iran experienced significant problems in running its P-1 centrifuge cascades, encountering a high rate of centrifuge breakage and instability in their operation. These problems resulted in a lower than expected output of LEU. Under these conditions, a sizeable quantity of enriched uranium was "dumped" into the cascades' waste stream where it was mixed with depleted uranium and lost.

This latest report, however, shows that Iran has largely overcome these problems, which is reflected in the increased feed rates and LEU production. One official close to the Agency stated that Iran may have reached a point where its cascades are operating in a stable manner, noting that fewer centrifuges are breaking.

In addition to the 18 cascades containing some 3,000 P-1 centrifuges, Iran continues to install a second module of 3,000 centrifuges, of which five cascades are enriching and another one is under vacuum. Installation of an additional 12 cascades is continuing, although a schedule of completion is unknown. Iran does not appear to be rushing to install the second module of centrifuges at this time.

### **A note about a break-out nuclear weapons capability**

A key benchmark of enrichment progress is when Iran accumulates enough low enriched uranium to have a capability to produce quickly enough weapon-grade uranium for a nuclear weapon. In this case, Iran would use the LEU as feed into its cascades, dramatically shortening the time to produce weapon-grade uranium. Other ISIS-

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<sup>1</sup> Between December 12, 2007 and May 6, 2008, Iran introduced 2,300 kg of uranium hexafluoride (UF<sub>6</sub>) into the cascades at the Fuel Enrichment Plant, and 1,670 kg of UF<sub>6</sub> during the entire period from February 2007 to December 2007.

<sup>2</sup> Based on Iran's stated feed rates of 70 grams per hour per cascade, one would expect that a single cascade would consume 50 kg per month, with 18 cascades consuming 900 kg. Between May 7 2008 and August 30, 2008 we calculate that 21 cascades were operating on average, with a potential maximum feed of 4200 kg. Iran introduced 3630 kg during this period, indicating that the cascades were operating at approximately 85 percent capacity. This is a significant increase over the 50 percent capacity indicated by the last IAEA report.

generated reports have discussed this issue in more detail.<sup>3</sup> Achieving this benchmark is bound to increase tensions between the United States and Iran over when it could build nuclear weapons.

ISIS estimates that under optimal conditions, Iran could use between 700 and 800 kilograms of LEU to produce in its P1 centrifuges 20-25 kilograms of weapon-grade uranium, enough for a crude fission weapon. Other estimates are more pessimistic about Iran's ability to enrich the LEU up to weapon-grade, estimating that 1,000-1,700 kilograms of LEU would be necessary to produce 25-30 kilograms of weapon-grade uranium, generally considered more than enough for one nuclear weapon. Whatever the actual amount of LEU, Iran is progressing toward this capability and can be expected to reach it in six months to two years.

### **New advanced centrifuge designs in testing phase: Iran increasing the feed rate of its test cascade of IR-2 centrifuges**

At the Natanz Pilot Fuel Enrichment Plant, Iran has installed two or three types of next-generation centrifuges: the IR-2, the IR-3, and possibly a longer centrifuge. Previous ISIS reports describe these more advanced centrifuges in more detail.<sup>4</sup> These centrifuges are expected to have greater enrichment output and perform better in operation.

During this reporting period, Iran has significantly increased the feed rate into its IR-2 centrifuges. This development appears to reflect Iran's goal of developing a more advanced centrifuge that can be deployed in the FEP instead of its P1 centrifuges. It is unknown how long Iran intends to test these new designs or when they could be deployed in large numbers in the underground halls.

From May 16 to August 30, 2008, Iran introduced a total of about 30 kilograms of uranium hexafluoride into the 10-machine IR-2 machine and the single P1, IR-2, and IR-3 centrifuges. During the last two reporting periods, stretching from October 23, 2007 through early May 2008, Iran fed a total of 8 and 19 kilograms, respectively, of uranium hexafluoride into mostly P1 centrifuge cascades.<sup>5</sup> Thus, Iran is feeding significantly more uranium hexafluoride into its IR-2 centrifuges, stepping up its developmental activities on this more advanced centrifuge.

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<sup>3</sup> A Witches' Brew? Evaluating Iran's Uranium Enrichment-Progress, David Albright and Jacqueline Shire, Institute for Science and International Security

[http://www.armscontrol.org/act/2007\\_11/Albright](http://www.armscontrol.org/act/2007_11/Albright)

<sup>4</sup> [http://www.isis-online.org/publications/iran/ISIS\\_Iran\\_IAEA\\_Report\\_29May2008.pdf](http://www.isis-online.org/publications/iran/ISIS_Iran_IAEA_Report_29May2008.pdf)

[http://www.isis-online.org/publications/iran/ISIS\\_Iran\\_P2\\_7Feb2008.pdf](http://www.isis-online.org/publications/iran/ISIS_Iran_P2_7Feb2008.pdf)

<sup>5</sup> Between October 23, 2007 and January 21, 2008, Iran fed a total of about 8 kilograms of uranium hexafluoride in the single P1 and the 10-machine P1 cascade; no nuclear material was fed into the 20- and 164-machine cascades. Other P-1 cascades were dismantled. Between January 28, 2008 and May 16, 2008, Iran fed a total of about 19 kilograms of uranium hexafluoride into the 20-machine P1 cascade, the single IR-2 centrifuges, the 10-machine IR-2 cascade, and the single IR-3 centrifuge

Iran is not required under its current safeguards agreement to share with the IAEA centrifuge research and development work or details about centrifuge manufacturing. If Iran were observing the Additional Protocol, the IAEA would have access to such information. Its lack of such information has created large uncertainties in assessing the scope and direction of Iran's enrichment program.

### **Gridlock on alleged weaponization work**

Iran and the IAEA made no progress in resolving a series of outstanding questions the IAEA has raised with regard to alleged research into nuclear weaponization issues, or other issues with a "military" dimension. According to the latest report, Iran has "confirmed the veracity of some of the information" but reiterated its assertion that the allegations were based on forged or fabricated data.

### **Foreign expertise on nuclear weapons' component?**

There is important new information obtained by the IAEA related to possible assistance from a foreign expert to Iran's alleged nuclear weapons effort. According to the report, the IAEA has obtained information indicating that experimentation on the "symmetrical initiation of a hemispherical high explosive charge suitable for an implosion type nuclear device" may have involved the "assistance of foreign expertise." A senior official close to the IAEA declined to provide details about the person who may have provided this assistance. The IAEA has asked Iran to clarify this issue, and according to the senior official, continues to pursue this matter with Iran and other countries.