



July 26, 2010

## What is Iran's competence in operating centrifuges?

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A [recent article in \*The Financial Times\*](#) examines the status of Iran's gas centrifuge uranium enrichment program and the potential reasons behind Iran's recent lack of progress in using more centrifuges to enrich uranium at the Fuel Enrichment Plant (FEP) at Natanz.

The article cites Ivan Oelrich of the Federation of American Scientists (FAS) as saying that Iran's centrifuges are "only working at 20 percent efficiency." According to the [latest IAEA data](#) from May, however, each machine is achieving two to three times that efficiency, and perhaps even more. The average output of each machine is [0.9 separative work units \(swu\) per year](#)<sup>1</sup>. The Iranian stated target swu per year, per machine appears to be [between 1.36 and 2](#)<sup>2</sup>. In this case, the efficiency is between 45% and 66%. In any case, the centrifuges are working better than the FAS number would imply.

In addition, further improvements in efficiency can be expected as Iran becomes more competent in operating cascades. For example, temporary shutdowns of centrifuges in the top part of the cascade have led to the evacuation of slightly enriched uranium (about one percent) into dump tanks, preventing the dilution of the low enriched uranium (LEU) product. As of November 22, 2009, about 2026 kilograms of at least 0.97 percent were in dump tanks. The separative work to produce this enriched uranium is not included in the average of 0.9 swu per year, per machine.

It was a surprising development when Iran was able to produce 20% enriched uranium with no apparent delay at the Pilot Fuel Enrichment Plant (PFEP). In this process, the efficiency was at least the same, and perhaps better than it was from natural uranium up to 3.5% material. If the claim by Ali Akbar Salehi, the head of the Atomic Energy Organization of Iran, that Iran had produced 17 kilograms of 19.75% uranium between February 9 and June 23 is accurate, it would result in an average 0.9 swu per machine, per year. Furthermore, taking Iran's interceding report of 19.75% uranium production in between February and June, the swu per machine per year would have been initially around 0.7 and then it would have risen above 1 swu per machine per year during the later period.

The 20% efficiency cited by Oelrich appears to derive from earlier FAS swu calculations which were misinterpretations of the available data. The 20% efficiency number also does not take into account subsequent IAEA data.

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<sup>1</sup> The 0.9 average swu value is also an underestimation, as it assumes that all 3,936 centrifuges were enriching during the last reporting period.

<sup>2</sup> David Albright and Christina Walrond, "Iran's Gas Centrifuge Program: Taking Stock," ISIS Report, Institute for Science and International Security, February 11, 2010: <http://isis-online.org/isis-reports/detail/irans-gas-centrifuge-program-taking-stock>

Problems in operating centrifuge cascades and possibly sabotage have set back the Iranian centrifuge program. However, it is a mistake to believe that Iran is incompetent or is not progressing in operating large numbers of centrifuges.

Nonetheless, much more stringent enforcement of sanctions and possibly sabotage could still significantly hinder the progress of Iran's centrifuge program.