IAEA's Report on Iran's P2 Centrifuge Design, or is it really P3?

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At long last, the International Atomic Energy Agency (IAEA) has released its latest report [1] on Iran's nuclear dossier; focusing on chronological findings related to the acquisition and development of the first (P1) and second (P2) generation centrifuge technologies. Centrifuges are considered a critical piece of equipment in that they are a central part of the nuclear fuel enrichment process, in which processed uranium gas is spun at very high speed. This report was aimed at removing some of the remaining technical ambiguities that had resulted when Iran's nuclear case was referred to the United Nations Security Council (UNSC).

Contrary to what the New York Times [2] and other mainstream US news organizations have represented, the report is overall positive, although it does not completely close the door on the P1 and P2 issue, probably because of pressure from the US. The report clearly confirms Iran's cooperation in answering relevant questions, even beyond what is normally expected from a member country. It goes so far as to stating several times that the information Iran has provided corroborates what the IAEA already knew from other sources. It should also be mentioned that Iran's R&D work on centrifuges is completely within her rights under the Non Proliferation Treaty (NPT). Furthermore, based on its charter the IAEA is tasked to provide enrichment know-how (which includes centrifuge design) to the member countries, so they can achieve their goals for peaceful nuclear technology.

The report also revealed several extremely important issues that are worth further discussion, outlined as follows:

1. *Status of P2:* Iran has voluntarily informed the IAEA that the mechanical testing of this model based on composite rotor material has commenced.
2. *Bushehr Reactor Fuel:* The agency will be making arrangements by the end of this November to receive nuclear fuel in preparation for its delivery from Russia; the actual date of delivery is still unknown.
3. *Uranium Metal Document:* Although the IAEA had previously reviewed and sealed this document in 2006, an actual copy was finally given to the IAEA.
4. *3000 P1 Working at Natanz:* The IAEA confirmed that 18 cascades (each 164 centrifuges) are operational and have been enriching uranium gas at a lower rate than what is expected for this design.

P1 centrifuges used at the Natanz facility are based on a 40-year old European design modified by Pakistani scientists. As part of the enrichment process, this particular design uses aluminum rotors for the spinning of the uranium gas at a nominal speed of 64,000 revolutions per minute (RPM), close to the speed of sound. The second generation design (P2) originally relied on a stronger material called *maraging steel* which provides a more efficient rotor design and improved speed, hence yielding a higher Separating Work Unit (SWU). This particular material is extremely hard to manufacture and the private company contracted for manufacturing apparently could not deliver it.

The third generation centrifuges that are the cornerstone of modern European and American designs are based on composite material (carbon fiber). This is an extremely strong and lightweight material that has been used in a variety of applications ranging from tennis racquets to airplanes (*e.g.*, the Boeing 787). If Iran has indeed completed the mechanical design of a centrifuge based on composite material, then it probably should be considered a P3 or beyond technology; they would have skipped P2-generation centrifuges for technical or other reasons. The speed for a composite material design could reach 90,000 RPM which is about 50% higher than what can be reached with the P1 design. Since the efficiency of a centrifuge (SWU) is directly related to the speed of the rotor raised to the 4^{th} power, one can estimate that P3 is about 7 times more efficient than P1. What does this imply? That it will take less time (reduced roughly by a factor of 7), to enrich uranium as compared to what has been installed at the Natanz facility which uses (older) aluminum-based P1 technology. Therefore, if the US decides to strike the Natanz facility with its older centrifuges, it is almost certain that Iran will leave the NPT and continue work on the P3 technology, which is much more efficient, but she will do so underground and without inspections.

If these assumptions are correct, it could be the most crucial deciding factor for the US to delay an attack on Iran. All the previous concerns regarding impact on the economy or loss of lives will not be as critical to the two scoundrels in the White House. They have already eloquently demonstrated their utter insensitivity to these issues during the current war in Iraq. Not knowing the location of *all* the P3 workshops has been a source of concern for those in charge of planning an attack. This is probably one of the reasons why the IAEA is under a lot of pressure from the US to encourage Iran to provide more access to these non-declared centrifuge workshops that are not covered by the Nonproliferation Treaty. One cannot embark on an attack (incidentally, yet another illegal and immoral one from this administration) unless all the target sites have been identified.

Thus and paradoxically, if Iran has demonstrated to the IAEA that she masters the design of more modern centrifuges (P3), it may spare her from a pre-emptive, not to mention illegal strike by the US or Israel.

1. http://www.isis-online.org/publications/iran/IranIAEAreportNov15.pdf
2. Report Raises New Doubts on Iran Nuclear Program - New York Times
3. http://www.armscontrol.org/act/2007_11/Albright.asp