The deal struck between the P5 +1 (5 permanent members of the UN and Germany) and Iran satisfies two major objectives. First, it limits the possibility of diverting a peaceful nuclear energy program for nuclear weapon production; and it enables the means to detect cheating by Iran with reasonable certainty. The emphasis on reasonable certainty is deliberate, it is not reasonable to expect a verification regime to be perfect, and detect a diversion with 100 percent certainty. A compromise is always made in what is possible, reasonable and affordable.

It is also important to remember the grand bargain made under the treaty of the nonproliferation of nuclear weapons (NPT) between states that possessed nuclear weapons at the time the treaty went into force (known as the nuclear weapon states: United States, Soviet Union, China, France and UK, ie. the P5) and ones that didn’t (the non-nuclear weapon states). The treaty gives full rights to peaceful nuclear energy programs for non-nuclear weapon states like Iran as long as they do not seek nuclear weapons. Unfortunately, the NPT was not completely clear about what is and what is not legal, and the problem is compounded by the fact that a peaceful and a military nuclear program intersect at various points in what is called the nuclear fuel cycle.

The nuclear fuel cycle consists of a series of steps that describe the use of uranium metal from its extraction through mining, utilization in a nuclear reactor, to the eventual management of the nuclear waste produced. In the enrichment step which is one of the steps in the nuclear fuel cycle, the more useful isotope uranium-235 is increased in proportion relative to the other uranium isotopes. Most power reactors use fuel containing uranium enriched from 3-5 percent uranium-235, whereas nuclear weapons use uranium that has been enriched to higher than 90 percent (weapons grade). However, enriching from 0.7 percent to 3-5 percent is the bulk of the work, increasing it further to weapons grade is much less effort which is why even 3-5 percent enriched material is a concern.

Iran has constructed several elaborate centrifuge enrichment facilities in order to produce fuel for its reactors. The problem is that exactly the same facility can also be used for nuclear weapon production. The current treaty essentially closes such cheating scenarios by first cutting Iran’s uranium enrichment capability by two-thirds and then dramatically slashing its current stockpile of low enriched uranium, increasing the time required to produce enough enriched uranium for a bomb from 2-3 months to upwards of a year. Other measures as part of the deal are limiting research, development and testing of more advanced centrifuges, and having continuous surveillance at their points of production. All of these steps are time-bound with some steps lasting 10 years but others such as continuous access to uranium mines lasting as long as 25 years.

Another principal concern for the negotiators of the treaty was the construction of the 40 MW Arak reactor which uses unenriched fuel which could
produce enough weapons grade plutonium (which just like uranium can be used as the explosive material of a nuclear bomb) for more than a bomb per year. The negotiators are rightfully concerned because India constructed its first nuclear bomb from plutonium produced in a similar design reactor with the same power under the pretext of a civilian nuclear program. The treaty agreed to this week, will essentially dismantle the reactor, convert it to a lower power reactor, and slightly increase the fuel enrichment. The agreement will also require Iran to ship all of its spent fuel out of the country, which is significant because plutonium is extracted from the spent nuclear fuel. These measures reduce plutonium production to less than a couple of kg plutonium per year and of a lesser quality than that usually used in nuclear weapons.

The last possible route to a bomb blocked by the treaty is the possibility of using clandestine facilities to enrich uranium or to extract plutonium. Iran has agreed to abide by enhanced safeguards measures known as the Additional Protocol which is in force in 126 countries around the world. The protocol will give the International Atomic Energy Agency (IAEA) increased access to relevant sites as well as to locations which are not part of the nuclear fuel cycle but deemed relevant for the IAEA.

All of these measures still allow Iran to continue to conduct peaceful nuclear research, produce nuclear isotopes for medicine and industry as well as expand nuclear power. However, the agreement limits and delays more proliferation sensitive steps in the fuel cycle like indigenous enrichment and spent fuel processing. Most countries that currently produce nuclear energy don’t enrich uranium but purchase enriched uranium from large multinational consortia.

It is also important to remember that the IAEA is not alone in verifying compliance of Iran with the treaty. The IAEA is supported by the national technical means of all stakeholders and by civil societal groups that will monitor Iran’s compliance with the deal very carefully.

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