

The Iran Deal in Six Minutes¹

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On 14 July 2015, the United States, Iran, and five other participants signed the Joint Comprehensive Plan of Action (JCPOA), under which Iran commits itself to verifiable restrictions and even reversals of its programs in the nuclear energy area. The six states other than Iran—France, the United Kingdom, Germany, China, Russia, and the United States—are variously characterized as the “P5+1” or “EU+3.” In addition to the individual states, the European Union was also represented. In return for accepting the restrictions on its programs, Iran was freed from sanctions imposed by the international community and individual states related to its non-compliance with its obligations under the Nonproliferation Treaty (NPT).

The purpose, of course, is to delay the time at which Iran could have material for a nuclear weapon, and to have Iran formally renounce the research, development, manufacture, possession, and use of a nuclear explosive device. Without detailing nuclear weapon stockpiles in the world today, it is useful to list the date of the first and most recent explosions and number of nuclear explosive tests by country (Table).

Iran had a substantial program for enrichment of the fraction of U-235 in normal uranium from its natural 0.71% concentration to 5% for fuel for power reactors and to 19.97% for fuel for “research reactors.” Until 2003, Iran had elements of a program to acquire nuclear weapons, although it is unclear whether this program was a tentative one meant to explore the possibility, or to obtain the ability to make but not deploy, nuclear weapons.

As sanctions were applied by the United States, the EU, and the United Nations, Iran abated its nuclear weapon program as indicated by the following statement of the U.S. intelligence community in 2007:

- We assess with high confidence that until fall 2003, Iranian military entities were working under government direction to develop nuclear weapons . . .

1 Read 13 November 2015.

State	First Nuclear Test	Most Recent Test	Total Tests
United States	1945	1992	1030
Russia	1949	1990	715
United Kingdom	1952	1991	45
France	1960	1996	210
China	1964	1996	43
India	1974	1998	7
Pakistan	1998	1998	6
North Korea	2006	2013	3

TABLE. First and most recent nuclear explosions by state. North Korea tested again 6 January 2016.

- We assess with moderate confidence Tehran had not restarted its nuclear weapons program as of mid-2007, but we do not know whether it currently intends to develop nuclear weapons.

However, enrichment proceeded unabated, from about 164 gas centrifuges when such matters were first discussed with Javad Zarif in 2005,² to 19,000 centrifuges at the time of signing of the JCPOA.

With the evolution of normal industrial technology and communication and resources via the Internet, as well as the scurrilous pro-proliferation campaign that was constituted by Pakistan’s A.Q. Khan, selling to Libya and other states information about not only the gas centrifuge enrichment technology he had stolen from EURENCO but also the design of the Pakistani nuclear weapon, the best option to prevent additional states from acquiring nuclear weapons is to (a) persuade them of the reality that nuclear weapons are likely to make them less secure rather than more secure; and (b) limit access to technology for both the enrichment of U-235 and the production of the other common fissile isotope, plutonium-239, that can be separated from uranium fuel exposed in nuclear reactors—the approach used by the United States for the Trinity explosion in New Mexico on 16 July 1945, and to destroy the city of Nagasaki on August 9 of that same year.

The plutonium route is the most straightforward and has the additional problem that normal nuclear power plants invariably make plutonium in very large amounts that can be used in weapons, despite the fact that the high-exposure fuel is not the most preferred type for nuclear weaponry. Here are some numbers from the International Atomic Energy Agency: the “significant quantity” (SQ) of uranium contains 25 kg of U-235, and for plutonium, the SQ is given as 8 kg.

2 In 2005, Zarif was Iran’s permanent representative to the United Nations in New York. The technical group, of which I was a member, was convened by Amb. William Green Miller, senior advisor to the U.S.-Iran program of Search for Common Ground.

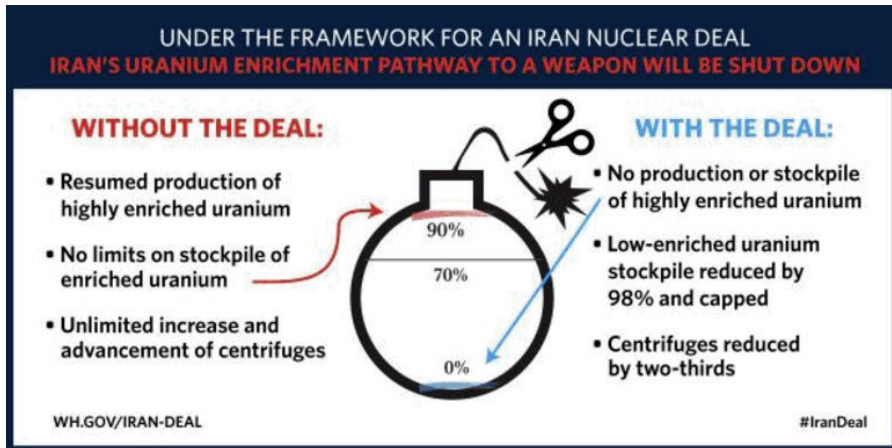


FIGURE 1. Image courtesy of the White House.

Spent fuel downloaded from a normal commercial power reactor contains about 160 kg of fissile plutonium for a year's worth of operation of a 1000-MWe power plant. Furthermore, diversion of the input to the reactor can also contribute to nuclear weaponry because it is typically enriched to about 5% U-235, and a supply of 1000 kg of U-235 per year (as 5%) is required for each 1000-MWe power plant.

The JCPOA is 159 pages of incredible detail. Here is what I wrote about it with some 30 other knowledgeable scientists in a letter from August 9 to President Obama:

This is an innovative agreement, with much more stringent constraints than any previously negotiated nonproliferation framework This agreement also for the first time, explicitly bans nuclear weapons R&D, rather than only their manufacture. . .

The plutonium route is closed for more than 10 years by Iran's agreement (a) not to have reprocessing capability for any reactor fuel, (b) to remain a member of the Nonproliferation Treaty, and (c) to allow both IAEA inspections of all its nuclear activity and, under the Additional Protocol to the NPT, inspections of facilities identified by environmental sampling or other means. The enriched uranium route to a nuclear weapon is blocked by the enormous reduction in Iran's stockpile of enriched uranium and, especially, by the 98% reduction of low enriched uranium. Figure 1 adds the blue "NEW IRAN DEAL" line to Israeli Prime Minister Netanyahu's UN presentation of 27 September 2012, to show how effectively the Iran Deal restricts Iran's holdings of U-235 in enriched uranium.

Furthermore, Iran agrees not to enrich beyond 3.67% for the duration of the agreement, and to rapidly transform the UF₆ enriched

product into solid reactor fuel, so that it will be less convenient to further enrich it by gas centrifuge or other means. The plutonium route is further blocked by a total transformation of the heavy water reactor that had been largely complete and, if it were to operate at the rated power of 40 megawatts (thermal; MWt) like the Israeli reactor at Dimona, could have produced about 12 kg of weapon-grade plutonium per year. The redesigned reactor will produce about one-tenth that much plutonium, and the spent fuel will be shipped out of Iran.

Low-enriched uranium, not conventionally regarded as a proliferation hazard, includes up to almost 20% U-235. The problem is that a given complex of centrifuges can be fed the higher enrichment material and very quickly produce a bomb's worth—an SQ of 25 kg—of weapon-grade uranium much more quickly than if those same centrifuges had been fed natural uranium.

Therefore, during the term of the agreement (i.e., 10 to 15 years, although some elements of control will last longer than that—and membership in the NPT lasts indefinitely), there is no possibility that Iran can produce a nuclear weapon. A totally covert program would be far more difficult to conceal in the presence of the JCPOA than it would have been without it.

Does the Iran Deal accomplish everything that the United States would like? We would, of course, prefer that Iran stop promoting the weekly chant, "Death to Israel; death to the United States," but would we be satisfied with Iran's good intentions if they stopped? No.

And what about the \$60 billion that Iran will have under the agreement because of relief from sanctions—and perhaps more if the economy really develops? Will that be used to buy more rockets for Hezbollah to fire across the border at Israel from the Gaza Strip or Lebanon? It's unlikely because those rockets are so cheap, and even rockets containing GPS guidance cost very little; it is not the cost that, even at present, prevents Iran from providing effective means to bombard the territory of Israel.

My six minutes are up. For more information, please see my presentation from 20 August 2015, where you will find supporting detail.³ A brief discussion is in the letter I signed to President Obama.⁴

3 Garwin, R. L., "The 14 July 2015 Iran Agreement: Joint Comprehensive Plan of Action—JCPoA," *Plenary Presentation of 20 August 2015, International Seminar on Nuclear War and Planetary Emergencies* (Erice, Sicily). Accessed at <http://fas.org/rlg/jcpoa-erice.pdf>

4 Letter to President Barack Obama regarding Iran nuclear deal, signed by R. L. Garwin, et al., on 9 August 2015. Accessed at <http://fas.org/rlg/iranletter.pdf>