

An Iran Nuclear Deal That Spreads Nuclear Weapons

The nuclear deal reached with Iran on July 14, 2015, the Joint Comprehensive Plan of Action (JCPOA), had as its original purpose the prevention of the acquisition of nuclear weapons by Iran. Indeed the preliminary Joint Plan of Action (JPOA), agreed to with Iran in November 2013, used the term “Comprehensive Solution” to refer to this follow-on final deal. No one now thinks that the JCPOA is a solution to the problem of Iranian nuclear weapons and even its advocates see it as just a means to buy a little time.

Three major early concessions to Iran doomed any chance that the JCPOA might actually prevent Iranian nuclear weapons. Additionally, the terms of the JCPOA itself are flawed. The redesigned Arak reactor will still be a significant source of plutonium and the JCPOA will accelerate its completion. The low enriched uranium (LEU) stockpile restrictions needed to stop Iran from acquiring the ability to quickly produce highly enriched uranium (HEU) for nuclear weapons will be almost impossible to enforce. This is only one of several gray areas in the JCPOA that will allow Iran to erode its restrictions. Moreover, the U.S., by permitting Iran to falsely claim that it never had a nuclear program, is allowing Iran to undermine the JCPOA before it even begins. It is doubtful that the JCPOA will delay Iran’s ability to produce the nuclear material for a nuclear weapon by even the eight to fifteen years hoped for by its supporters.

Congress should reject this terribly flawed agreement. The U.S. should continue the sanctions pressure on Iran to slow down the progress of its nuclear program and the U.S. should adopt a more comprehensive nonproliferation policy to restrict all non-nuclear weapon countries’ access to the nuclear material required to produce nuclear weapons.

Three Early Major Concessions to Iran

Three major U.S. concessions in the negotiations for the JPOA doomed any chance that the JCPOA would actually prevent Iran from acquiring nuclear weapons. These concessions were that Iran was not forced to admit that it had tried to acquire nuclear weapons, Iran was granted the “right to enrich” by not being required to give up its centrifuge enrichment program and the JCPOA would place only temporary restrictions on Iran’s nuclear program after which it would be allowed to expand its nuclear program as it saw fit.

It is widely agreed that until late 2003, Iran had a nuclear weapons program. Iran’s violations of its International Atomic Energy Agency (IAEA) safeguards by clandestinely developing centrifuge enrichment were a direct result of this nuclear weapon program. Iran was not forced to admit to this weapons program as a condition for these negotiations. It has been argued that such an admission would embarrass Iran and it was more important to move the negotiations

¹ This paper is the product of the author’s personal research and the analysis and views contained in it are solely his responsibility. Though the author is also a part-time adjunct staff member at the RAND Corporation, this paper is not related to any RAND project and therefore RAND should not be mentioned in relation to this paper.

forward than deal with these past issues. Unfortunately Iran has not shown the same sensitivity as Ayatollah Khamenei continues to call Iranian nuclear weapons a U.S. created “myth.”² Iran has repeatedly made the false claim that not only is its current nuclear program exclusively for peaceful purposes but also, that it always has been.

U.S. policy on whether Iran would have to admit to its past nuclear weapon program before the JCPOA was finalized had been inconsistent. As recently as April 2015, Secretary of State John Kerry referring to the need for Iran to disclose its past military-related nuclear activities said, “They have to do it. It will be done. If there is going to be a deal, it will be done.”³ Yet by June Kerry indicated that the U.S. was granting Iran another concession by not requiring Iran to admit to its past military-related nuclear activities by saying, “...we’re not fixated on Iran accounting for what they did at one point in time or another. We know what they did. We have no doubt. We have absolute knowledge with respect to the certain military activities they were engaged in.”⁴

However, the problem is more than just that Iran has not admitted to having a nuclear weapon program but rather that the U.S. has never explicitly contradicted Iran and said that it did have such a program. Rather the U.S. limits itself to cryptic statements such as “We know what they did.” This U.S. failure is important since it allows Iran to implicitly promote the narrative that any special restrictions on its nuclear program (such as are required by the JCPOA) are unjustified and unfair.

If the U.S. were to make a direct statement regarding Iran’s nuclear weapon program it would raise uncomfortable questions about the terms of the JCPOA. Since the main impediment to the production of nuclear weapons is the need to acquire nuclear material (HEU or plutonium), the centerpieces of Iran’s nuclear weapons program were its centrifuge enrichment program and the construction of a heavy water plutonium production reactor at Arak. Yet the JCPOA allows Iran to retain both of these key elements of its nuclear weapons program.

That Iran would continue to have a centrifuge enrichment program was a concession agreed to in the November 2013 JPOA. The importance of this concession is illustrated by the fact that initially Secretary Kerry denied that Iran had been granted the right to enrich.⁵ Unfortunately this is only one example of the large number of inaccurate statements made by the Obama Administration regarding these negotiations since it is now widely acknowledged that Iran has been granted the right to enrich.

What is worse, by legitimizing Iran’s centrifuge enrichment, the JCPOA agreement deals a serious blow to overall U.S. nuclear nonproliferation policy. If Iran, which has violated its IAEA safeguards by conducting clandestine centrifuge enrichment and defied multiple U.N. Security Council resolutions demanding that it halt centrifuge enrichment, is allowed to retain this capability, on what basis can any country that has abided by its IAEA safeguard obligations be

² Sam Wilkin, “Khamenei says Iran nuclear weapons are U.S. ‘myth,’” *Reuters*, April 19, 2015.

³ “Full Interview: Iran must disclose past nuclear military activities for a final deal, says Kerry,” PBS NEWSHOUR, April 8, 2015.

⁴ Nahal Toosi, John Kerry: Iran doesn’t have to account for past nuclear weapons research,” *Politico*, June 16, 2015.

⁵ Aaron Blake, “Kerry on Iran: ‘We do not recognize a right to enrich,’” *Washington Post*, November 24, 2013.

denied centrifuge enrichment? The proposed agreement with Iran is setting the stage for many countries to acquire centrifuge enrichment, making it very easy for them to produce the HEU for nuclear weapons whenever they desire them. Saudi Arabia appears ready to pursue this path to match Iran's nuclear capabilities.

The third early concession to Iran was a provision in the JPOA stating that any major restrictions on Iran's nuclear program would only be temporary and these restrictions would lapse after a certain time. Henry Sokolski and I had pointed out this problem as early as December 2013⁶ but other analysts and the media tended to ignore this issue. This was in part because it was hoped that the major restrictions might last for 20 or 30 years or more and in part because some analysts were still proposing permanent restriction on Iran's nuclear program, ignoring that the JPOA ruled out such restrictions.

Nor were matters helped by the misleading statements by the Obama Administration. For example in July 2014 Under Secretary of State Wendy Sherman said that the final agreement "when implemented, will ensure that Iran cannot acquire a nuclear weapon and that Iran's nuclear program is exclusively peaceful."⁷ She also indicated that the duration of the agreement would be "double digit" but the implication of her statements was that Iran would not acquire a nuclear weapon for an indefinite period, not that the restrictions would be temporary.

It was only when Israeli Prime Minister Netanyahu raised this issue in his speech before the U.S. Congress in March of 2015 combined with the Lucerne agreement⁸ of April 2, 2015 which gave the specific duration of the restrictions on Iran's nuclear program did this shortcoming of the JCPOA become more widely recognized. In early April 2015, when pressed in an interview, President Obama admitted that the JCPOA will only prevent an Iranian nuclear weapon for thirteen years, "What is a more relevant fear would be that in year 13, 14, 15, they [Iran] have advanced centrifuges that enrich uranium fairly rapidly, and at that point the breakout times would have shrunk almost down to zero."⁹ This revelation surprised many people who had believed the Administration's statements that the purpose of the negotiations was to prevent an Iranian nuclear weapon, not just delay it.

For non-governmental backers of the JCPOA, this major revelation had little effect on their support but the Obama Administration itself sees the matter as being of more significance and has lapsed back into pretending that the JCPOA will prevent an Iranian nuclear weapon not just delay one. For example, in July 2015 President Obama has said, "If 99 percent of the world's community and the majority of nuclear experts look at this thing [the JCPOA] and they say 'this will prevent Iran from getting a nuclear bomb,' and you are arguing that it does not or that even if it does, it's temporary..."¹⁰ If President Obama believes that the fact that the key restrictions in the JCPOA are only temporary is simply a specious argument against it, then clearly he does

⁶ Greg Jones and Henry Sokolski, "Deflating the Hype on Obama's Nuclear Deal," *National Review Online*, December 10, 2013 <http://www.nationalreview.com/article/365894/deflating-hype-obamas-iran-nuclear-deal-greg-jones-henry-sokolski>

⁷ "Written Statement, Wendy Sherman, Under Secretary of State for Political Affairs, U.S. Department of State, Senate Committee on Foreign Relations, "Status of Negotiations with Iran," July 29, 2014."

⁸ The Lucerne agreement outlined the JCPOA.

⁹ "Transcript: President Obama's Full NPR Interview On Iran Nuclear Deal," April 7, 2015.

¹⁰ "Full text: Obama's news conference on the Iran nuclear deal," *The Washington Post*, July 15, 2015.

not understand what the U.S. has agreed to. Nor was this just a slip by the President. In the news conference after the agreement to the JCPOA on July 14, 2015, Secretary Kerry said, “And contrary to the assertions of some, this agreement has no sunset.”

Arak Reactor

As part of its nuclear weapons program, Iran was building a natural uranium fueled, heavy water moderated, plutonium production reactor at Arak. Iran has not been required to give up this reactor but rather the design has been altered in an attempt to “block the plutonium path” to a nuclear weapon. President Obama has said that weapons-grade plutonium is required to produce a nuclear weapon¹¹ and the main text of the JCPOA says “The redesigned and rebuilt Arak reactor will not produce weapons grade plutonium.” Therefore it would seem that the agreement has been successful in this respect and the President has said as much. Unfortunately this is not true.

The reactor has been redesigned to use approximately 3.5% enriched uranium instead of natural uranium and the reactor power level has been reduced from 40 MW to 20 MW. A reactor of this design will certainly generate weapons-grade plutonium as part of its operation. Apparently the fuel is supposed to remain in the reactor long enough so as to convert the plutonium the reactor produces to fuel-grade¹² but the JCPOA is not explicit on this point. Indeed there is no way to guarantee how long the fuel remains in the reactor since safety concerns (real or fabricated) could force the fuel to be discharged at any time. Even if it operates as intended the reactor will discharge about 1.1 kilograms of plutonium every eight month cycle. In contrast to the JCPOA’s main text, the JCPOA’s Annex I (Nuclear-related measures) has clarified that the redesign will, “be such as to minimize the production of plutonium and not to produce weapon-grade plutonium *in normal operation*. [Emphasis added.]

Further, the U.S. revealed almost 40 years ago that even reactor-grade plutonium, let alone fuel-grade plutonium can be used to produce nuclear weapons and that the U.S. conducted a successful nuclear test with reactor-grade plutonium in 1962. President Obama’s statement that weapons-grade plutonium is required to produce a nuclear weapon is incorrect and it is unclear why Secretary of Energy Moniz has allowed the President to make such an obviously erroneous statement.¹³ The President’s statement undermines broader U.S. nonproliferation policy to restrict plutonium stockpiles in non-nuclear weapon countries since there are still some in the nuclear industry who continue to deny the weapons usability of reactor-grade plutonium.

The JCPOA states that the spent fuel containing this plutonium must be exported from Iran but this cannot take place immediately due to the need to allow some of the fuel’s radioactivity to

¹¹ “Because of this deal, Iran will not produce the highly enriched uranium and weapons-grade plutonium that form the raw materials *necessary* for a nuclear bomb.”[Emphasis added] “Read President Obama’s Remarks on Iran Nuclear Deal,” *Time*, July 14, 2015.

¹² The U.S. defines weapons-grade plutonium as containing less than 7% Pu-240. Fuel-grade contains 7% to less than 19% Pu-240 and Reactor-Grade 19% or more Pu-240. *Plutonium: The First 50 Years*, DOE/DP-0137, U.S. Department of Energy, February 1996, p.17.

¹³ The president has continued to repeat this incorrect statement. He said that the core of the Arak reactor will be “replaced with “one that will not produce plutonium for a weapon.” “Full text: Obama gives a speech about the Iran nuclear deal,” *The Washington Post*, August 5, 2015.

decay before the fuel is moved. The JCPOA has indicated that it could be a year or more before the spent fuel is exported, by which time Iran could have already have discharged additional loads of spent fuel from the reactor. This means that Iran could easily have access to over two kilograms of plutonium or more.

To recover the plutonium, Iran would need to build a reprocessing plant and the JCPOA prohibits such facilities for fifteen years. However, since the basic technology to extract the plutonium from the spent fuel is already used at Iranian uranium ore processing plants, it would not be difficult for Iran to construct a clandestine reprocessing plant on an Iranian military base where it will be difficult for the IAEA to find. Though the JPOA prohibited Iran from reprocessing, the JCPOA had granted Iran the right to reprocess spent reactor fuel after 15 years.

Two kilograms of plutonium is sufficient to produce a nuclear weapon. In 2008 North Korea revealed that its first nuclear test utilized only two kilograms of plutonium. In 2012 it was revealed that in 1953 the Soviet Union tested a weapon using only two kilograms of plutonium that produce a yield of 5.8 kilotons and in the same year it tested a weapon with only 0.8 kilograms of plutonium that produced a yield of 1.6 kilotons.¹⁴

Further, plutonium can be used with HEU in a nuclear weapon. By using about two kilograms of plutonium it is possible to reduce the HEU required to produce a critical mass by around 50%.¹⁵ This fact has implications for HEU breakout times.

One might argue that at least the redesigned reactor will produce significantly less plutonium since the original design would have produced about nine to ten kilograms of plutonium per year whereas the reactor specified in the JCPOA will only produce one to two kilograms of plutonium per year. However, sanctions on Iran had significantly slowed the construction of the original Arak reactor and it was not clear when the reactor would have started operation. The JCPOA will significantly speed up the completion of the Arak reactor. The JCPOA specifies that there is to be a Working Group comprised of E3/EU+3 participants to “facilitate the redesigning and rebuilding of the reactor.” Further if Iran requests it, the IAEA is to provide, “technical and financial assistance, supply of required materials and equipment...” Therefore the JCPOA will accelerate the completion of the Arak reactor while saving Iran money. Under the JCPOA, Iran will have access to plutonium faster than without the JCPOA.

Enrichment Path to a Nuclear Weapon

The JCPOA has allowed Iran to keep its centrifuge enrichment program even though it was a centerpiece of Iran’s nuclear weapons program. The JCPOA places various restrictions on Iran’s centrifuge enrichment program, though these restrictions begin to relax after only eight years and after 15 years Iran will be able to have an unrestricted centrifuge enrichment program. Thus after 15 years, Iran will be able to produce the HEU for a nuclear weapon in a week or less.

¹⁴ Pavel Podvig, “Amounts of fissile materials in early Soviet nuclear devices,” International Panel on Fissile Materials Blog, October, 1, 2012.

¹⁵ H.C. Paxton, “Los Alamos Critical Mass Data,” Los Alamos Scientific Laboratory Report, LA-3067-MS, December 1975, p.51.

Under the JCPOA the objective is to keep the time required to produce sufficient HEU for a nuclear weapon to at least one year. Originally it was expected that Iran would be limited to one or two thousand IR-1 (Iran's least effective) centrifuges. But the JCPOA allows Iran to continue to operate 5,060 centrifuges and to have an additional 1,044 centrifuges in operational condition though not operating.

However, the JCPOA does not define what an IR-1 centrifuge is or more precisely what the centrifuge's performance is (in technical terms the annual SWU output per centrifuge). This is an important omission since Iran has improved the IR-1's performance over time. The current centrifuges operating at Iran's main centrifuge site at Natanz have an enrichment output about 50% higher than when they first began large scale operation in 2008 and 2009. The centrifuges operating at the underground site at Fordow have at times, achieved performance almost one third higher than the centrifuges currently operating at Natanz (double the performance of the original Natanz centrifuges). Nothing in the JCPOA prevents Iran from improving the centrifuges at Natanz so as to achieve or exceed the performance of the Fordow centrifuges.

Given that Iran is allowed to keep operating such a large number of centrifuges and that their performance may be improved, the JCPOA sets a very low limit on the amount of LEU (no more than 3.67% enriched) that Iran is allowed to stockpile. Iran will be allowed no more than 203 kilograms of LEU (the LEU content in 300 kilograms of uranium hexafluoride). This limit is important since without it Iran could produce enough HEU for a nuclear weapon in four months or less.

However, this limit will be almost impossible to maintain and Iran will likely have significantly more LEU than 203 kilograms. With the number of centrifuges Iran is allowed to operate at Natanz, it will produce about 81 kilograms of LEU per month even if the centrifuges are not improved. If the centrifuges are improved to the level of the Fordow centrifuges, then Iran will produce 116 kilograms of LEU per month. This means that Iran will reach the JCOPA's limit in no more than two and one half months and perhaps in one and three quarters months or even less if the centrifuges are further improved. This means at best Iran will have to export small batches of LEU almost continuously. It is not hard to imagine some disruption to the export process that would allow Iran's stockpile to go above 203 kilograms even if only "temporarily."

Further, after the Arak's reactor's first core, all of the fuel for this reactor will be manufactured by Iran in Iran. Since this reactor will hold about 309 kilograms of LEU, Iran will likely go over the 203 kilograms limit in the fuel manufacturing process. Indeed the JCPOA calls for the creation of a "Technical Working Group" that if this Working Group determines that fresh fuel assemblies for the Arak reactor as well as the intermediate products used in their manufacture "cannot be readily reconverted into UF₆" then this material "will not count against the 300 kg UF₆ stockpile limit." The JCPOA does not define what how much time must be required for a process to meet this "cannot be readily reconverted" standard.

An even more serious problem is the large stock of LEU that Iran has produced since the JPOA took effect on January 20, 2014. Under the terms of the JPOA Iran was allowed to continue to produce LEU but was required to convert the chemical form of the LEU from uranium hexafluoride to uranium dioxide. As of July 1, 2015 Iran had produced 2,902 kilograms of LEU

(in the form of 4,293 kilograms of uranium hexafluoride) since the JPOA took effect. Iran has failed to perform the required conversion, as only 260 kilograms of uranium had been converted into uranium dioxide. Though Iran has apparently claimed technical problems this failure may well be deliberate since during the same time interval Iran managed to use the conversion facility to process 1,829 kilograms of natural uranium into uranium dioxide.

Iran has fed 2,910 kilograms of LEU into the conversion process, meaning that most of this material (2,650 kilograms) is in intermediate compounds though it is possible that some is still in the form of hexafluoride. The majority of the uranium is likely an uranyl fluoride/hydrogen fluoride solution. Such a solution would be difficult to transport out of Iran due to the dangers of the hydrogen fluoride acid. Yet given Iran's slow production rate of uranium dioxide, it is going to take Iran a long time to process all of the uranyl fluoride/hydrogen fluoride solution. Further Iran is currently continuing to produce LEU at the rate of about 170 kilograms per month. Therefore, Iran is likely to retain a stockpile far larger than the 203 kilogram limit giving Iran the ability to produce the HEU for a nuclear weapon in a time far shorter than one year.

Will the Restrictions of the JCPOA Be Enforced?

Discussions of the enforcement of the JCPOA tend to focus on the detection of Iranian violations and assume that swift action will be taken to remedy any violation. However, one must doubt whether this will actually be the case. Iran has a long history of violating its IAEA safeguards. A key Iranian violation was its clandestine centrifuge enrichment prior to the latter part of 2003 that led to concerns about Iranian nuclear weapons.

Iran's violations of its IAEA safeguards have continued well past 2003. In 2003, Iran agreed to abide by a safeguards provision termed the "modified code 3.1," which essentially says that a country must inform the IAEA before it begins construction of any new nuclear facility. In 2007 Iran informed the IAEA that it would no longer abide by this provision. The IAEA told Iran that it could not unilaterally change its IAEA safeguards but Iran ignored the IAEA's protests. In 2009 Iran, fearing that it had been discovered by Western Intelligence, was forced to reveal that it was constructing a secret centrifuge enrichment facility at Fordow in violation of the terms of the modified code 3.1. The construction of this facility began in 2006 when by even Iran's own account it was bound by the modified code 3.1. Yet in the JCPOA, Iran has been allowed to retain a significant number of centrifuges at this facility, thereby preserving the benefits from this violation of IAEA safeguards.

Nor has Iran fulfilled all of the terms of the JPOA.¹⁶ As was discussed above Iran has converted less than ten percent of the LEU that it has produced during the term of the JPOA to the required uranium dioxide and this failure may well be deliberate. The Obama Administration chose to ignore this violation and repeatedly falsely stated that Iran was abiding by all of the terms of the JPOA. When this problem became more widely acknowledged in June 2015, the Administration reinterpreted the JPOA to say that any chemical conversion was permissible. This issue has set a

¹⁶ Gregory S. Jones, "In Iran, Distrust and Verify: Has the Iranian nuclear program violated the Joint Plan of Action?," *National Review Online*, March 2, 2015 <http://www.nationalreview.com/article/414640/iran-distrust-and-verify-gregory-s-jones>

bad precedent for the enforcement of the JCPOA and certainly raises doubts that swift action will be taken to deal with Iranian violations of the JCPOA.

Similar concerns have been raised by former Secretaries of State Kissinger and Shultz.¹⁷

Any report of a violation is likely to prompt debate over its significance—or even calls for new talks with Tehran to explore the issue. The experience of Iran’s work on a heavy-water reactor during the “interim agreement” period—when suspect activity was identified but played down in the interest of a positive negotiating atmosphere—is not encouraging.

Compounding the difficulty is the unlikelihood that breakout will be a clear-cut event. More likely it will occur, if it does, via the gradual accumulation of ambiguous evasions.

It may be easy for Iran to erode the JCPOA’s restrictions and achieve breakout times of less than four months even earlier than the 13 years hoped for by President Obama. The failure to force Iran to admit that it had a nuclear weapon program has allowed Iran to implicitly promote the narrative that any special restrictions on its nuclear program are unjustified and unfair. Thus Iran is undermining the JCPOA before it even begins.

The discussion above has illustrated areas where this “gradual accumulation of ambiguous evasions” may occur. Iran may fail to export spent fuel from the Arak reactor in a timely manner (perhaps citing safety concerns) and accumulate a significant source of plutonium. Iran may upgrade its IR-1 centrifuges which would allow for the more rapid production of HEU.

Even at the start of the JCPOA Iran may well possess a stockpile of LEU far larger than the permitted 203 kilograms, since it will be hard for Iran to dispose of its current large stockpile of LEU contained in a variety of chemical forms. Even if Iran can eventually export all of its current LEU stockpile, it will be difficult for Iran to remain under the LEU limit. Iran will continue producing LEU at the rate of about 100 kilograms per month, requiring Iran to export LEU approximately every two months. Given the inefficiencies of exporting small quantities of uranium hexafluoride, it is easy to imagine that Iran may fall behind in the required exports. In addition, Iran will be manufacturing the fuel for the Arak reactor. Since the core loading requires 309 kilograms of LEU and since the manufacturing process is likely to produce substantial amounts of scrap and waste, Iran could have several times the specified LEU limit tied up in just the Arak fuel manufacturing process. Iranian violations of the 203 kilogram limit may become almost routine, allowing Iran to slowly move towards the capability to quickly produce HEU for nuclear weapons.

IAEA Safeguards Cannot Prevent Iranian Nuclear Weapons

Attempting to respond to concerns over the finite term of the JCPOA the Obama Administration has pointed out that even after the agreement’s main restrictions lapse, Iran will be bound by the

¹⁷ Henry Kissinger and George P. Shultz, “The Iran Deal and Its Consequences,” *The Wall Street Journal*, April 8, 2015.

its obligations under IAEA safeguards and the JCPOA's restrictions on nuclear weapon development. However, if IAEA safeguards were sufficient, there would be no need to negotiate any additional agreement with Iran. As a signatory to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), Iran has already pledged to not develop nuclear weapons. It was Iran's violations of its IAEA safeguards that were one of the first indications that it had breached its NPT obligations by having a nuclear weapons program. Even if the IAEA safeguards were enhanced to permit continuous monitoring of nuclear material in Iran, they could still provide little warning of an Iranian effort to produce nuclear weapons.

It is not widely understood that IAEA safeguards permit non-nuclear weapon states to produce and stockpile HEU and plutonium. For example, countries such as Germany still use HEU fuel in research reactors. Another example is Japan which already has a stockpile of nearly 11 metric tons of plutonium under IAEA safeguards. Iran would need to provide some nominally peaceful excuse for the stockpiling of these nuclear materials but the explanation would not have to be very plausible. Japan has said that its plutonium stockpile is for use in breeder reactors but it is now 45 years since these reactors were expected to have started operation and no Japanese breeder reactor is expected before 2050.

Iran's centrifuge enrichment program brings this problem into sharp focus and raises broader concerns about the adequacy of IAEA safeguards regarding various fuel cycle facilities and stocks of HEU and separated plutonium. According to the IAEA "...the objective of safeguards is the timely detection of diversion of significant quantities of *nuclear material* from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown and deterrence of such diversion by the risk of early detection."¹⁸ [Emphasis in original] Presumably, "timely detection" allows sufficient time not only for a diversion to be detected but also for action to be taken to prevent safeguarded nuclear material or facilities from being used to produce the nuclear material (HEU or plutonium) that could be used for nuclear weapons. To allow sufficient time for counteraction, the detection time should be at least many months.

The IAEA has never been willing to admit that there are nuclear materials and facilities that are inherently unsafeguardable in the sense that timely detection of diversion is impossible. To take an extreme case, imagine that a country has produced large spheres of HEU or plutonium metal. The country might claim these spheres are for peaceful criticality experiments but they could also be used as the cores for nuclear weapons. These spheres could be inserted into the non-nuclear components of a nuclear weapon and used in combat in a matter of hours. Obviously any detection of the diversion of these spheres could hardly be timely. Some boundary lines are necessary between nuclear materials and facilities that can be effectively safeguarded and those that cannot.¹⁹

¹⁸ *The Structure and Content of Agreements Between The Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons*, INFCIRC/153, International Atomic Energy Agency, June 1972, p.9.

¹⁹ Thirty five years ago I analyzed where the boundary lines should be. For safeguards to be able to provide timely detection of diversion, non-nuclear weapons countries must be prohibited from possessing any materials or facilities that can quickly provide nuclear material for nuclear weapons. This includes prohibiting not only enrichment and reprocessing facilities but also separated HEU, plutonium or U-233; and HEU, plutonium or U-233 that is contained in unirradiated reactor fuel (such as HEU fuel for research reactors or mixed oxide fuel for power reactors).

As a result one should not expect much warning of Iran's production of HEU. After the restrictions imposed by the JCPOA on enrichment have expired or unraveled, Iran could create a large stockpile of 20% enriched uranium. In 2010 Iran gave the IAEA only one day notice that it was going to start producing 20% enriched uranium. Iran produced 20% enriched uranium between 2010 and 2014, and so established that it is not a violation of IAEA safeguards to do so. Similarly Iran could provide the IAEA with only one day notice of its intention to start producing HEU. With a centrifuge enrichment facility sized to supply fuel for just one large nuclear power plant, Iran could produce enough HEU for five nuclear weapons in just over one week. Based on U.S. experience during World War II, the HEU could be converted to metal form and mated with the non-nuclear weapon components in just nine days. Therefore Iran could have a nuclear arsenal in less than three weeks. Only the last nine days of this interval might involve a violation of IAEA safeguards. It is quite unlikely the U.S. could take any action during this short time period that would prevent Iran from acquiring nuclear weapons.

Is the Choice Between the JCPOA and War?

In a recent speech, President Obama said, "Congressional rejection of this deal leaves any U.S. administration that is absolutely committed to preventing Iran from getting a nuclear weapon with one option, another war in the Middle East."²⁰ Again President Obama has lapsed into pretending that the JCPOA will prevent Iran from obtaining nuclear weapons instead of what its terms actually provide which is only a temporary delay before Iran can acquire nuclear weapons. The reality is that *even if* Congress accepts the JCPOA, a U.S. administration that is absolutely committed to preventing Iran from getting a nuclear weapon has only one option, another war in the Middle East. In fact President Obama said words to this effect in April 2015.²¹ One thing that is clear is that President Obama does not want another Middle Eastern war. Neither do I.

In the past Israel effectively carried out one time strikes on nuclear reactors in Iraq in 1981 and in Syria in 2007²². But attacks on centrifuge enrichment facilities, even if carried out by the U.S. are quite different from attacking single nuclear reactors and it would be difficult for such attacks to be effective in the long-term. At its main enrichment facility at Natanz, Iran has 54 cascades operating in parallel. An air strike on Natanz that scored multiple bomb hits would shut down the entire facility. But the majority of the cascades would be undamaged and not able to operate only due to damage to piping and the loss of utilities. It would only take a few months of repairs before these undamaged cascades were back in operation. Even for the cascades that suffered bomb hits, the majority of the centrifuges would still be undamaged. Iran could pull out the undamaged centrifuges and use them to build new cascades. It would only take four to six months before Iran would return to close to full production.

A further problem is Iran's current stockpile of nearly 8,000 kilograms of 3.5% enriched uranium in a variety of chemical forms at a number of different facilities. This stockpile represents years

See: Albert Wohlstetter, Thomas A. Brown, Gregory Jones, David C. McGarvey, Henry Rowen, Vince Taylor and Roberta Wohlstetter, *Swords from Plowshares*, The University of Chicago Press, 1979.

²⁰ "Full text: Obama gives a speech about the Iran nuclear deal," *The Washington Post*, August 5, 2015.

²¹ "Transcript: President Obama's Full NPR Interview On Iran Nuclear Deal," April 7, 2015.

²² The Syrian reactor site has since fallen into the hands of ISIS which underscores the importance of the destruction of this reactor. This episode provides another illustration of the dangers of nuclear proliferation.

of centrifuge plant operation but would be very difficult to destroy by air attack. The total volume of this dispersed stockpile is fairly small and it would be easy to hide or protect.

It is small wonder that in the past U.S. officials talked of bombing campaigns rather than single strikes.²³ By bombing Iran's facilities every few months, it would be possible to keep Iran's enrichment facilities shut down. Such a campaign would also have the advantage that the question of whether U.S. large bunker-buster bombs can actually penetrate and hit Iran's underground enrichment facility near Qom would largely be moot. No matter how deep and well protected a bunker is, it is always possible to collapse the entrance tunnels and cut off the utilities from the outside.

There are two problems with such an air bombing campaign. First, Iran could respond by dispersing its centrifuges. Indeed centrifuge enrichment with its many parallel cascades would be ideal for such dispersal. The U.S. would be able to find and bomb some of these dispersed enrichment sites but many would continue in operation undetected. Second, such a prolonged bombing campaign would run a serious risk of turning into a large-scale war with Iran. Though no doubt the U.S. would eventually win such a war, I think that given the war-weary condition of the U.S., such a war would be ill-advised and I am opposed to a major war with Iran.

Will Rejection of the JCPOA End Sanctions on Iran?

The Obama Administration has argued that if Congress rejects the JCPOA then sanctions against Iran will unravel. It said that it was very difficult to win the voluntary cooperation of countries such as China, and India to enforce sanctions on Iran and if there is no JCPOA this cooperation will end. This is a peculiar argument to be making since the Administration has simultaneously argued that even after sanctions are lifted under the terms of the JCPOA, it will be easy to reimpose (snap back) the sanctions if Iran is found to be cheating. It is hard to see how both of these things can be true.

In fact there have been no UN sanctions imposed on Iran since 2010 due to opposition from Russia and China. Sanctions on Iran since that time have all been the result of U.S. and EU action.

India being cited as a strong supporter of sanctions against Iran is yet another example of the inaccurate statements being used to try to win approval of the JCPOA. India has been clear from 2011 that though it would abide by UN sanctions it would not support U.S./EU sanctions which it termed "unilateral." India changed its tax code to facilitate rupee purchases of Iranian oil. With the prospect of the end of sanctions with the Lucerne agreement in April 2015, Iran dealt India an economic blow by saying that it would be renegotiating contracts signed with India while the sanctions were in force.²⁴

²³ Joby Warrick, "Iran's underground nuclear sites not immune to U.S. bunker-busters, experts say," *The Washington Post*, February 29, 2012.

²⁴ In the words of the Indian press: "The push back from the Iranians came as a surprise to India, which has enjoyed special dispensation from Tehran as one of only a handful of countries willing to do business with it while it faced Western economic sanctions." *The Hindu*, May 20, 2015. In particular, this story related to an Iranian order for Indian manufactured railroad rails signed in October 2014.

Whatever cooperation in sanctioning Iran has been provided by China, India and other countries has been the result of the dominant economic and banking positions of the U.S. and EU. If the U.S. continues to exert its economic pressure on Iran then other countries will be forced to comply.

If Congress Rejects the JCPOA, then What?

If Congress rejects the JCPOA, what policies and actions should the U.S. take to try to stop an Iranian nuclear weapon? First it must be recognized that the spread of nuclear weapons is not an Iran-specific problem. The U.S. needs to implement policies that limit the spread of nuclear weapons to all non-nuclear weapons states, not just Iran. Since the 1960s it has been recognized that the best way to achieve this goal would be to restrict access to the nuclear material needed to produce nuclear weapons, which are principally HEU and plutonium. This in turn means restricting access to the key technologies used to produce these materials, namely uranium enrichment and reprocessing. In the past, the U.S. has intermittently and inconsistently pursued this goal as part of its overall nonproliferation effort.

The U.S. needs to adopt a clear and consistent policy opposing the acquisition and expansion of uranium enrichment and reprocessing in non-nuclear weapon countries. A key part of this policy would be to have the IAEA clarify what activities and nuclear materials it can effectively safeguard and which it cannot. In particular the IAEA should specify that centrifuge uranium enrichment and the separated plutonium that is the product of reprocessing plants are inherently unsafeguardable.

Such a policy would have implications outside of Iran. For example, Japan already has 11 metric tons of separated plutonium on its soil.²⁵ This quantity of plutonium could be used to produce thousands of nuclear weapons and Japan has no peaceful means of utilizing this large quantity of plutonium. Yet Japan plans to open a large reprocessing plant at Rokkasho which would separate an additional eight metric tons of plutonium each year. The U.S. needs to make clear its opposition to this reprocessing plant and to discuss with Japan options for the disposal of its large plutonium stockpile.

Iran would be a top priority in the implementation of a U.S. policy to restrict uranium enrichment and the production of separated plutonium. An important first step would be for the U.S. to explicitly affirm that Iran's centrifuge enrichment development, which involved violations of IAEA safeguards, was part of a nuclear weapons program. This would counter Iran's false narrative that it has never tried to develop nuclear weapons and the implication that Iran is being treated unfairly by the attempts to restrict its nuclear program. Similarly it would be important to stop referring to the Arak reactor as a research reactor but rather as a plutonium production reactor which is what it has always been intended to be.

The U.S. should also correct the inaccurate statements made by President Obama which falsely imply that only weapons-grade plutonium can be used to produce nuclear weapons. The U.S. should reaffirm what it first revealed nearly 40 years ago that all grades of plutonium, including

²⁵ Japan also owns an additional 36 metric tons of plutonium which is temporarily stored in the UK and France.

reactor-grade, can be used to produce nuclear weapons and such material must be restricted in non-nuclear weapon states.

The U.S. should adopt the policy that all elements of Iran's program to produce nuclear material for nuclear weapons should be shut down and eliminated. This would include not only Iran's centrifuge enrichment program but also require the elimination of the stocks of enriched uranium that this program has produced. Iran's Arak plutonium production reactor should never be completed but rather dismantled and the components destroyed. The facility that produced the heavy water for the Arak reactor should be shut down and dismantled. Iran's stocks of heavy water should be exported or otherwise disposed of.

It is commonly agreed that such an outcome would have been preferred but the Administration and others have argued that Iran would not agree to such terms. The fact is we do not know whether Iran would agree or not. As was discussed at the beginning of this paper, the three major U.S. concessions at the start of the negotiations with Iran precluded obtaining this preferred outcome. If Congress rejects the JCPOA the U.S. will have the opportunity to put Iran to the test. In the face of continued major sanctions and the threat of military action, Iran may yet agree and the U.S. will obtain its preferred outcome.

Iran might well not agree to these terms but then at least one thing will be clear. If Iran is willing to suffer tens of billions of dollars in economic losses, as well as face the threat of war with the West, Iran is not interested in just supporting an uneconomical peaceful nuclear program but rather is pushing ahead towards its acquisition of nuclear weapons.

Though the Administration continues to argue that the JCPOA will prevent Iranian nuclear weapons, all of the non-governmental supporters of this agreement concede that it only intended to delay an Iranian nuclear weapon. The JCPOA allows Iran to begin to ramp up its centrifuge enrichment program in just eight years and in 15 years its centrifuge enrichment program will be sized to permit Iran to obtain the HEU for a nuclear weapon in one week or less.

Yet for these supporters of the JCPOA, this delay of the Iranian enrichment program is the reason that they support it. Whether the JCPOA will actually provide such a delay depends on two doubtful assumptions. First, they implicitly assume that in the absence of the JCPOA Iran will obtain nuclear weapons tomorrow. However, this is not the case. Though Iran was certainly making steady progress towards nuclear weapons before the negotiations began Iran was still many years away from obtaining nuclear weapons. Therefore even if the JCPOA were to remain in force for the full 15 years, the delay to the Iranian nuclear weapons program compared to the case where there is no JCPOA will be significantly less.

Second, it has to be considered doubtful that the restrictions on Iran's nuclear program will last the full 15 years. Iran's continued denial that it ever had a nuclear weapons program, combined with the U.S.'s failure to contradict Iran's false statements, undermines the JCPOA before it even goes into force. Iran's implied narrative allows it to argue that any special restrictions on its "peaceful" nuclear program are unjustified and unfair. Though there has been much discussion about whether Iran could cheat on the agreement without being caught, the real question is whether the U.S. will do anything if Iran undertakes to slowly undermine the JCPOA

[such as by upgrading IR-1s, keeping a larger than permitted stockpile of LEU, and failing to export Arak spent fuel in a timely manner]. Iran failed to fulfill all of its obligations under the JPOA, but the Administration issued inaccurate statements to the contrary. When it was called to account for these statements, the Administration reinterpreted the JPOA so as to define away Iran's failure.

Further, the JCPOA will actually accelerate the completion of the plutonium production reactor at Arak. Sanctions against Iran have greatly slowed the construction of this reactor but under the JCPOA Iran will receive outside assistance to complete this reactor. Though the JCPOA will reduce the amount of plutonium that this reactor produces, its production rate will still be significant. It would not be difficult for Iran to accumulate sufficient plutonium for a nuclear weapon.

It has been argued that sanctions will not be enough to stop Iran from pushing ahead and acquiring nuclear weapons. This may well be the case. The trouble is that the JCPOA will not stop Iranian nuclear weapons either and since the JCPOA is likely to produce little or no delay compared to the case of no JCPOA, there is little to choose from between these two options on the issue of the Iranian acquisition of nuclear weapons. However, the JCPOA is far inferior compared to the no JCPOA case is on the issue of the costs to Iran of acquiring nuclear weapons and the impact on broader U.S. nonproliferation policy.

Continued sanctions on Iran will cost it roughly \$50 billion, whereas with sanctions removed by the JCPOA Iran's costs of acquiring nuclear weapons will be vastly reduced. If nothing else, these large costs imposed on Iran by sanctions would discourage other nations from proceeding in Iran's footsteps.

The JCPOA, by legitimizing Iran's centrifuge enrichment program, heavy water production program and its Arak reactor seriously undermines broader U.S. nonproliferation policies. If Iran is permitted to acquire centrifuge enrichment, how is any other country in good standing with the IAEA to be denied it? If Congress rejects the JCPOA, the U.S. can adopt clear policies to oppose centrifuge enrichment and separated plutonium, and the U.S. will be in a much better position to oppose efforts by countries such as Saudi Arabia to emulate Iran. Further, such a policy would help continue the pressure on Iran since it could no longer claim that it was being unfairly singled out.

The bottom line is that with or without the JCPOA, Iran is may well acquire nuclear weapons in the next 10 to 15 years. The JCPOA significantly eases Iran's path to a nuclear weapon by removing the sanctions that have considerably increased the costs of Iran's nuclear weapon program. The JCPOA, by legitimizing centrifuge enrichment, heavy water production and the Arak reactor, greatly undermines U.S. nonproliferation policy and makes it likely that there will be additional Irans in the not-too-distant future. For these reasons, Congress should reject the JCPOA.