An Arms Control Association Briefing Book

Solving the Iranian Nuclear Puzzle

The Joint Comprehensive Plan of Action

4th Edition, August 2015

Kelsey Davenport, Daryl G. Kimball, and Greg Thielmann

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Arms Control Association (ACA) Research Staff Authors

Kelsey Davenport is the Director for Nonproliferation Policy at the Arms Control Association (ACA). She first joined ACA in 2011 as the Herbert Scoville Jr. Peace Fellow. Prior to joining ACA, she worked for a think tank in Jerusalem researching regional security issues and Track II diplomatic negotiations and holds a master of arts degree in international peace studies from the Kroc Institute for International Peace Studies at the University of Notre Dame.

Daryl G. Kimball has been Executive Director of ACA since 2001. Previously, he was Executive Director of the Coalition to Reduce Nuclear Dangers, a consortium of 17 of the largest U.S. nongovernmental organizations working on nonproliferation and disarmament, and was Director of Security Programs for Physicians for Social Responsibility. He was a Herbert Scoville Jr. Peace Fellow in 1989-1990.

Greg Thielmann joined ACA as Senior Fellow in 2009. He served more than three decades in the executive and legislative branches of government, specializing in political-military and intelligence issues, including as a senior professional staffer of the Senate Select Committee on Intelligence and Director of the Strategic, Proliferation and Military Affairs Office in the Department of State's Bureau of Intelligence and Research.

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Responsibility for the report's contents rests exclusively with the authors and our recommendations do not necessarily represent those of the ACA Board of Directors and members.

Cover Photo

(L-R) China's Foreign Minister Wang Yi, French Foreign Minister Laurent Fabius, German Minister for Foreign Affairs Frank-Walter Steinmeier, High Representative of the European Union for Foreign Affairs and Security Policy Federica Mogherini, Iranian Foreign Minister Mohammad Javad Zarif, British Foreign Secretary Philip Hammond and U.S. Secretary of State John Kerry pose for a picture during the final press conference of Iran nuclear talks in Vienna, Austria on July 14, 2015. Credit: JOE KLAMAR/AFP/Getty Images

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Preface

For over a decade, the sensitive nuclear fuel-cycle activities of the Islamic Republic of Iran have been at the center of international concerns about the further spread of nuclear weapons.

After years of on-and-off international diplomatic efforts, on July 14, negotiators from the P5+1 (China, France, Germany, Russia, the United Kingdom, and the United States) and Iran secured a comprehensive nuclear agreement—the Joint Comprehensive Plan of Action (JCPOA)—designed to verifiably block Iran's pathways to nuclear weapons development and guard against a clandestine weapons program in exchange for sanctions relief.

This agreement follows over 20 months of diplomatic efforts and intense negotiations involving seven nations, including longtime adversaries.

The Arms Control Association has intensively followed Iran's program and the diplomatic efforts to prevent a nuclear-armed Iran. In consultation with fellow experts and government officials on both sides of the negotiating table, our research staff has worked to identify practical, technical, and policy solutions for the negotiators in order to help them conclude a sound, sustainable, verifiable, win-win agreement.

Our conclusion is that the JCPOA, combined with the associated UN Security Council resolution and an IAEA-Iran "roadmap," is a strong and effective formula that can verifiably block Iran's potential uranium and plutonium pathways to nuclear weapons and guard against a secret weapons program for more than a generation.

An increasing number of nonproliferation and security experts also share the view that the agreement is a net-plus for nuclear nonproliferation and for U.S., international, and regional security.

Congress has until September 17, 2015 to review this complex agreement and decide whether it should approve or disapprove the deal. We believe that each and every member needs to take a serious look at this agreement, get the answers to their questions, and consider the benefits and the unpleasant alternatives.

Implementation of the JCPOA in the coming years will also be vital to the success of the agreement—and this requires a solid understanding of the agreement and how it is designed to work.

Good policy depends on good information. We have written and published this revised edition of our "Solving the Iranian Nuclear Puzzle" briefing book to help improve public and policymaker understanding of this complex agreement with far-reaching consequences for the nuclear nonproliferation regime and for international peace and security.

—Daryl G. Kimball, Executive Director,
Arms Control Association, August 2015

EXECUTIVE SUMMARY

A Net-Plus for Nonproliferation

After over a decade of negotiations, Iran, the United States and its P5+1 partners (China, France, Germany, Russia, and the United Kingdom) reached a historic nuclear deal on July 14. The agreement—the Joint Comprehensive Plan of Action (JCPOA)—was the result of over 20 months of negotiations and, if implemented, will block Iran's pathways to nuclear weapons for at least 15 years and put in place additional transparency measures permanently.

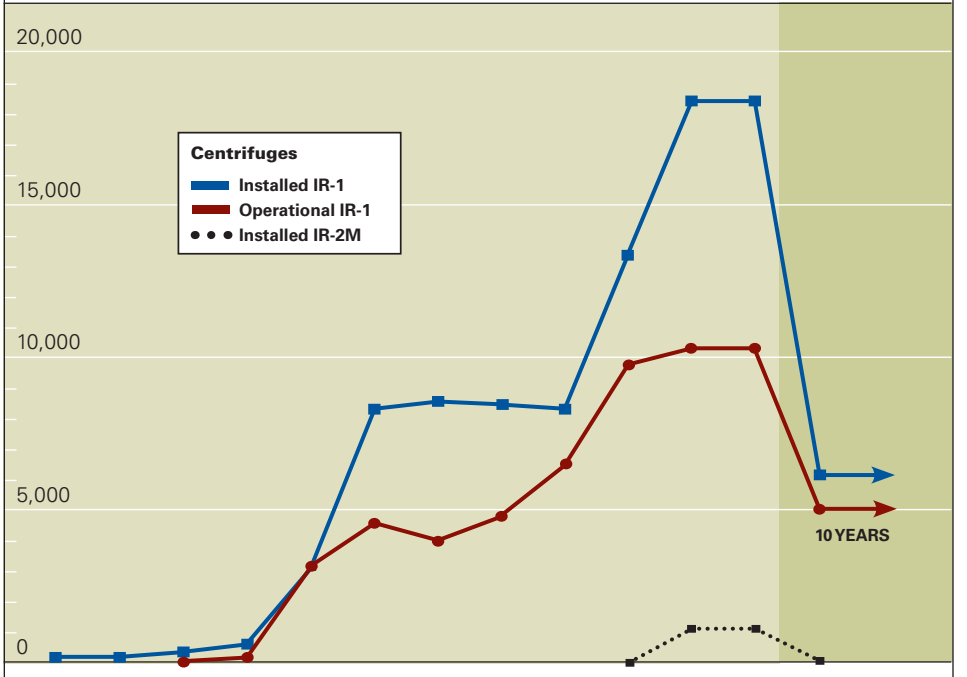
In exchange for nuclear restrictions and intrusive monitoring, the deal will provide Iran with relief from nuclear-related sanctions and allow it to pursue a limited civilian nuclear power program.

In total, the JCPOA will block Iran's potential pathways to nuclear weapons using highly-enriched uranium and plutonium and guard against a covert nuclear weapons program.

The restrictions on Iran's uranium-enrichment program will ensure that Tehran cannot produce enough weapons-grade uranium for a bomb in less than 12 months for over a decade. In addition to monitoring Iran's entire uranium supply chain, the key restrictions include

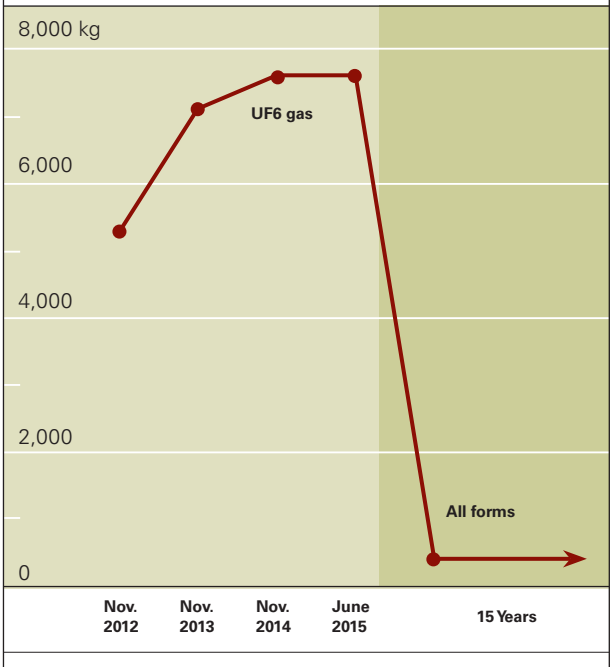
- cutting Iran's enrichment capacity in half and reducing for 10 years the number of installed centrifuges from over 20,000 to 6,100 first-generation IR-1 machines, of which 5,060 will be operational;
- barring enrichment of uranium above normal reactor fuel-grade (up to 3.67 percent), eliminating 97 percent of Iran's stockpile of low-enriched uranium (LEU) and capping it at 300 kg for 15 years;
- limiting the testing of advanced centrifuge machines for 10 years;

The Impact of a Comprehensive Nuclear Deal on Iran's Deployment of Centrifuges



Source: International Atomic Energy Agency (IAEA); Joint Comprehensive Plan of Action (JCPOA)

Capping Iran's LEU Stockpile



Source: JCPOA, IAEA

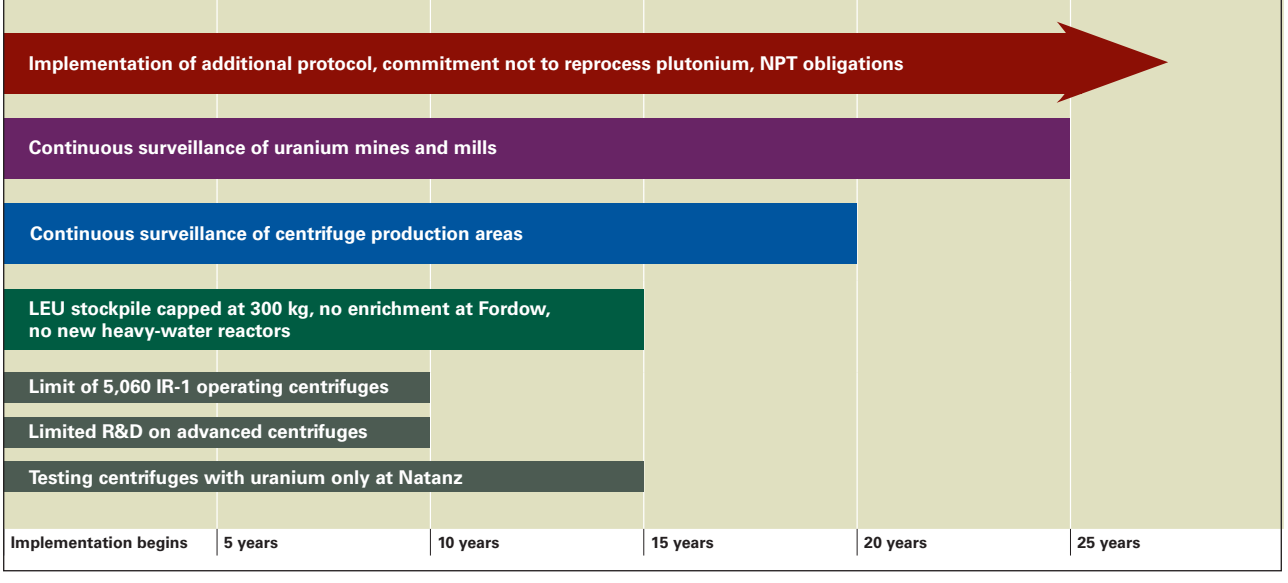
- limiting deployment of advanced centrifuge machines in years 11–13, so that enrichment capacity remains the same; and
- converting the underground Fordow facility to a medical research facility, with less than half of the current centrifuges and a prohibition on uranium enrichment there for at least 15 years.

The restrictions blocking Iran's plutonium pathway are even stronger. Under the terms of the JCPOA, Iran will

- destroy the core of the unfinished Arak reactor and replace it with a modified core which will produce minimal weapons-grade plutonium;
- commit not to reprocess spent nuclear fuel (which would result in weapons-grade plutonium) for 15 years, or conduct any related experiments, plus an intention to never reprocess;
- commit not to build any new heavy-water reactors for 15 years and not stockpile heavy water for that time; and
- ship out spent nuclear fuel.

The JCPOA will put in place enhanced international monitoring and accountancy to promptly detect and deter Iranian noncompliance. It sets up a multilayered system to monitor and inspect every aspect of Iran's nuclear supply chain and fuel cycle. Other elements, including access to a wider number of nuclear sites—notably centrifuge manufacturing sites—and inspections on short notice under the terms of Iran's additional protocol, will be permanent. Inspectors will have timely access to any site, anywhere, including military sites, if there is evidence of suspicious nuclear activities. With sufficient resources, the International Atomic Energy Agency (IAEA) will be able to verify Iran's commitments effectively.

Key Restrictions Will Last Significantly More than Decade



The JCPOA's verification and monitoring requirements include

- a time-bound 24-day process to ensure IAEA access to undeclared sites, including military installations, to investigate evidence of illicit nuclear activities for 15 years;
- continuous surveillance of Iran's centrifuge production areas for 20 years;
- continuous surveillance of Iran's uranium mines and mills for 25 years;
- monitored procurement channel for items that could be used for Iran's nuclear program (dual-use) for 10 years; and
- implementation of Iran's additional protocol, which gives inspectors expanded access to sites and information, and eventual ratification.

The JCPOA also prohibits certain activities related to nuclear explosives.

The structure of the deal also increases the likelihood of Iranian compliance by providing incentives for Tehran to follow through on its commitments. No sanctions relief will be granted until Iran has taken key steps to limit its program and put in place additional transparency measures. If Iran fails to comply with the restrictions of the deal, sanctions will snap back into place.

In this agreement, Iran also achieved its objectives—namely receiving sanctions relief and maintaining nuclear infrastructure for a peaceful nuclear program. The domestic implications of Iran being able to sell the JCPOA as meeting its core needs will increase buy-in and the incentive to implement the agreement.

Critics of the JCPOA argue that a "better deal," one that completely dismantles Iran's nuclear infrastructure or gives inspectors carte blanche access to military sites in Iran, is possible. But there is no realistic, achievable alternative to this agreement.

Attempting to exert further pressure on Iran through military action or additional sanctions will destroy the good deal at hand and invite Iran to escalate its nuclear program. If the United States is seen as responsible for blocking implementation of the deal, it will be extremely difficult to continue international support for the sanctions that have helped push Iran to the negotiating table.

U.S. national intelligence has assessed that since 2007 Iran has had a nuclear weapons capability. That capability cannot be bombed or sanctioned away. The only way to mitigate the threat of an Iranian nuclear weapon is to restrict and monitor its nuclear capabilities to ensure that any violations will be quickly detected.

The JCPOA meets U.S. nonproliferation goals and strengthens U.S. national security by guarding against an Iranian nuclear weapons program for the next 15 years. Beyond that timeframe it offers greater assurance to the international community that any move toward nuclear weapons will be quickly detected and there will be time to disrupt Iran's pursuit of the bomb.

It is also important to view the deal in the context of Iran's decision-making on nuclear issues. As Director of National Intelligence James R. Clapper explained in his 2012 testimony, "We judge Iran's nuclear decision-making is guided by a cost-benefit approach, which offers the international community opportunities to influence Tehran."

The JCPOA changes the costs and benefits of a nuclear weapons program. Iran entered into the JCPOA voluntarily and agreed to give up certain technologies applicable to nuclear explosives development and abide by restrictions on its nuclear program; the cost of noncompliance with the agreement is severe. If Iran is caught pursuing nuclear weapons, or violating the terms of the deal, the international community will react punitively.

The JCPOA is a historic opportunity to resolve the long-running dispute over Iran's nuclear program. It is a strong deal from a nonproliferation standpoint and, if implemented, is the best option to guard against an Iranian nuclear weapon.

SECTION 1

Background and Status of Iran's Nuclear Program

The comprehensive nuclear agreement reached by Iran and the P5+1 (China, France, Germany, Russia, the United Kingdom, and the United States) on July 14 2015, is a breakthrough after over a decade of negotiations to resolve international concerns about Tehran's nuclear program.

Prior to this historic agreement, Tehran had been steadily improving its capability to produce fissile material for nuclear weapons.

Although the U.S. intelligence community assessed that Iran abandoned a coordinated nuclear weapons program in 2003, the 2007 National Intelligence Estimate (NIE) on Iran and more-recent intelligence community testimony assessed that Iran has developed a range of technologies, including uranium enrichment, nuclear warhead mechanics, and delivery systems, that would give it the option to launch a nuclear weapons development effort in a relatively short time frame "if it so chooses."[1]

Such an effort is not the same as a crash program designed to construct a nuclear weapon as soon as possible, which would require that Iran eject inspectors and try to produce weapons-grade material at its declared facilities or perhaps at undeclared facilities before such an effort could be detected and disrupted.

Instead, Tehran appeared to be taking a more deliberate approach, building up as much of its technological base as possible for what is ostensibly a peaceful nuclear energy program while reserving the option to make a political decision to build and deploy nuclear weapons.

As Director of National Intelligence James R. Clapper explained in his 2012 testimony, "We judge Iran's nuclear decision-making is guided by a cost-benefit approach, which offers the international community opportunities to influence Tehran."[2] A comprehensive deal dramatically increases the costs of pursuing nuclear weapons and decreases the benefits.

Iran's Nuclear Ambitions and Capabilities

Iran's interest in pursuing an ambitious nuclear power program preceded the 1979 revolution. The United States provided a kick-start to Iran's nuclear program by signing a nuclear cooperation agreement under President Dwight Eisenhower's Atoms for Peace Program in 1957 and subsequently provided the five-megawatt-thermal (MWt) Tehran Research Reactor. The shah's government later announced plans for building more than 20 nuclear power reactors for generating electricity.[3]

Beginning with the first serious discussions with Tehran in the 1970s about helping to construct nuclear power reactors, the U.S. government sought to impose safeguards beyond those required by the nuclear Nonproliferation Treaty (NPT). For his part, the shah pushed hard for domestic development of

1. James R. Clapper, "Unclassified Statement for the Record on the Worldwide Threat Assessment of the U.S. Intelligence Community for the Senate Select Committee on Intelligence," Office of the Director of National Intelligence, January 31, 2012, p. 6, http://www.intelligence.senate.gov/120131/clapper.pdf.

2. Ibid.

3. International Institute for Strategic Studies (IISS), "Iran's Nuclear, Chemical, and Biological Capabilities: A Net Assessment," February 3, 2011.

the full nuclear fuel cycle, in particular the ability to reprocess spent fuel.[4] Although Iran claims today that Washington accepted a robust nuclear power program in Iran under the shah, the United States insisted at the time that Iran not possess a reprocessing capability due to fears it would be used to produce plutonium for nuclear weapons.[5]

After a brief interregnum following the 1979 revolution, the Iranian government resumed its pursuit of the previous regime's nuclear aspirations, albeit slowly, as Ayatollah Ruhollah Khomeini initially opposed nuclear development for theological reasons. Following Khomeini's death in 1989, the new supreme leader, Ayatollah Ali Khamenei, expanded Iran's undeclared nuclear activities.[6] The nuclear capabilities that Iran has been pursuing can be used for a peaceful nuclear energy program and nuclear weapons development, although some of the capabilities on which Iran focused strongly before the July 2015 deal suggest a prior intention to develop the option to build weapons.

Iran's interest in developing a nuclear weapons capability was directly aligned with the central priority of its leadership: the survivability of its regime. The Islamic Republic's revolutionary government has seen itself under threat since it came to power in 1979 because of Tehran's adversarial relationship with the United States and from the bitter eight-year war with Iraq, which invaded Iran in 1980.

According to a 2010 Pentagon report on Iran's military power, "Iran's nuclear program and its willingness to keep open the possibility of developing nuclear weapons is a central part of its deterrent strategy."[7] Subsequent reports found that Iran "is developing a range of technical capabilities that could be applied to the production of nuclear weapons if the decision is made to do so."[8]

Iran's nuclear ambitions also are rooted in the country's goal of exerting influence throughout the region. Tehran's military power is not proportionate to its economic power, however, and its conventional military capabilities are limited by lack of training and modern weaponry.

Any decision by Iran's leadership to pursue nuclear weapons development would need to overcome significant political and technical hurdles, even more so after a deal is implemented. Iran has long said that its nuclear program is exclusively for peaceful purposes. Additionally, there is religious opposition to the development of weapons of mass destruction. Khamenei has called nuclear weapons a "grave sin," claiming that Iran "has never pursued and will never pursue" them.[9]

Iran's apparent work on developing a nuclear warhead, at least prior to 2004, undermines Khamenei's declarations; Iran would need to find some way to explain the reversal of its stated policy to Iranian domestic audiences and the international community.

The comprehensive nuclear deal limits the most relevant aspects of Iran's nuclear program that could be used to build nuclear weapons. The deal restricts Iran's uranium-enrichment-related activities, modifies its heavy-water reactor activities, and puts in place a stringent monitoring and verification regime to ensure that Tehran abides by the agreement and does not pursue a covert program.

Uranium Enrichment

For more than a decade, Iran's uranium-enrichment program was the focus of international concern about Iran's nuclear aspirations. Iran's enrichment program provides it with the ability to produce one form of fissile material for nuclear weapons: weapons-grade highly enriched uranium (HEU).

The uranium pathway is the most likely route that Iran would use to produce fissile material for nuclear weapons, if the decision was made to pursue them. Iran enriches uranium using a machine called the gas centrifuge, which spins at very high speeds to increase the concentration, or percentage, of the fissionable isotope uranium-235 (U-235).

Centrifuges are organized in groups called cascades, which generally contain either 164 or 174 machines and produce uranium enriched to different levels. Uranium enriched to less than 5 percent U-235 is typically used to fuel nuclear power plants. Research reactors, such as the Tehran Research Reactor, often run on uranium enriched to 20 percent. Uranium enriched to less than 20 percent is referred to as low-enriched uranium (LEU). Nuclear weapons require

4. Abbas Milani, "The Shah's Atomic Dreams," *Foreign Policy*, December 29, 2010.
5. IISS, "Iran's Nuclear, Chemical, and Biological Capabilities."
6. Ibid.
7. U.S. Department of Defense, "Unclassified Report on Military Power of Iran," April 2010.
8. U.S. Department of Defense, "Unclassified Report on Military Power of Iran," April 2012.
9. "Iran Will Never Seek Nuclear Weapons: Leader," Press TV, February 22, 2012.

HEU, which typically has greater than 90 percent U-235.

Beginning in the mid-1980s, Iran acquired gas centrifuge technology through the nuclear smuggling network led by former Pakistani nuclear official Abdul Qadeer Khan, who provided similar assistance to Libya and North Korea. The centrifuge model that Iran is using to enrich uranium, the IR-1, is based on a Pakistani design, the P-1. The P-1 design was originally smuggled by the Khan network from the European enrichment consortium URENCO in the 1970s.

Iran currently enriches uranium at two sites, Natanz and Fordow. Iran has manufactured more than 20,000 centrifuges domestically for these facilities, but is unlikely to be able to produce indigenously all of the materials, such as high-quality carbon fiber and maraging steel, necessary to expand its nuclear program. Tehran relied on illicit networks to bypass international sanctions prohibiting the purchase of these materials. This dependency on foreign suppliers slowed Iran's production of centrifuges.

The Natanz plant is Iran's primary uranium-enrichment facility. An Iranian opposition group, the National Council of Resistance of Iran, revealed in August 2002 that Iran was building the facility. In February 2003, Iran officially acknowledged the existence of Natanz and allowed the International Atomic Energy Agency (IAEA) to visit the facility. At that time, Iran had about 100 centrifuges installed in a pilot cascade.

The Natanz site comprises an industrial-scale enrichment facility, the Fuel Enrichment Plant, which is intended to eventually house about 50,000 centrifuges, and the Pilot Fuel Enrichment Plant. The Pilot Fuel Enrichment Plant is a research and development facility where Iran is testing more-advanced models of centrifuges, including the IR-2M, IR-4, IR-5, IR-6, and IR-6S, to replace the crash-prone IR-1 models. An IR-8 machine is partially installed. Progress on the advanced machines has been slow and it is unclear how efficient these machines are.

Prior to the November 24 Joint Plan of Action, Iran had installed 15,420 IR-1 centrifuges at the Fuel Enrichment Plant, of which approximately 9,200 are operational in 54 cascades. The IR-1 machines are currently enriching uranium to 3.5 percent. Another 328 IR-1s enriched uranium to 20 percent at the Pilot Plant until the November 2013 interim deal dropped the enrichment level to 3.5 percent.

In January 2013, Iran informed the IAEA that it planned to install IR-2M machines in production-scale cascades at the Natanz Fuel Enrichment Plant. Prior to the November 2013 agreement, Iran had installed 1,008 advanced IR-2M centrifuges, but these machines never enriched uranium.

Experts assess that, when operational, the IR-2M centrifuges will be three to five times more efficient than the IR-1 centrifuges.

The Fordow facility is located inside a mountain bunker and was built in secrecy, until September 2009, when France, the UK, and the United States publicly revealed its existence. Iran is believed to have informed the IAEA about the plant's existence only after discovering that Western intelligence agencies had learned of it.

Iran enriched uranium to 20 percent at that facility using 696 IR-1 centrifuges. After the November 2013 interim deal, these machines produced uranium enriched to 3.5 percent. An additional 11 cascades containing approximately 2,000 IR-1 centrifuges were installed at Fordow, but are not operating, bringing

Iran's Centrifuges Between January 2014–July 2015[10]

		Natanz (FEP)*	Natanz (PFEP)*	Fordow (FFEP)*
IR-1	Installed	15,420	328	2,710
	Operating	9,166	328	696
IR-2M	Installed	1,008	0	0
	Operating	0	0	0
Total operating centrifuges: 10,190				

*FEP - Fuel Enrichment Plant; PFEP - Pilot Fuel Enrichment Plant; FFEP - Fordow Fuel Enrichment Plant

Note: Not included in this table are research and development centrifuges being tested at the Pilot Fuel Enrichment Plant. These include models IR-1, IR-2M, IR-4, IR-5, IR-6, and IR-6s and total less than 400. Iran is not withdrawing any enriched uranium from these machines.

Source: International Atomic Energy Agency

10. International Atomic Energy Agency Board of Governors, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran: Report by the Director-General," GOV/2014/28, May 23, 2014; David Albright et al., "ISIS Analysis of the IAEA Iran Safeguards Report," *ISIS Report*, May 23, 2014, http://isis-online.org/uploads/isis-reports/documents/ISIS_Analysis_IAEA_Safeguards_Report_23May2014-finaldoc.pdf.

the facility to nearly full design capacity of about 2,800 machines.

Iran was ostensibly enriching uranium to 20 percent to provide fuel for the Tehran Research Reactor, which produces medical isotopes, and for similar research reactors Iran claims it will build in the future.[11] Although enriching uranium to 20 percent is not necessarily indicative of an intention to make a nuclear weapon, stockpiling uranium at this level was worrisome because if Iran attempted to produce weapons-grade uranium, it could do so much faster using 20 percent-enriched uranium than by starting with 3.5 percent-enriched material. Enriching uranium to 20 percent constitutes about 90 percent of the work needed to enrich uranium to weapons-grade levels.

Moreover, the rationale behind Iran's production of 20 percent-enriched uranium was dubious, particularly as experts assess that current stockpiles "exceed any realistic assessment of [Iran's] need."[12]

Iran's Major Nuclear Facilities

Heavy-Water Reactor Project

Another potential path to the construction of nuclear weapons is to separate weapons-grade plutonium from spent nuclear fuel. Iran began construction of a reactor, the IR-40, in 2004 at its Arak site. This reactor, if completed as originally designed, would have provided enough plutonium annually for up to two nuclear weapons. Iran claimed the reactor was intended to produce medical isotopes, but it was poorly suited for that function.

Construction was beset by delays, due in part to proliferation-related sanctions, which have prevented Iran from obtaining some of the materials required.

However, by November 2013, Iran had made considerable progress, including installing the upper containment vessel and the reactor vessel and testing prototype uranium fuel assemblies for the reactor in the Tehran Research Reactor.

In order to use plutonium from a reactor such as the IR-40, Iran would have needed a reprocessing facility to separate the plutonium from the reactor's spent fuel. In 2004, Iran revised its declaration to the IAEA regarding the Arak site and eliminated plans for constructing a reprocessing facility. Iran currently is not known to be working on such a capability, although Tehran admitted to the IAEA in 2003 that it had carried out reprocessing experiments during 1988-1993 without informing the agency.[13]

IAEA Safeguards

For nearly 20 years, Iran pursued much of its sensitive nuclear work in secret without informing the IAEA of its activities. It was not until Iran's facilities at Natanz and Arak were publicly revealed in the fall of 2002 that the agency was able to begin carrying out a thorough accounting of work Iran performed on uranium enrichment and other programs with possible weapons purposes.

Since 2003, many key Iranian facilities (now 18) have been under IAEA safeguards. From 2004 until

11. The United States originally supplied Iran with the Tehran Research Reactor in 1967. At that time, the reactor operated using highly enriched uranium fuel enriched to more than 90 percent uranium-235. In 1993, conversion of the reactor to use fuel targets enriched to just under 20 percent was completed. Argentina facilitated the conversion and provided 115 kilograms of 20 percent-enriched uranium for the reactor. IISS, "Iran's Nuclear, Chemical, and Biological Capabilities."

12. William C. Witt et al., "Iran's Evolving Breakout Potential," *ISIS Report*, October 8, 2012, http://isis-online.org/uploads/isis-reports/documents/Irans_Evolving_Breakout_Potential.pdf.

13. IISS, "Iran's Nuclear, Chemical, and Biological Capabilities."

early 2006, Iran voluntarily agreed to implement an additional protocol to its IAEA safeguards agreement, which expanded inspector access to facilities.

Between 2006 and the November 2013 interim agreement, Iran kept many activities out of the inspections process. For example, Iran's centrifuge manufacturing and development work was not safeguarded after 2006, when Iran stopped implementation of its additional protocol. This was preceded by the IAEA finding Iran in noncompliance with its safeguards agreement in September 2005 and the agency's decision to refer Iran to the UN Security Council in February 2006.

In 2007, Iran stopped sharing early access and design information for its nuclear facilities with the IAEA, as it is obligated to do under the so-called modified Code 3.1 of its safeguards agreement. Although Iran announced it would revert to the original arrangement, the agency said the modified arrangement cannot be unilaterally altered and that Iran was still required to provide the notifications required by Code 3.1.[14]

As a result, the agency did not have regular access to the heavy-water reactor under construction at Arak, and Iran refused to share plans regarding the construction of any additional nuclear facilities. Tehran also refused IAEA requests to install real-time camera monitoring at its enrichment facilities, a measure that would provide the earliest indication of any Iranian move to begin producing weapons-grade material.

Until 2013, Iranian officials argued that their actions were justified because the IAEA and the UN Security Council were trying to deprive Iran of the inherent rights to which all NPT members are entitled. In fact, Iran was reneging on the terms of the safeguards agreement it concluded with the IAEA, one of its core NPT responsibilities on which its rights to nuclear technology is conditioned. Within the construct of the final deal, reapplication of Iran's additional protocol and Code 3.1 assists the agency in exercising due diligence in monitoring Iran's program so that it can determine whether the program encompasses weapons-related activities.

14. Ibid.

SECTION 2

The November 2013 Interim Agreement

The November 24, 2013, Joint Plan of Action contained first-phase steps for Iran and the P5+1 to take, initially for a six-month period, to address urgent concerns of both sides. When negotiators extended the talks in July 2014 and again in November 2014, each side undertook additional commitments. The interim deal also contained the broad parameters that guided the negotiations on a comprehensive agreement.

This breakthrough accord was reached after three rounds of talks between the P5+1 and Iran, following Rouhani's inauguration as president of Iran and his appointment of a new negotiating team led by Foreign Minister Mohammed Javad Zarif.

The framework agreement's first-phase steps froze progress in all areas of acute concern regarding Iran's nuclear program, rolled back Iranian capabilities in some areas and significantly increased IAEA monitoring and verification of Iranian nuclear activities. The IAEA submitted monthly reports assessing Iran's compliance with the nuclear-related elements of the interim deal.

In exchange, Iran received some relief from proliferation-related sanctions imposed by the United States and the European Union, including the repatriation of some frozen Iranian oil revenue, and a pledge that new nuclear-related sanctions would not be imposed for the duration of the agreement. The rest of the existing international financial and oil sanctions regime against Iran remained in place and were implemented during the negotiations on a final deal.

The agreement also set up a joint commission to evaluate any disputes over implementation that emerged while the interim deal was in effect.

Enriched Uranium

Implementation of the first phase of the agreement rolled back Iran's uranium-enrichment program by capping the levels of enrichment at no more than 5 percent, freezing the number of centrifuges enriching uranium, and neutralizing the most proliferation-sensitive aspect of Iran's nuclear program: its stockpile of uranium gas enriched to 20 percent.

On January 20, 2014 the IAEA confirmed that Iran halted production of uranium enriched to 20 percent at Fordow and the Pilot Fuel Enrichment Plant at Natanz and disconnected the interconnected design of the cascades at Fordow. The IAEA had daily access to monitor Natanz and Fordow.

On January 20, 2014 Iran's stockpile of uranium gas enriched to 20 percent was 209.1 kilograms, just short of the estimated 240 to 250 kilograms that, when further enriched, is enough for one weapon.

Between January 20 and July 24, 2014, Iran blended down 105 kilograms of 20 percent enriched uranium gas to 3.5 percent enriched uranium gas. The other half was fed into process to convert the gas to powder, which can be used to make fuel plates for the Tehran Research Reactor.

The powder can be reconverted, but the IAEA would be aware of Iran's attempts to do so.

Iran was allowed to continue enriching uranium to 3.5 percent under the November 24 agreement, but Tehran agreed to convert the uranium enriched to that level as part of the interim deal to a powder form that can be used to fuel nuclear power reactors. Essentially, Iran had about 7,650 kilograms of

uranium gas enriched to 3.5 percent. All of the gas produced above that amount was fed into an plant to convert it to powder, which can be used for reactor fuel.

Natanz

Under the November 24 agreement, Iran committed not to install any additional centrifuges at the Natanz Fuel Enrichment Plant and not to operate any additional centrifuges. Over the course of the interim deal, Iran had 15,420 IR-1 machines in 90 cascades, of which about 9,200 were operating, and 1,008 IR-2M machines installed at Natanz.

An additional two cascades, 328 machines, that had been producing uranium enriched to 20 percent at the Pilot Fuel Enrichment Plant at Natanz were converted to enrich uranium to 3.5 percent and are no longer enriching in an interconnected design.

Fordow

Iran halted uranium enrichment to 20 percent at the Fordow facility and committed not to operate or install any additional centrifuges at the facility as part of the November 24 agreement. Iran operated its four cascades, totaling 696 centrifuges, to enrich to 3.5 percent during the interim deal.

Centrifuge Production and Monitoring

Under the Joint Plan of Action, the IAEA was allowed managed access for the first time to Iran's centrifuge assembly workshops, rotor production sites, and centrifuge storage areas.

This access helps guard against the pursuit of any clandestine enrichment programs because it will gives the IAEA greater oversight of Iran's centrifuge production capabilities and allows it to better track the total number and locations of centrifuges Iran has produced.

Arak

Under the November 24 agreement, Iran was required to provide the IAEA with updated design information for the heavy-water reactor at Arak (IR-40), refrain from installing any major components, and halt production of fuel assemblies. Also, Iran committed not to engage in any reprocessing activities or build a facility to reprocess plutonium from spent fuel.

Research and Development

Under the terms of the November 24 agreement, Iran was allowed to continue its research and development activities under existing IAEA safeguards.

According to the IAEA's quarterly reports in 2014 and 2015, Iran continued to test its advanced centrifuges (the IR-2M, IR-4, IR-6, and IR-6s machines) as single machines and in cascades at its R&D plant at Natanz. Iran also has an IR-5 centrifuge at the facility that it was not yet testing and a partially installed IR-8 centrifuge.

Sanctions Relief

The P5+1 committed to provide relief from proliferation-related sanctions over the course of the first-phase agreement. The Joint Plan of Action also committed the United States, the EU, and UN Security Council from passing any further sanctions related to proliferation concerns.

On January 20, 2014, the United States and the EU suspended sanctions that prohibited the purchase of Iranian petrochemical products and trade with Iran using gold or other precious metals.

The United States also suspended sanctions on Iran's auto industry and allowed for the supply of spare parts for civilian aircraft and installation services for the necessary repairs. On April 4, 2014 Boeing Co. announced that it received a license from the U.S. Department of the Treasury that will allow it to export spare aircraft parts.

Sanctions relief also targeted Iran's oil sector. A December 2011 U.S. law required countries to stop importing oil from Iran unless granted a six-month waiver by the United States. Failure to comply would result in exclusion from the U.S. financial system. The waivers were renewable if countries continued to reduce their oil imports from Iran.

By the time of the November 24 agreement, Iran's oil exports were limited to six countries: China, Japan, South Korea, India, Turkey and Taiwan. In total, this amounted to approximately 1 million barrels per day by mid-2013, roughly one-third of what Iran exported in mid-2011.

Under the November 24 agreement, the United States suspended its requirement that countries continually reduce their oil imports from Iran and froze Iran's export levels at the November 2013 levels.

In addition, the agreement enabled the repatriation of frozen Iranian revenue held abroad. Provisions that went into effect in 2013 prevented Iran from transferring oil payments back to Iran and required that the money only be used for trade between the country holding the funds and Iran. This has resulted in billions of dollars of Iranian oil revenues being held in foreign banks. The money was repatriated to Iran over the course of the first-phase agreement.

Some of the payments were tied to the completion of Iranian actions, such as completion of the dilution of uranium enriched to 20 percent.

The first-phase agreement established a financial channel to facilitate humanitarian trade using the oil revenues held abroad. This channel was designed to allow for the purchase of food, medicine, and medical products and to pay for Iran's UN obligations and tuition for Iranian students abroad.

The EU announced on January 20 a 10-fold increase in the authorizations for non-sanctioned trade with Iran.

Compliance

Over the course of the implementation of the Joint Plan of Action, the IAEA issued monthly reports assessing Iran's compliance with the nuclear elements of the interim deal. This included tracking the progress of dilution and conversion of Iran's uranium enriched to 20 percent, and the conversion of the uranium gas enriched to 3.5 percent that was produced over the duration of the agreement. The agency also tracked implementation of the additional commitments made in July 2014 and November 2014 when the talks were extended.

U.S. Secretary of State John Kerry noted at the November 24, 2014 extension announcement that Iran had complied with all of its obligations under the final deal.

The IAEA noted Iran's implementation of its commitment under the interim deal over the course of its duration. It noted one issue of concern in November 2014 related to the testing of the single IR-5 machine at the Natanz Pilot facility. The agency noted in its November 2014 report that Iran was testing the machine using natural uranium gas.

The interim deal allowed Iran to continue its ongoing research and development, but prohibited feeding new centrifuges at the Natanz enrichment plant with uranium gas. Iran maintained that the testing was allowed under the interim deal, whereas the United States said it was an ambiguity.

Iran agreed to stop testing the machine using natural uranium. The resolution of this dispute is noteworthy, as it indicates a willingness of both sides to work through ambiguities and maintain compliance with the deal.

SECTION 3

Understanding the JCPOA

From a nonproliferation standpoint, the Joint Comprehensive Plan of Action (JCPOA) is a strong agreement. In evaluating the effectiveness of the deal it is important to look at the individual elements of the agreement and assess how the layers work together in a system. No single element blocks Iran's pathway to nuclear weapons, but taken together, the nuclear restrictions and monitoring form a comprehensive system that will put nuclear weapons out of Iran's reach for at least 15 years.

Many of the JCPOA provisions also extend beyond 15 years. Monitoring of centrifuge production facilities continues for 20 years, and monitoring of uranium mines and mills continues for 25 years. International Atomic Energy Agency (IAEA) inspectors will have enhanced access indefinitely.

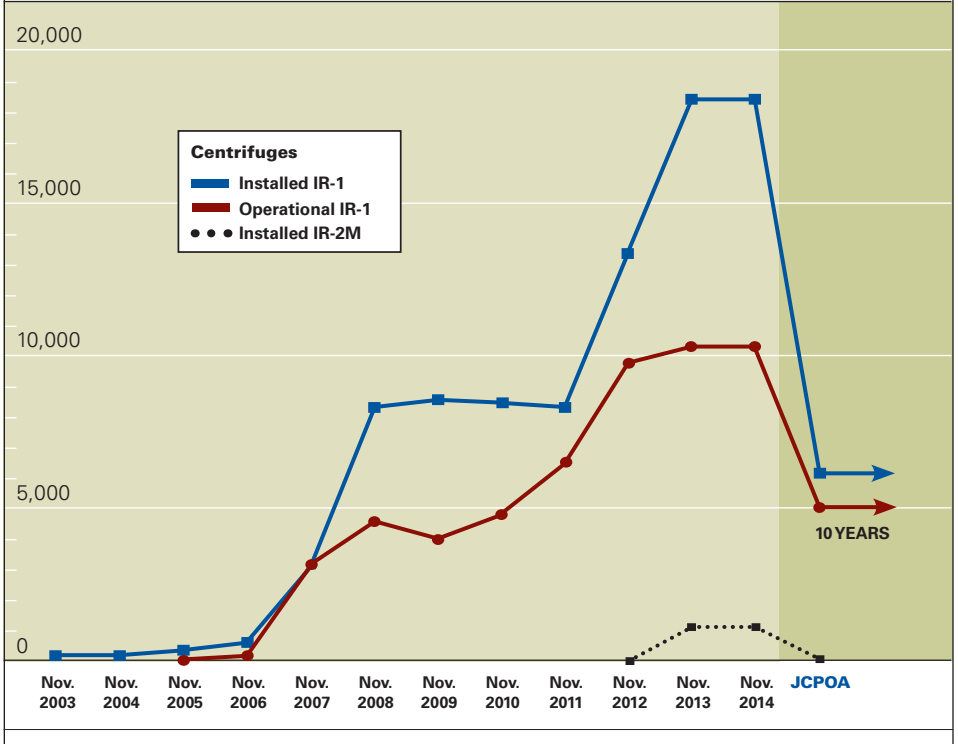
If successfully implemented, the agreement is a win-win solution. It serves the national security interests of the United States, the global community, and the Middle East. It strengthens nuclear nonproliferation by preserving the integrity of the nuclear Nonproliferation Treaty (NPT) and it incentivizes Iranian cooperation by meeting Tehran's core objectives for the agreement.

Blocking the Uranium Pathway

The JCPOA blocks Iran's pathway to nuclear weapons using highly-enriched uranium (HEU) for over a decade.

The combination of restrictions on Iran's uranium-enrichment program pushes back the time it would take for Tehran to obtain enough HEU for a bomb to

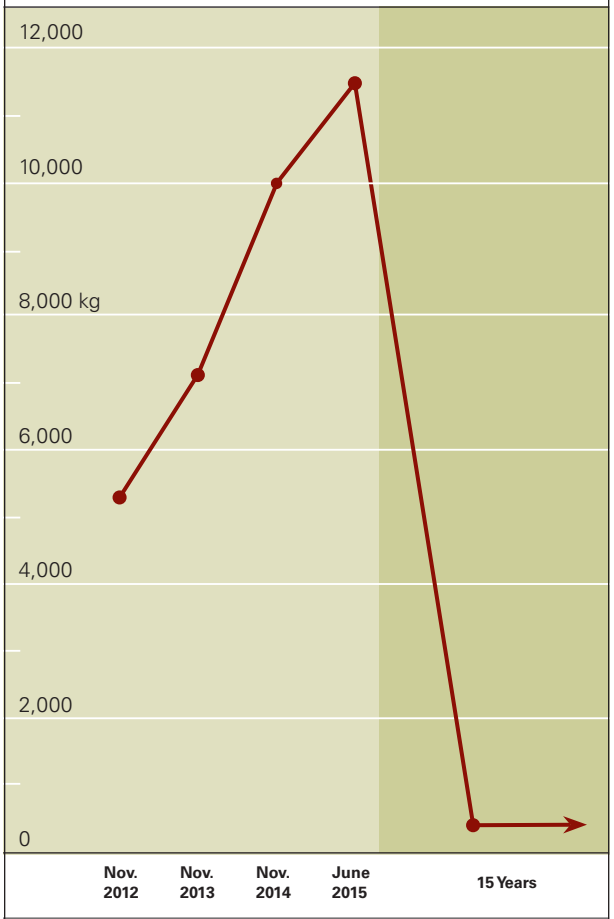
The Impact of a Comprehensive Nuclear Deal on Iran's Deployment of Centrifuges



Source: International Atomic Energy Agency (IAEA); Joint Comprehensive Plan of Action (JCPOA)

Capping Iran's 3.5% LEU Stockpile

Material exceeding above 7600 kg was converted into powder form under interim deal.



Source: JCPOA, IAEA

over 12 months. That extended 12-month breakout timeline will last over a decade, and monitoring provisions under JCPOA ensures that any attempt to obtain the material would be quickly detected.

This is a significant increase over the 2–3 months it would take Iran to obtain enough HEU for a bomb (roughly 25 kilograms of uranium enriched to greater than 90 percent uranium-235) under the November 2013 interim deal restrictions. These breakout calculations only include the time required to obtain the material. Conversion of the HEU and weaponization would add additional time.

The extended breakout timeline is a function of restrictions on Iran's uranium-enrichment capacity, the level of enrichment, and its stockpile of enriched uranium.

As of July 2015, Iran has more than 19,000 centrifuges installed at two facilities, of which about 10,200 were enriching uranium.

As of July 2015, at Iran's Natanz Fuel Enrichment Plant, Iran had 15,420 first generation, IR-1 centrifuges, of which about 9,200 IR-1 were enriching uranium. There were an additional 328 IR-1s enriching uranium at the Natanz Pilot Fuel Enrichment Plant. There were 2,700 IR-1 machines at the Fordow Fuel Enrichment Plant, of which 698 were operating. There were additional advanced machines at various stages of testing at the Natanz Pilot Plant.

Under the JCPOA, the number of operating machines will be cut in half, down to 5,060 IR-1 machines, and enrichment will only occur at Natanz. Iran is restricted to enriching uranium with 5,060 IR-1 centrifuges for 10 years, but due to limits on the deployment of advanced centrifuge machines in years 11–13, Iran's enrichment capacity will remain constant for 13 years.

The excess, non-operating machines will be removed and stored at Natanz under IAEA seal—separate from the enrichment areas. The associated infrastructure for uranium-enrichment cascades—all piping, uranium hexafluoride (UF6) withdrawal equipment including vacuum pumps and chemical traps—will also be removed and stored under seal. Essentially, this means that Iran will not be able to plug its centrifuges back into an existing cascade infrastructure that would allow it to resume enrichment quickly.

Iran will be permitted to keep an additional 1,040 IR-1 machines at Fordow. The Fordow facility may only be used for stable isotope production for medical purposes, with 328 centrifuges dedicated to that purpose. An additional 700 IR-1 machines will remain installed, but idle. The remaining centrifuges will be removed, along with the associated infrastructure, and stored under seal at Natanz.

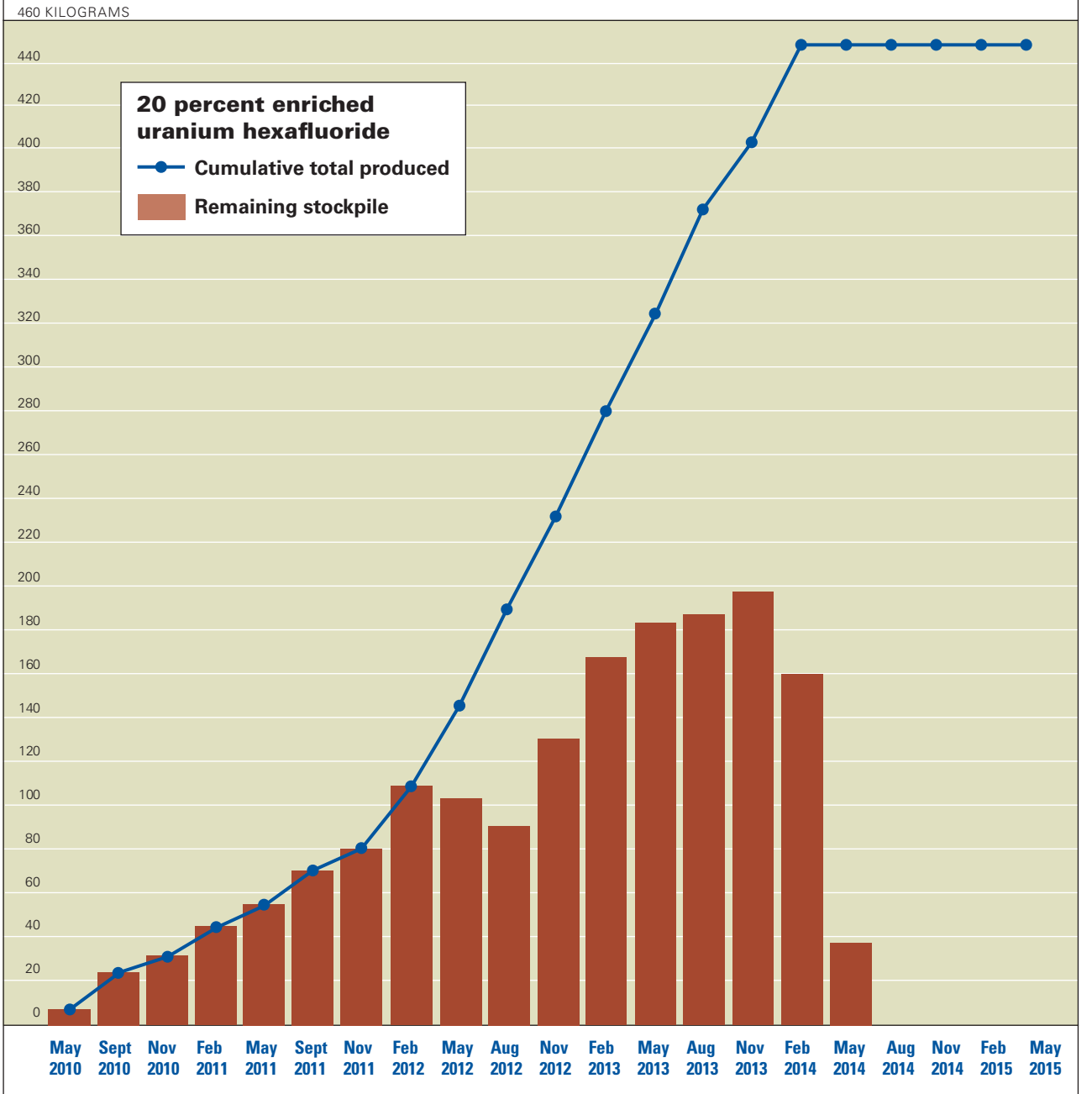
Russia will work with Iran on stable isotope production. Once these machines are used for this purpose, the machines would need to be sanitized before any uranium could be re-introduced for the purpose of enrichment.

Iran will not be permitted to enrich uranium at Fordow or bring uranium into the Fordow facility for 15 years. The IAEA will test the uranium traces in the facility after the centrifuges used for uranium enrichment are removed. This will provide a baseline for IAEA monitoring to ensure that no additional uranium is introduced into the facility.

Removal and storage of excess centrifuges under IAEA seal is an important element of this deal. The seals employed send direct signals back to the IAEA. If there is any attempt to breach the seals, the agency

Elimination of Iran's 20 Percent Enriched Uranium Stockpile

Iran began enriching uranium to 20 percent in February 2010. In May 2012, Iran began converting some of its 20 percent enriched uranium hexafluoride gas to uranium oxide, a solid to make fuel plates for the Tehran Research Reactor. Using quarterly reports from the IAEA, this graph shows Iran's total production of uranium enriched to 20 percent and how much uranium enriched to this level remains stockpiled as uranium hexafluoride gas.



*In February 2012, Iran began enriching uranium to 20 percent at its Fordow Fuel Enrichment Plant. Prior to this point, all enrichment to 20 percent occurred at the Natanz Pilot Fuel Enrichment Plant. Beginning with the May 2012 report, the quantity of uraurnium enriched to 20 percent reflects the combined total of both sites.

will be notified. Iran will be permitted to access these machines to replace damaged or broken centrifuges. Any replacement of damaged machines, however, will be done under the surveillance of the IAEA. The agency will also need to verify the centrifuges are indeed broken and will supervise removal. This adds an extra layer of assurance that Iran will not be able to siphon off centrifuges for a covert program.

During the first 10 years, Iran will not be allowed to produce any additional IR-1 centrifuge machines, unless the stored number of machines drops below 500. At that point, Iran could produce additional IR-1 centrifuges, but based on calculations of average breakage rate, and monitored by the IAEA.

Centrifuges, however, are only one component that must be taken into account to limit breakout capacity. Breakout also depends on stockpiles of enriched material and enrichment levels.

Under the deal Iran will only be permitted to enrich uranium up to 3.67 percent uranium-235, a level typical for fueling nuclear power reactors, for 15 years. Iran's stockpile of enriched material will be capped at 300 kilograms for 15 years, about a quarter of the material necessary (if enriched further) is enough for a nuclear weapon.

The 300-kilogram limit includes material in gas or powder form, meaning that Iran cannot meet the limit by converting its gas into a powder form that can be reconverted easily for further enrichment. The limit will not include enriched uranium in fuel assemblies for the Tehran Research Reactor, the Arak reactor, or the Bushehr power plant. The fuel assemblies will be monitored and should Iran attempt to remove the uranium from the assemblies, which is a difficult chemical process, the IAEA will quickly detect this action.

To stay below the 300-kilogram limit, Iran will need to ship out its stockpiles of enriched material, by either selling it or storing it abroad. Iran could also chose to dilute the material back down to the enrichment levels in natural uranium. The method of disposal does not impact the breakout time.

The stockpile limit also takes into account any scrap material or uranium enriched to 20 percent that Iran has in powder form trapped in the conversion process. Iran will need to ship that material out for formation into fuel plates for its Tehran Research Reactor, diluting it down, or render it to a state where it is impossible to enrich further. This ensures that Iran cannot extract this material at a later date and move more quickly toward weapons-grade material. Any material Iran does not dispose of will count against the 300-kilogram limit.

Estimated Plutonium Production for Original IR-40 and Modified Arak Reactor Design

The table below lists the calculated annual reactor-grade plutonium production in the fuel of the original Arak design and in the modified design described in the JCPOA assuming full-power operation 250 days per year.

Reactor/fuel combination	Annual unseparated plutonium production *(kilograms per year)*	
	40 MWt	20 MWt
ORIGINAL DESIGN Heavy-water research reactor, *natural uranium fuel*	≈6.5	
MODIFIED DESIGN Heavy-water research reactor, *3.67 percent-enriched fuel*		≈1.0

Source: Ali Ahmad, Frank von Hippel, Alexander Glaser, and Zia Mian, Princeton University; Arms Control Association

Advanced Centrifuges

Iran will be subject to limitations on its testing and development of advanced centrifuge machines for the first decade of the deal. Iran currently uses its IR-1 machines, an inefficient, crash-prone model, for enrichment. Iran did install 1,008 IR-2M machines for uranium production, but, under the interim deal, Iran agreed not to use these machines for uranium enrichment. Experts assess that the IR-2Ms would be three to five times more efficient than the IR-1s.

Iran will remove the IR-2M machines and store them under seal. Iran has additional advanced machines at the Natanz Pilot Plant, including a cascade of IR-2Ms and IR-4s. Iran will have a short period of time to conclude testing on those machines and then will remove the cascades and infrastructure. The removal will occur before implementation day and before any sanctions relief is provided.

During the first eight-and-a-half years of the deal, Iran will be able to keep one IR-4, IR-5, IR-6, and IR-8 machine at the pilot plant for research purposes. Iran will be able to feed these machines with uranium gas, but it cannot withdraw any enriched material.

At the end of eight-and-a-half-years, Iran will be able to test small cascades of up to 30 IR-6 machines and 30 IR-8 machines. Again, Iran will not be able to withdraw the feed from these machines and the

Nuclear "Rights" and Responsibilities

Iranian leaders have argued for years that attempts to limit Iran's nuclear program and impose sanctions infringe on Iran's sovereign rights as a member of the nuclear Nonproliferation Treaty (NPT). Article IV of the NPT says that the states-parties have an "inalienable right to the peaceful use of nuclear energy."

U.S. and other Western government officials, however, note that the NPT does not specifically give states-parties a "right" to engage in sensitive nuclear fuel-cycle activities, including uranium enrichment and plutonium separation. They also point out that the treaty obliges non-nuclear-weapon states under Article II "not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices" and under Article III "to accept safeguards" in accordance with International Atomic Energy Agency standards and practices "with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices."

Some critics of the P5+1 and Iran agreement argue that "allowing" Iran to continue enriching uranium is counter to the U.S. policy position that does not recognize the right to enrich as part of the NPT, especially if states have engaged in illicit nuclear weapons-related research.

The P5+1 and Iran did not agree on the nature of Iran's nuclear energy "rights" in their November 24, 2013 interim agreement, but the P5+1 recognized that Iran already has a nuclear enrichment program and would insist on retaining some enrichment capacity.

As such, as part of the broad parameters of the final deal, the parties agreed to negotiate practical limits on the scope of the enrichment program and additional safeguards on ongoing Iranian enrichment activities at its Natanz and Fordow facilities in order to reduce Iran's nuclear weapons potential.

IAEA will have continuous access to the pilot plant at Natanz.

Iran will also be able to produce up to 200 IR-6s and 200 IR-8s after year eight of the deal. Tehran will not, however, be permitted to manufacture the rotors for these machines during the first ten years of the JCPOA.

After ten years, Iran will be able to begin using advanced machines for enrichment. However, the total enrichment capacity will not increase between years 11–13. This means that the enrichment capacity will remain equal to 5,060 IR-1s. For any advanced machines that Iran introduces, it must remove the equivalent enrichment capacity in IR-1s. For instance, if the IR-6 is seven times more efficient than the IR-1, Iran must remove seven IR-1s for every IR-6 that it begins operating. This means that the time it would take Iran to amass enough fissile material for a bomb remains over 12 months through year 13.

In years 14–15, Iran will be able to increase its separative work units "SWU" capacity, but breakout time will still be longer than the current estimate of 2–3 months, in part because of the 300 kilogram limit on LEU. SWU is the measurement of the efficiency of centrifuges.

Increasing the SWU capacity is of course based on the supposition that Iran will be able to deploy advanced machines for industrial enrichment at the end of a decade and will chose to do so. Centrifuges, even under optimal circumstances with no testing restrictions, still require years to perfect, and Iran has not even begun testing the IR-8 with uranium gas. U.S. Energy Secretary Ernie Moniz said in testimony to the Senate Foreign Relations Committee on June 23 that it is unlikely that Iran will be ready to deploy advanced machines in ten years time.

Uranium Ore

In addition to strict accountancy of Iran's enriched uranium, the IAEA will also monitor all elements of Iran mining and milling operations to accumulate uranium ore. Iran has two operating uranium mines, at Gniche and Saghand. The uranium ore removed from the mines and the uranium converted into gas at the Isfahan conversion facility, will each be measured and accounted for under the IAEA's monitoring mechanisms for 25 years. This also reduces the likelihood of covert activity for that time period, because Iran would need to find another source of uranium for enrichment if it chose to pursue nuclear weapons.

Eliminating the Plutonium Pathway

The restrictions on blocking the plutonium pathway to nuclear weapons are even more enduring than the uranium pathway under the JCPOA.

Iran currently has an incomplete 40MWt heavy-water reactor at its Arak site. If the reactor would be

completed as originally designed, it would produce enough weapons-grade plutonium for about two bombs on an annual basis. Iran would still need to separate that material from the spent fuel—it currently does not have a facility to do so.

Under the deal, Iran will be required to remove the core of the Arak reactor and fill the fuel channels with cement. This will render the core inoperable. Iran will then lead a project team, with P5+1 support, to install a re-designed core. The new core will reduce the power of the reactor to 20MWt and use fuel enriched to 3.67 percent, as opposed to the natural uranium-fueled 40 MWt.

Under these modifications the reactor will produce negligible weapons-grade plutonium. If the reactor was completed as designed it would produce over seven kilograms of reactor-grade plutonium a year, which, when separated, provides more than enough weapons-grade plutonium for a nuclear weapon.

Under the modified design, the combination of reducing the power to 20 MWt and using 3.67 percent fuel, cuts the reactor-grade plutonium production to about one kilogram. At this rate of plutonium production, Iran would need to run the reactor for over four years to produce enough weapons-grade plutonium for a bomb. The risk of Iran accumulating spent fuel is neutralized by Iran's commitment to ship out the spent fuel from the Arak reactor.

Iran could reconvert the reactor, but it could not be done quickly once operations begin and the reactor goes hot. It would likely take Iran upwards of 18 months to reconfigure the reactor before it could begin operations. Even if Iran chose to misuse the reactor (short-cycling the fuel and misusing production targets), it would still need to operate for two years before Iran could accumulate enough weapons-grade plutonium for a nuclear weapon. The IAEA, however, would quickly detect changes in the reactor's operation.

As a further safeguard, Iran committed to ship all of the spent fuel out of the reactor, and not to build a separation facility for 15 years. Construction of any hot cell or shielded glove box that might also be used for fuel separation will be monitored by the Joint Commission set up to oversee the deal. Iran also said as part of the deal that it never intends to reprocess spent fuel, which would put the plutonium pathway out of reach indefinitely, and that it intends to ship out all spent fuel from any future reactors.

Iran also committed not to build any additional heavy-water reactors for 15 years, and not to accumulate any additional heavy-water for the same time period. Any additional heavy-water produced at Iran's facility at the Arak site that will not be used for the modified reactor will be sold on the open market. The IAEA will be monitoring the levels of heavy-water produced to ensure that Iran is not stockpiling it.

Iran is also prohibited from building hot cells beyond certain specifications. And any hot cells constructed that meet the specifications laid out in the deal cannot be built without the approval of the Joint Commission. Hot cells can be used to separate weapons-grade plutonium from spent fuel, but they also are used for medical isotope separation.

If Iran tried to covertly build a larger separation facility, or a reactor able to produce weapons-grade plutonium, it is highly likely that such efforts would be detected. Reactors have particular geo-thermal signatures that satellites can pick up and the materials necessary to build plutonium separation facilities will be monitored.

Monitoring and Verification

If Iran tried to pursue nuclear weapons under the deal, it would have two options. First, it could break out using its declared facilities; second, it could choose a covert program, the so-called "sneakout" option. If Iran chose to pursue nuclear weapons, the "sneakout" is more likely, given the intrusive monitoring at Iran's declared nuclear facilities.

The JCPOA guards against both the breakout and sneakout options. Intrusive monitoring and verification will give inspectors daily access to nuclear facilities including enrichment sites and provide for continuous monitoring of Iran's supply chain. Given these restrictions, it is extremely improbable that Iran would attempt to cheat using declared facilities. Any attempt would be quickly detected or predicated on Iran choosing to leave the NPT and pursue the bomb.

Guarding against a covert program is more challenging. However, a combination of measures under the deal, including implementation and ratification of its additional protocol, monitoring of Iran's procurement of dual-use technologies, and a time-bound process to resolve disputes over access to sensitive sites provide the IAEA with the flexibility to investigate suspect activities when necessary.

Opponents of the deal have criticized the inspections regime for not allowing "anytime, anywhere" access. Iran would not have accepted an agreement with requirements that would allow inspectors unfettered access to its military sites, and more importantly, such access is unnecessary. The IAEA will have timely access to any site of concern, when necessary, under the JCPOA. The Joint Commission will ensure that the agency is able

to visit sites within 24 days, even if Iran initially attempts to block this access.

Monitoring of Declared Facilities

The JCPOA puts in place a multilayered approach for monitoring every element of Iran's nuclear fuel supply chain and the import of materials and technologies that could be used to grow Iran's nuclear program. In addition to the comprehensive safeguards agreement in place already, the IAEA's monitoring and inspections authority will be strengthened by Iran's implementation and eventual ratification of Iran's additional protocol, and adherence to Code 3.1 of Iran's comprehensive safeguards agreement.

Together, these measures ensure that if Iran were to pursue a covert nuclear weapons program it would need to replicate its entire nuclear supply chain to get the necessary fissile material. While no single element of the monitoring regime offers a 100 percent guarantee against cheating, the multilayered approach, particularly combined with information gathered by national intelligence organizations, provides the high confidence that Iran cannot deviate from the restrictions under the deal without prompt detection.

In addition to continuous monitoring of enrichment at the Natanz and the Fordow facilities, including real-time monitoring of enrichment levels, the IAEA will be able to continuously monitor Iran's production of centrifuges for 20 years. It will be able to continuously monitor uranium mines and mills for 25 years and account for all of the material in Iran's nuclear fuel chain.

Also, Iran's unused centrifuges will be disassembled and stored under seal. The seals are a sophisticated system that alerts the IAEA in the event of tampering. This will give a strict accountancy of the components and materials that comprise Iran's nuclear program, making it extremely difficult to siphon off materials for a covert program.

Implementation of Iran's additional protocol will allow for short-notice inspections at all of Iran's nuclear facilities. The expanded nuclear declaration under Iran's additional protocol will include more facilities than are counted under Iran's current comprehensive safeguards agreement—such as the uranium mines and heavy-water production plant. Even after the continuous monitoring allowed in the JCPOA expires, under the model additional protocol, inspectors are to be granted access to facilities within twenty-four hours of a request. This timeline can be shortened to as little as two hours if inspectors are already present at a site. Under the JCPOA, IAEA inspectors will be ensured space for operations near Iran's nuclear sites.

Iran's additional protocol, once ratified, is also permanent. Iran voluntarily implemented it between 2003-2006, but did not ratify the document. The JCPOA requires Iran to seek ratification in eight years.

As part of the JCPOA, Iran will also implement modified Code 3.1 to its safeguards agreement. Under the terms of Code 3.1, Iran must notify the IAEA when it decides to build a nuclear facility (rather than simply six months prior to introducing nuclear material) and provide updates on design of existing nuclear facilities. This will give the IAEA additional warning if Iran intends to expand its nuclear program, and adjust the safeguards approach accordingly.

Detection of Covert Facilities

Concern about Iranian cheating under the deal is legitimate, given Iran's past nuclear activities and attempts to build covert facilities. And if Iran were to choose to pursue nuclear weapons, it might attempt a sneakout using covert facilities.

Due to the complex multilayered monitoring of Iran's nuclear supply chain, should Tehran choose a covert pathway, it would need to reconstitute its entire nuclear supply chain, from obtaining uranium ore to converting it to gas, and then enriching it to over 90 percent uranium-235.

Based on Iran's past attempts to purchase materials for its nuclear program, Tehran is unlikely to be able to produce all the materials necessary for an enrichment program domestically. Iran has been caught illicitly importing high-quality carbon fiber, ball bearings, ring magnets, and maraging steel, amongst other dual-use materials to use for its enrichment program and the Arak reactor. Iran would need to import these materials either through illicit channels or siphon off materials from authorized procurements. Both strategies carry considerable risk. The Joint Commission's procurement working group can conduct verification checks to ensure that dual-use items end up in the right place. If Iran were to be caught illicitly importing materials, this would constitute a breach of the agreement.

In addition to monitoring Iran's procurement of dual-use equipment, the IAEA has considerable means at its disposal to monitor for covert facilities. National intelligence organizations will also continue to monitor Iran, and can provide information to the agency if there are concerns about illicit activities. Satellite imagery plays a particularly important role in monitoring and checking for potentially illicit activity.

U.S. monitoring is particularly robust. Director of National Intelligence James Clapper said in January 2014, prior to the implementation of the additional transparency measures under the interim deal, that the intelligence community assesses that "Iran would not be able to divert safeguarded material and produce enough WGU [weapons-grade uranium] for a weapon before such activity would be discovered."[15]

If the agency has concerns about a particular site, under the terms of Iran's additional protocol and the JCPOA, the agency will provide Iran with the reasons for its concerns. This is a standard practice under an additional protocol.[16] Iran must then respond to the IAEA's request. If the explanation does not satisfy the IAEA, it can request access to the site. Iran can take some steps to protect sensitive information if, for instance, the inspection is on a military facility. But ultimately, it is up to the IAEA to determine if the access is sufficient.

Under the Model Additional Protocol, the agency does not have to allow a country time to respond to evidence or concern if a "delay in access would prejudice the purpose for which the access is sought."[17] Thus in cases where the agency is concerned about a delay, it can request access immediately, and the 24-day clock mandated by the JCPOA would begin at that point.

Under a typical additional protocol, there is no timeline for the agency's access. However, to prevent Iran from stonewalling the agency and attempting to sanitize any illicit activities, the JCPOA requires Iran to respond within 14 days. If they fail to reach agreement, then the Joint Commission, established by the agreement, has seven days to rule on the issue. If a consensus of the commission or a majority vote of five of the eight members agrees that the IAEA's request should be granted, Iran has three days to comply.

Critics of the agreement argue that Iran could hide traces of covert activity within 24 days. However, if the illicit activities involved uranium, it would be extremely difficult to sanitize an area so that the environmental sampling available to the agency would not be able to determine if trace amounts had been present.

U.S. Energy Secretary Moniz disclosed that to test the timeframe the Department of Energy attempted to sanitize sites in that period of time, but that the sampling tools available to the agency were able to detect the presence of uranium.[18]

Additionally, once the IAEA requests access to a site, or provides notification about a concern, it is likely that the agency will access increased satellite coverage of an area. This will provide clarity about any actions Iran may take to sanitize a site or remove equipment.

These measures in the deal significantly increase the chances of detection and Iran's commitments under the deal not to pursue certain types of activities related to nuclear weapons development increases the costs of noncompliance. If Iran were to get caught conducting these types of experiments, even for non-nuclear purposes, it would be in violation of the JCPOA.

The IAEA's investigation into the past military dimensions (PMD) is also incentivized by the agreement. Although the agency's investigation remains a separate process governed by a "roadmap" signed by the IAEA and Iran on July 14, Iran will not receive sanctions relief until it complies with the terms of the "roadmap" and provides the IAEA with the information and access it needs to resolve its outstanding concerns.

The resolution of these issues is not necessary to design and implement an adequate monitoring and verification regime. The monitoring and verification regime set up by the JCPOA operates on the worst-case scenario, namely that Iran has a nuclear weapons capability. Additionally, the provision of this information can continue to inform the application of safeguards by the IAEA over the course of the deal.

For more information on the IAEA's investigation and the PMD issues, see Annex C.

Weaponization Activities

The JCPOA also blocks Iran from pursuing activities that could be applicable to developing a nuclear weapon. There is a specific list in Annex I, Section T, in which Iran agrees to forgo computer modeling to simulate nuclear explosive devices, testing, developing, or acquiring multi-point explosives and

15. James R. Clapper, "Unclassified Statement for the Record on the Worldwide Threat Assessment of the U.S. Intelligence Community for the Senate Select Committee on Intelligence," Office of the Director of National Intelligence, January 2014.

16. International Atomic Energy Agency, Model Protocol Additional to the Agreements Between States and the International Atomic Energy Agency for the Application of Safeguards, INFICR/540, September 1997 https://www.iaea.org/publications/documents/infcircs/model-protocol-additional-agreements-between-states-and

17. Ibid.

18. Darius Dixon, "Moniz: Test results back up assurances on Iran deal," *Politico*, July 22, 2015.

International Atomic Energy Agency Verification Measures

Safeguards Agreement

Safeguards are activities that the International Atomic Energy Agency (IAEA) undertakes to verify that a state is living up to its international commitments not to use nuclear programs for nuclear-weapons purposes. State parties to the nuclear Non-Proliferation Treaty are obligated to have a safeguards agreement in place. Safeguard activities undertaken by the agency are based on a state's declaration of its nuclear materials and nuclear-related activities. Verification measures include on-site inspections, monitoring and evaluation.

Status of Iran's Safeguards Agreement: Iran's safeguards agreement entered into force in 1974. It grants the IAEA access to nuclear sites, including Iran's uranium-enrichment sites at Natanz and Fordow, the fuel fabrication plant at Isfahan, the Arak heavy-water reactor, and the Tehran Research Reactor, for monitoring and verification purposes.

Modified Code 3.1 of the Subsidiary Arrangements to a Safeguards Agreement

Modified Code 3.1 requires countries to submit design information for new nuclear facilities to the IAEA as soon as the decision is made to construct, or authorize construction, of the facility.

Status of Iran's Code 3.1 Agreement: In 2003, Iran accepted modified Code 3.1 but reneged unilaterally in March 2007. The IAEA maintains that subsidiary arrangements, including 3.1, cannot be altered unilaterally. There also is no mechanism in the safeguards agreement to suspend implementation of Code 3.1. Therefore, the IAEA maintains that it remains in force, and Iran is not following through with its obligations under Code 3.1 to provide the agency with updated design information for new and existing nuclear facilities.

Implications of Implementing Code 3.1 in Iran: When Iran implements Code 3.1, the IAEA will receive information about any plans Tehran has to expand its nuclear program earlier than it would under the existing safeguards agreement. Iran would also be obligated to share any design changes to existing nuclear facilities.

Additional Protocol

The additional protocol is a legal document granting the IAEA inspection authority beyond what is permitted by a safeguards agreement. Additional protocols are voluntary agreements negotiated on a state-by-state basis with the IAEA. A principal aim is to enable the IAEA inspectorate to provide assurance that there are no undeclared activities and all declared nuclear activities are for peaceful purposes. Under the additional protocol, the IAEA is granted expanded rights of access to information and sites. States must provide information about, and IAEA inspector access to, all parts of a state's nuclear fuel cycle - including uranium mines, fuel fabrication and enrichment plants, and nuclear waste sites—as well as to any other location with nuclear material. The agency can request access to any site if concerns arise about undeclared nuclear activities and gather environmental samples as part of its investigative process. Additional protocols typically include provisions granting multiple entry visas to inspectors, access to research and development activities, and information on the manufacture and export of sensitive nuclear related technologies.

Status of Iran's Additional Protocol: Iran negotiated an additional protocol with the IAEA and signed the agreement in 2003. Between 2003 and 2006 Iran voluntarily implemented the additional protocol, but never ratified the document. In 2006, Iran announced that it would no longer implement the provisions of the agreement.

Implications of Implementing the Additional Protocol in Iran: With the additional protocol in place, the IAEA will be able to visit all of the facilities associated with Iran's nuclear activities, including sites that it does not currently have regular access to, such as the uranium mines, Iran's centrifuge production facilities, and its heavy-water production plant. The IAEA will also be able to visit any declared site on very short notice. The additional protocol also substantially expands the IAEA's ability to check for clandestine, undeclared, nuclear facilities by providing the agency with authority to request access to any facility, declared or not, to investigate questions about or inconsistencies in a state's nuclear declarations.

These monitoring and verification measures will give the agency a more complete picture of Iran's nuclear activities and allow for early detection of deviations from peaceful activities. Early notification would give the international community time to respond to any dash Iran might make toward nuclear weapons.

neutron sources, and development and designing of nuclear explosive diagnostic systems.

This commitment goes beyond Iran's NPT commitment not to pursue nuclear weapons. The NPT leaves open the option for peaceful nuclear test explosions and research or use of explosives suitable for nuclear weapons for non-nuclear purposes.

In the past, Iran has asserted that some of the alleged PMD work that the IAEA was investigating was for non-nuclear weapons purposes. While some of the activities listed in section T are relevant for non-nuclear purposes, Iran will not be able to claim it is undertaking any of these activities relevant to a nuclear explosive for peaceful purposes.

Nuclear Safety and Security

The civil nuclear cooperation elements of the JCPOA are frequently overlooked. Yet these areas are relevant to preventing the spread of materials and technologies related to nuclear weapons development.

In addition to collaboration on light-water research reactors and converting the Arak reactor, the P5+1 will also work with Iran on nuclear fuel fabrication and safety and security of the Iran's nuclear facilities.

Mastering fuel fabrication will allow Iran to domestically fuel Bushehr, a long stated goal of Iran's nuclear program. The fabrication of fuel for Bushehr, now currently supplied by Russia, and the Arak reactor, which will be supplied by the P5+1 until Iran can produce its own fuel, will make Iran's enriched uranium stockpile more difficult to convert and enrich further. Uranium stored in fuel assemblies for the reactor is more difficult to extract and enrich further.

The provision of equipment and training related to nuclear safety also has broader consequences. As demonstrated by the Fukushima disaster, the safety of nuclear power reactors, and their ability to withstand natural disasters and sabotage is critical to human and environmental security. Bushehr, Iran's sole nuclear power plant, lies near a geologic fault line. Safety improvements to guard against a nuclear accident, and security improvements to guard against sabotage are in the interest of Iran and the region. An incident involving the Bushehr reactor could have significant ramifications for the entire Persian Gulf region.

Sanctions Relief

After the JCPOA is adopted (90 days after passage of UN Security Council Resolution 2231), the European Union will adopt a regulation terminating a previous decision that imposed nuclear-related sanctions. The termination will go into effect on JCPOA implementation day. The United States will issue waivers to go into effect on implementation day that will lift nuclear-related sanctions and terminate executive orders on nuclear-related issues. For more information on the sanctions in place, see Annex B.

On implementation day, these sanctions will be terminated at the EU level and waived at the U.S. level. UN nuclear related sanctions will be terminated as well, but subject to re-imposition in the event of noncompliance. The UN heavy arms embargo and ballistic missile restrictions will remain in place for five and eight years, respectively.

Joint Commission

An additional element of oversight in the Iran deal rests with the Joint Commission mandated by the JCPOA. The Joint Commission is comprised of eight total members, one from each of the six countries of the P5+1, the European Union, and Iran. In addition to overseeing the procurement channel (see below) and disputes over IAEA access to suspect sites, the Joint Commission will serve as a dispute resolution body if there are concerns about material breaches and will approve or delay certain activities, such as plans for fuel fabrication projects, oversight of the Arak reactor conversion process, sanctions relief, approval of changes in research and development plans regarding mechanical testing of advanced centrifuges, the construction and operation of any hot cells or glove boxes, and any exports of nuclear-related technologies.

Meetings will take place on a quarterly basis, or within seven days of a request, but also can be convened in as little as three days. If the IAEA notes a concern regarding its monitoring of Iran's nuclear program under the JCPOA, it can request that the members convene a meeting.

In the event of a dispute over implementation of the deal or a concern about noncompliance, the Joint Commission will have 15 days to resolve the issues, although that time period can be extended by consensus. The Joint Commission can also decide to convene a ministerial level review, in which case the foreign ministers will then have 15 days to review the deal. Concurrently, or in lieu of the ministerial level consideration, an advisory opinion can also be requested by the Joint Commission. A three-member board, in which each disputant appoints a member and the third is independent, will have fifteen days to review the dispute and issue a non-binding opinion. The Joint Commission will have five days to review that opinion.

If at that point the issue remains unresolved, the complaining party can treat the issue as significant noncompliance and cease implementing its commitments. The party can also go to the UN Security Council to put sanctions from the prior nuclear-related resolutions back in place. The UN route, according to Security Council Resolution 2231, will allow any party to go to the Security Council at any time, although it encourages use of the dispute resolution mechanism in the JCPOA.

The Security Council will then vote on the resolution to continue the suspension of sanctions on Iran. Vetoing that resolution will put UN sanctions back in place. Iran has said that it will treat re-imposition of sanctions as grounds to leave the deal.

It is critical that the Joint Commission approach dispute resolution under the deal with a fair and balanced perspective. Over the course of the deal, it is inevitable that disputes over implementation will arise. This is a complex and technically challenging agreement.

The Joint Commission will inevitably face the crucial, yet difficult task, of differentiating between technical problems or ambiguous provisions and noncompliance. Premature snapback of sanctions or resumption of nuclear activities risks this historic opportunity. Parties should be given time to correct technical implementation challenges. Yet at the same time, the Joint Commission must respond to violations of the agreement, demonstrating that noncompliance will not be tolerated, and that neither side can get away with only partial adherence to their commitments.

Procurement Channel

Additionally, for 10 years, if Iran wants to import any materials or technologies that could be used for nuclear purposes, those purchases must be approved by the Joint Commission's working group on procurement. The Joint Commission working group will have to review and approve any attempts to import dual-use materials. The working group will also be able to conduct end-user checks to ensure that the dual-use materials or technologies end up at the appropriate facilities.

If an entity in Iran wants to purchase material or technologies from the standard list designated by the IAEA, the Joint Commission working group on procurement must review and approve or deny the request within 30 days. The JCPOA also entails validation of the end-user certificates for the purchases, meaning that under the JCPOA companies can be checked to ensure that the dual-use materials end up in the designated places.

Timing

The implementation timeline of the deal provides assurance that Iran will not receive sanctions relief until Iran has completed key obligations. After the deal was agreed upon and endorsed by UN Security Council Resolution 2231 on July 20, the 90-day pre-adoption period began. During that time, the P5+1 countries and Iran are able to work through domestic processes to review the agreement. Both Iran and the United States have respective internal processes for reviewing and approving the deal.

On the U.S. side, under the Iran Nuclear Review Act, Congress has a 60-day review period, which began on July 19, to examine the deal and supporting verification assessments from the State Department, and hold a vote on a resolution to approve or disapprove the deal. President Obama will then have twelve days to veto the bill, followed by a 10-day period in which Congress can attempt to override the veto. During the total review process, 82 days at most, the President cannot waive Congressionally-mandated sanctions.

On the Iranian side, the parliament agreed on an 80-day review period on July 21. A committee of the parliament will review the deal. The Iranian parliament can also vote to reject the agreement.

Iran must also provide the IAEA with the information and access necessary to resolve the agency's PMD investigation. According to the IAEA-Iran "roadmap," that initial provision of information will take place by August 15, and Iran's responses to any follow up questions will be due by October 15.

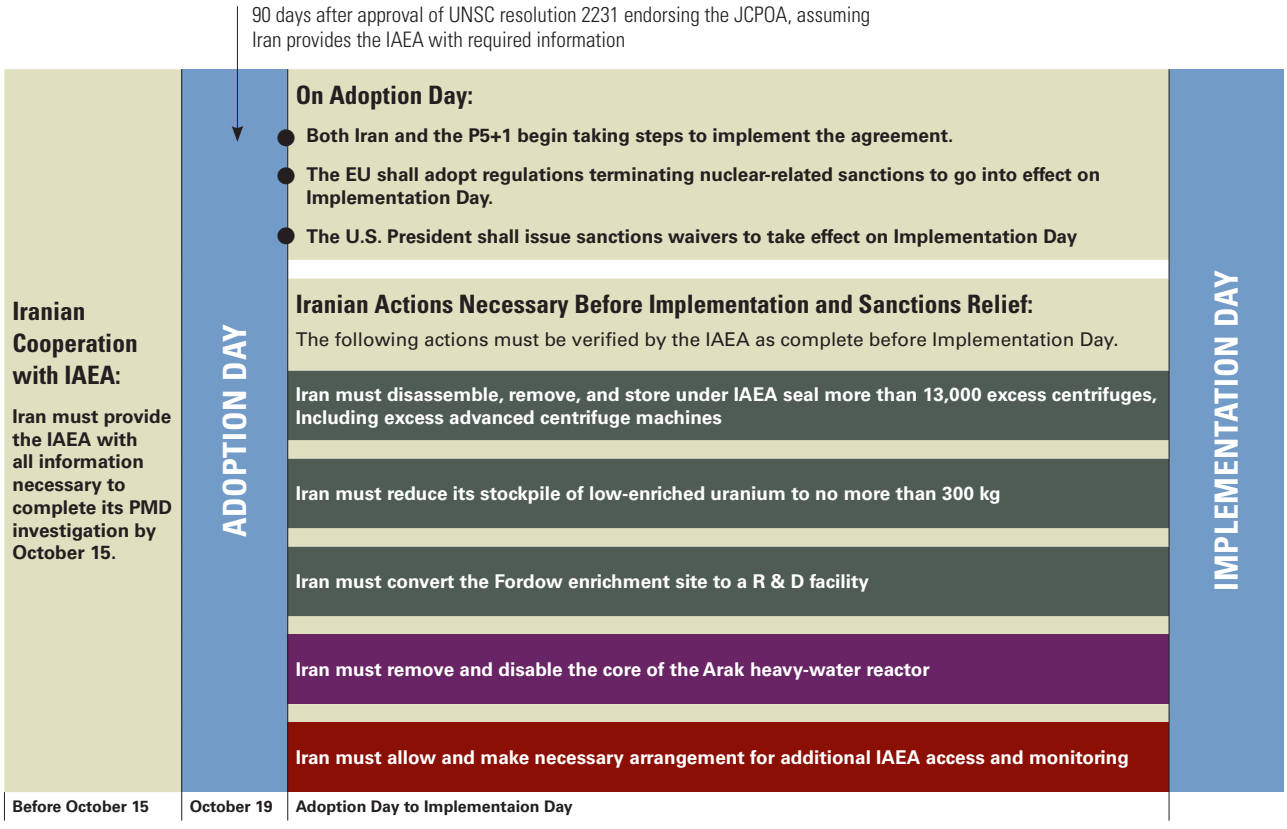
After adoption day, both sides begin taking the steps to implement the deal. For Iran that means implementing the uranium-enrichment restrictions that push its breakout timeline to over 12 months, namely dismantling centrifuges and the associated infrastructure and reducing the stockpile of enriched uranium to 300 kilograms. Iran must also remove and disable the core of the Arak reactor, remove all uranium from the Fordow facility and adapt it for medical isotope research only, and put in place the increased monitoring and transparency measures as specified in the JCPOA.

On the U.S. and E.U. side, that entails beginning work on the lifting of sanctions.

Implementation day occurs when the IAEA certifies that Iran has taken the requisite nuclear steps. At that

Key Nuclear-Related Commitments and Limitations of the P5+1 and Iran Over Time

The Joint Comprehensive Plan of Action, the IAEA-Iran "roadmap," and UN Security Council Resolution 2231, involves several interrelated requirements designed to limit Iran's sensitive nuclear fuel cycle activities and open the way for sanctions relief over a period that extends for more than two decades. The following chart summarizes the major components. Iran must provide the IAEA with all information necessary to complete its PMD investigation by October 15 (far left side).

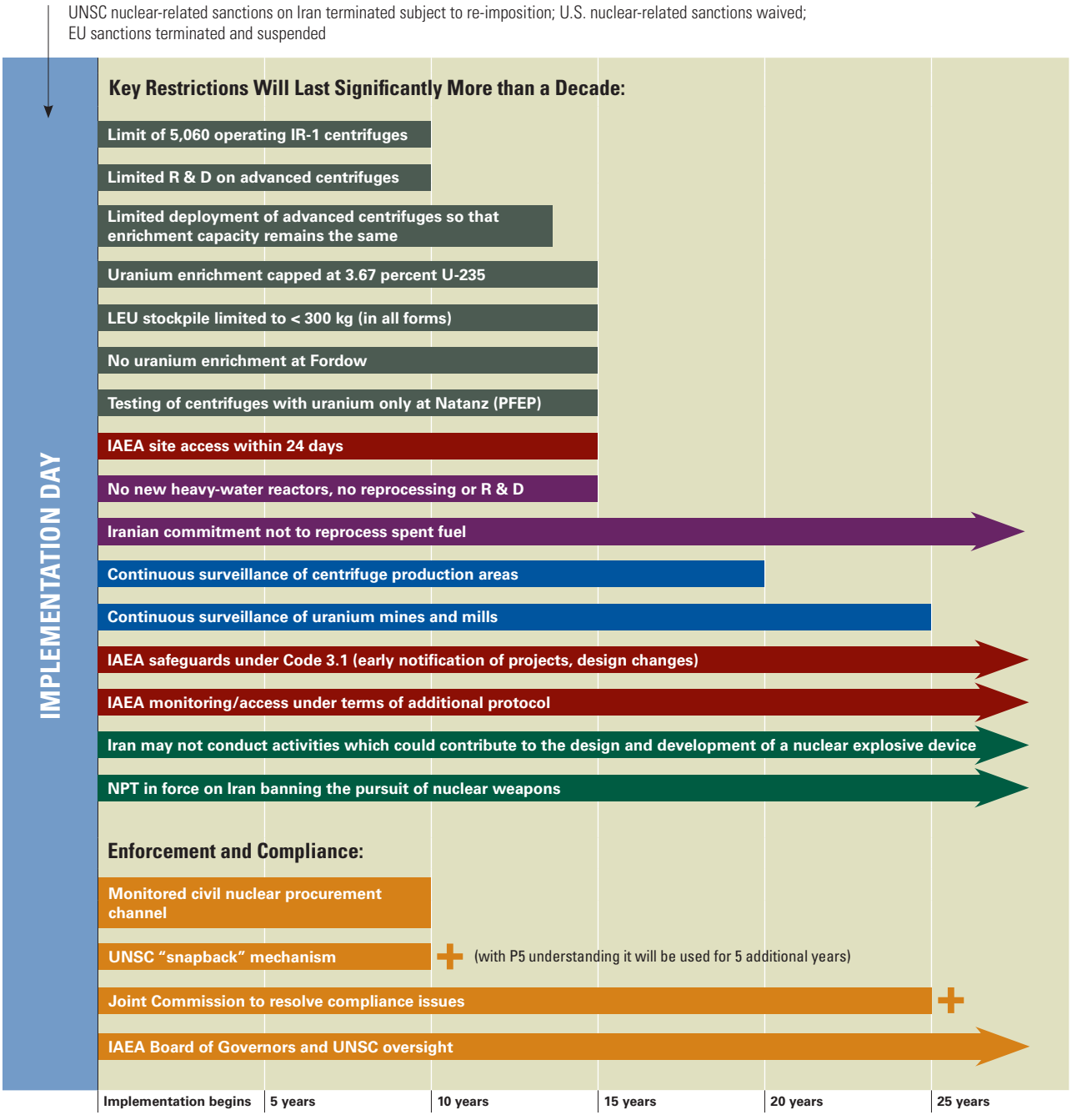


Sources: JCPOA, IAEA, UNSCR 2231, Arms Control Association

Dieter Nagl/AFP/Getty Images

Negotiators representing the P5+1 and Iran meet in Vienna in 2014 for nuclear talks aimed at reaching a comprehensive agreement on Iran's nuclear program.

… Post-Implementation Day Requirements and Limitations



Sources: JCPOA, IAEA, UNSCR 2231, Arms Control Association

point nuclear-related EU sanctions are suspended, U.S. sanctions are waived, and UN sanctions are "terminated subject to reimposition" (except for the arms embargo and ballistic missile restrictions).

It is difficult to estimate when implementation day is likely, due to the difficulty in determining how quickly Iran might be able to complete the nuclear-related restrictions. Dismantling, sanitizing, and storing the excess 13,000 centrifuges to allow their use in the future is a particularly time-consuming task and could take an hour per machine. Estimates for completing all of the nuclear-related work range from three to six months, putting implementation day in early 2016.

The heavy arms embargo will be lifted after five years. The next significant timing occurs on transition day, which is eight years after adoption day, or at the finding of the IAEA's broader conclusion, whichever comes first.

The broader conclusion is a rigorous IAEA finding that "all nuclear material remained in peaceful activities" for the year. The broader conclusion requires implementation of an additional protocol and for the IAEA to conclude two findings, one that there is no diversion of declared nuclear material from peaceful activities, and two, that there is no indication of undeclared nuclear material or activities.

At this point, the United States will seek a full lifting of congressionally mandated nuclear-related sanctions. The European Union will terminate its sanctions. Iran will seek ratification of its additional protocol.

At the eight-year mark, regardless of the broader conclusion, the UN restrictions on Iran's ballistic missiles will be lifted. This does not mean, however, that Iran will have unfettered access to ballistic missile technology at this point. U.S. sanctions on ballistic missiles, however, can remain in place, as will multilateral restrictions.

One important element of this system is the Missile Technology Control Regime (MTCR). The MTCR exists to prohibit the sale of technology or complete missile systems that enable a ballistic missile to carry a 500 kilogram payload over 300 kilometers. This is the threshold generally understood to be the capacity required for delivering a nuclear warhead. While a voluntary regime, the MTCR has had success in hindering Iran's procurement of technologies necessary for solid-fueled ballistic missiles and stemming programs in other countries. Solid-fueled ballistic missiles pose a greater threat than liquid fueled missiles because during the liquid fueling process, missiles are vulnerable to preemptive attacks and because mobile, liquid-fueled missiles require more equipment, making them more difficult to conceal.

Termination day occurs ten years after the adoption date. At termination day, the UN will no longer be seized of the Iran nuclear issue.

After Year 15

While some of the principal nuclear restrictions of the JCPOA do expire after 15 years, roadblocks will still exist that will keep Iran's nuclear program under close observation and provide the international community an early warning in the event of an Iranian move toward nuclear weapons.

In addition to Iran's commitment under the NPT not to pursue nuclear weapons, its additional commitments under the JCPOA not to pursue activities relevant to developing a nuclear weapon, more intrusive monitoring and verification under Iran's additional protocol, its adherence to Code 3.1, and surveillance of centrifuge production facilities (20 years) and uranium mines and mills (25 years) will remain in place.

The additional nuclear power reactors that Iran plans to purchase from Russia will also come with lifetime fuel supplies, thus reducing Iran's need to produce nuclear fuel for domestic purposes.

While this agreement is strong from a nonproliferation standpoint, it would behoove the United States and the international community to consider new nuclear nonproliferation policies writ large to the region. Iran may be willing to abide by certain restrictions, such as limiting enrichment to 3.67 percent U-235 for a longer duration if other countries in the region make similar commitments.

Multilateralizing Iran's enrichment facility could increase regional confidence in the peaceful nature of Tehran's activities, provide regional oversight, and provide nuclear fuel for countries pursuing nuclear power in the Middle East.

The United States and other nuclear supplier states should also consider arrangements for lifetime fuel guarantees to increase assurance of reliable fuel sources when contracting to build reactors in Iran and in the region. Additional steps to strengthen nuclear security in the region, including by encouraging signature and/or ratification of the Comprehensive Nuclear Test Ban Treaty, could also help guard against proliferation in the years ahead.

The JCPOA is a strong, verifiable barrier against the acquisition of nuclear weapons by Iran, but additional attention to nuclear issues in the region will bolster its chances of success in the longer term.

SECTION 4

Frequently Asked Questions

In response to the many inquiries we have received about the Joint Comprehensive Plan of Action (JCPOA) over the course of the past several weeks, the Arms Control Association has compiled the following brief responses to the most frequently asked questions.

1. Iran's Nuclear and Missile Programs

Is Iran still pursuing a covert nuclear weapons program?

No. According to evidence collected by and shared with the International Atomic Energy Agency (IAEA), Iran had an organized nuclear weapons program, but abandoned it in 2003. These activities are referred to as the possible military dimensions (PMDs) of Iran's nuclear program and are actively being investigated by the IAEA.

This corresponds with the assessment from the 2007 U.S. National Intelligence Estimate on Iran's nuclear program, which also stated with moderate confidence that Iran had not restarted its nuclear program. According to a 2011 IAEA report, activities that could be relevant to nuclear weapons development may have continued after 2003, but not as part of an organized program.

In the 2014 Worldwide Threat Assessment, the Director of National Intelligence James Clapper also said that Iran would not be able to divert safeguarded nuclear material and enrich enough to weapons grade for a bomb without discovery.

Does Iran have or is it developing long-range ballistic missiles that could be armed with nuclear warheads?

The U.S. intelligence community assesses that Iran may be technically capable of developing an intercontinental ballistic missile (ICBM) with sufficient foreign assistance, but has not reported that they are doing so.

To date, Iran has never tested any long-range missiles. Iran's longest-range systems (2,000 kilometers) are medium-range ballistic missiles, not ICBMs, as some have implied. Iran would need an ICBM with a range of over 9,000 kilometers to reach the United States. If Iran makes a concerted effort, deploying such a missile within ten years is theoretically possible, but unlikely.

Additionally, if a comprehensive nuclear deal blocks Iran's potential pathways to a bomb, its ballistic missiles become less of a threat, because they cannot be armed with a nuclear weapon.

2. Impact of the Joint Plan of Action

Did the 2013 interim agreement, or Joint Plan of Action (JPOA), halt advances in Iran's nuclear program?

Yes. The implementation of the November 2013 JPOA halted the expansion of Iran's nuclear program and rolled back the most proliferation-sensitive elements.

Under the JPOA, Iran stopped enriching uranium to 20 percent, a key proliferation concern to the P5+1, because 20 percent enriched uranium is more easily enriched to weapons-grade material (greater than 90 percent U-235). Iran also took steps to neutralize its stockpile of 20 percent enriched-uranium gas.

Iran halted major construction activities on its Arak heavy-water reactor, froze the number of its operating and installed centrifuges, and agreed to more intrusive inspections, including daily access to its enrichment facilities. Iran also agreed only to produce the centrifuges necessary to replace damaged machines.

Without the JPOA, Iran could have very significantly increased its uranium-enrichment capacity and possibly completed the Arak reactor.

Did Iran comply with the terms of the November 2013 JPOA, or did it violate it by operating an advanced centrifuge, the IR-5?
The IAEA's November 7, 2014 quarterly report noted that Iran began feeding natural uranium hexafluoride "intermittently" into a single IR-5 centrifuge at its pilot facility for the first time. While unhelpful, this was not a violation of the JPOA, which prohibits the use of advanced centrifuges to *accumulate* enriched uranium. However, to dispel any ambiguities, in the extension agreed to on November 24, 2014, Iran agreed not to feed the IR-5 with any uranium for the duration of the interim agreement.

The IAEA has reported, and U.S. Secretary of State John Kerry said on November 24, 2014, that Iran upheld its commitments under the interim deal.

3. Nuclear Negotiations with Iran

Did the UN Security Council resolutions require Iran to permanently halt enrichment, dismantle its enrichment facilities, and dismantle the heavy-water reactor at Arak?
No. Since July 2006, the Security Council has passed six resolutions calling on Iran to suspend its uranium-enrichment activities and suspend construction work on the heavy-water reactor at Arak. None of the six resolutions passed by the UN Security Council called for Iran to dismantle its enrichment facilities or permanently halt enrichment. The call for suspension was intended to push Iran to comply with the IAEA investigation into concerns about past activities possibly related to nuclear weapons development, and to promote a diplomatic resolution to the concerns over Iran's nuclear program.

During debate on the most recent resolution in June 2010, British Ambassador to the United Nations Mark Lyall Grant, speaking on behalf of the P5+1, said the resolution was intended to keep "the door open for continued engagement" with Iran over its nuclear program. He said that the purpose of such diplomatic efforts must be to achieve a comprehensive, long-term settlement, that respects Iran's legitimate right to the peaceful use of atomic energy. The Security Council resolutions were never intended to eliminate an Iranian civil nuclear program in the future that complies with the conditions of the nuclear Nonproliferation Treaty.

Did President Obama shift U.S. policy from stopping Iranian enrichment to managing it?
No. Beginning in mid-2006, it was the George W. Bush administration that shifted U.S. policy and opened the door for Iran to enrich uranium for peaceful purposes if it met certain conditions.[19]

The 2006 proposal states that the enrichment moratorium could be lifted if Iran demonstrates "credible and coherent economic rationale in support of the existing civilian power generation program." Additionally, Iran would have been required to declare all nuclear facilities, demonstrate that it had no secret nuclear programs, and answer outstanding questions about the military aspects of its nuclear program.

It is a formula with some similar characteristics to the agreement reached in 2015 by the P5+1 and Iran.

By allowing Iran to continue its uranium-enrichment program, is the P5+1 recognizing a "right to enrich" under the nuclear Nonproliferation Treaty (NPT)?
Article IV of the NPT grants non-nuclear weapons states access to nuclear technology for peaceful purposes in return for pledging not to pursue nuclear weapons and meeting their IAEA safeguards obligations. The NPT, however, does not specifically grant or deny enrichment and spent fuel reprocessing rights to member states. Iran interprets the treaty to include a "right to enrich" and has insisted that its right to enrichment be "respected" under a nuclear agreement.

The U.S. policy does not recognize a "right to enrich" under the NPT. In the interim agreement and in the JCPOA, the United States and its P5+1 partners acknowledged that Iran has an enrichment program and will retain a limited enrichment program commensurate with its "practical needs" for its civil nuclear activities.

Acknowledging that a program exists is not the same as acknowledging that a treaty affords a "right." The United States has done the former, not the latter. And, after reaching the interim agreement in November 2013, U.S. Secretary of State John Kerry reiterated that U.S. policy remains unchanged and since then has repeatedly said: "there is no inherent right to enrich."

19. "U.S. Says Plan Offers Iran Uranium Option," by Helene Cooper and Elaine Sciolino, *The New York Times*, June 8, 2006.

Why doesn't the JCPOA require Iran to completely dismantle its nuclear weapons capability?

Iran has had a nuclear weapons capability, but has chosen not to develop nuclear weapons. The 2007 National Intelligence Estimate assessed that Iran has developed a range of technologies, including uranium enrichment, nuclear warhead mechanics, and delivery systems, that would give it the option to launch a nuclear weapons development effort in a relatively short time frame "if it so chooses."

Eliminating that capability, including the knowledge, is, for all practical purposes, not possible. Even if Iran were required to completely "dismantle" its nuclear infrastructure, it could rebuild it. Tougher sanctions or a military strike also will not eliminate the knowledge and basic industrial capacity that Iran has developed and could rebuild.

When did the arms embargo and ballistic missile sanctions become an issue in the negotiations?

The UN arms embargo and ballistic missile sanctions were imposed on Iran as part of Security Council Resolution 1929 on Iran's nuclear activities and were designed to help push Iran to the negotiating table. Following the conclusion of their framework agreement in April 2015, the two sides debated intensely over when to lift the UN Security Council-imposed heavy arms embargo and the ballistic missile restrictions emerged. Iran, along with Russia and China, argued for ending them upon implementation of the JCPOA, while the United States insisted on maintaining them for an extended period of time. The final agreement, which secures ongoing restrictions on heavy arms transfers to Iran and on Iran's ballistic missile activities for five and eight years respectively, was a major achievement in the negotiations for the United States.

How effective are the existing multilateral constraints on ballistic missile development/proliferation?

Not all ballistic missiles pose equal risk. Ballistic missiles capable of carrying a 500 kilogram payload over 300 kilometers are generally recognized as having the minimum capability needed for delivering a nuclear weapon. A multilateral regime known as the Missile Technology Control Regime (MTCR) is designed to limit the transfer of these systems, or related technologies, to nonmember countries. All of the P5+1 countries are members of the regime, except China, which voluntarily adheres to its guidelines. The MTCR restrictions have not stopped Iran's program, but have inhibited Iran's development of solid-fueled ballistic missiles. Additionally, U.S. restrictions on ballistic missiles will remain in place, as will UN restrictions on transferring ballistic missiles to Hezbollah.

4. The Impact of the Joint Comprehensive Plan of Action on Iran's Nuclear Capabilities

Will the JCPOA block all of Iran's nuclear weapons pathways?

Yes. This comprehensive agreement will effectively block Iran's uranium and plutonium pathways to the bomb for 15 years or longer. Among other features, the agreement establishes verifiable limits on Iran's uranium-enrichment capacity and its stockpiles of enriched uranium. Under the JCPOA, the time it would take Iran to produce enough highly enriched uranium for one bomb would increase to 12 months or more. It will also dramatically cut the output of plutonium at the Arak heavy-water reactor and eliminate Iran's ability to pursue plutonium-based nuclear weapons.

The JCPOA will also put in place additional measures to ensure that any covert program is deterred or quickly detected. These measures will build on the additional monitoring and verification under the interim agreement, which expanded international oversight of Iran's nuclear program through increased IAEA access to sites.

In addition, Iran is required to implement and ratify its additional protocol as part of the JCPOA. Specifically, the additional protocol gives the IAEA expanded rights of access to information and sites. With the additional protocol, the agency will continuously monitor Iran's entire fuel cycle, including facilities such as Iran's uranium mines, centrifuge production facilities, and its heavy-water production plant. This will make it extremely difficult for Iran to siphon off materials for a covert program without prompt detection.

The additional protocol also helps the IAEA check for any clandestine nuclear activities in

Iran by providing the agency with greater authority to carry out timely inspections in any facility, civilian or military, that the IAEA has reason to believe is engaged in noncompliant activity.

How does the JCPOA limit Iran's uranium-enrichment capacity after 10 years?

During the first ten years of the JCPOA, Iran may not enrich uranium to more than 3.67 percent U-235 and it may only do so with 5,060 first generation (IR-1) centrifuges at its Natanz site.

During the first eight years Iran will be permitted to conduct testing with uranium on a single IR-4, IR-5, IR-6, and IR-8 machines. Enriched uranium will not be extracted.

After eight and a half years, Iran will be permitted to test up to 30 IR-6s and 30 IR-8s, again without withdrawing any uranium. The Joint Commission must approve any changes to the research and development plan, which must be submitted well in advance.

While Iran will be able to manufacture IR-6 and IR-8 machines after eight years, it will only be permitted to produce 200 of each type of machine per year and will not be permitted to produce the rotors. During this time Iran's centrifuge production manufacturing will still be subject to continuous monitoring.

After ten years, Iran will be permitted to produce complete machines but production levels must be consistent with Iran's civilian enrichment needs, which will be low.

In years 11–13, Iran can deploy more advanced machines, but it will need to remove the equivalent capacity of the operating IR-1 centrifuges so that the overall enrichment capacity remains the same. Excess centrifuges will be stored under IAEA seal.

As stated in annex I, section A, "Iran will begin phasing out its IR-1 centrifuges in 10 years. During this period, Iran will keep its enrichment capacity at Natanz up to a total installed uranium-enrichment capacity of 5,060 IR-1 centrifuges."

For 15 years, Iran may not possess more than 300 kilogram of low-enriched uranium, which also helps to limit its potential breakout capacity.

For years 14–15, Iran could increase its uranium-enrichment capacity, but Iran would still remain several months away from accumulating enough material, and if it tried to do so, it would promptly be detected in sufficient time to stop or delay such an effort.

What is an additional protocol and is it permanent?

An additional protocol is an expansion of a country's comprehensive safeguards agreement with the IAEA. All countries that are members of the nuclear Nonproliferation Treaty are required to have a safeguards agreement in place. The additional protocol is optional, but strongly encouraged, and once ratified it is binding. The necessity of the additional protocol became clear after the Iraq and North Korean cases of the 1990s demonstrated that traditional safeguards are not thorough enough.

An additional protocol broadens the scope of the IAEA's monitoring to all facilities related the country's nuclear supply chain and allows for short-notice inspections. It also allows for the IAEA to request access to undeclared sites, including military areas, if there are concerns about illicit nuclear activities.

Once ratified an additional protocol is permanent. Iran negotiated an additional protocol and voluntarily implemented it between 2003–2006. As part of the JCPOA, Iran must update and implement its additional protocol before sanctions are suspended and it must seek to ratify its additional protocol no later than eight years after implementation day.

What is Code 3.1?

Code 3.1 is an extension of a comprehensive safeguards agreement. When Iran begins to implement this provision as required by the JCPOA, the IAEA will receive information about any plans Tehran has to expand its nuclear program much earlier than it would under the existing safeguards agreement. Under Code 3.1, Iran must notify the IAEA when it chooses to build a new facility as opposed to six months before the introduction of nuclear material. Iran would also be obligated to share any design changes to existing nuclear facilities in advance.

In 2003, Iran accepted modified Code 3.1 but reneged unilaterally in March 2007. The JCPOA commits Iran to implement Code 3.1 indefinitely.

Does the JCPOA provide the IAEA with "anytime, anywhere" access to suspected nuclear sites?

The JCPOA provides timely access to any site, military or civilian if there are concerns about illicit nuclear activities. The IAEA must identify specific questions to be resolved and identify specific locations where it wants to send its inspectors. Providing the inspected

party, in this case Iran, with this information will not provide it with information that helps Iran evade detection or stall the investigation.

There are 121 countries that have an additional protocol in force and 78 complementary access visits were carried out last year. Only in Iran is there a process to ensure timely access.

Under the JCPOA, the request by the IAEA triggers a 24-day clock under which Iran and the IAEA have 14 days to come to an agreement on access. If not, the Joint Commission, created by the JCPOA, has seven days to make a determination on access, and if at least five of the eight members vote to allow the IAEA to investigate, Iran has three days to comply.

If Iran tries to stall access beyond 24 days, there are consequences. If just one of the P5+1 countries is not satisfied with the decision of the Joint Commission on access, it could take action to re-impose earlier UN Security Council sanctions on Iran.

It is possible that there will be no delay, and in response to a request for urgent access by the IAEA, Iran will open the site for immediate inspection.

If there is a delay, the IAEA will be closely watching a site once it becomes suspicious by ordering satellite imagery, perhaps continuing through the investigation, and by seeking corroborating information, especially from states willing to share intelligence information.

Could Iran cover up illicit activities at a suspect site within in 24 days?

Under the terms of the JCPOA, Iran is required to provide inspectors access to undeclared facilities (military or civilian) if the IAEA requests it under the terms of Iran's additional protocol. Under an additional protocol, the IAEA can request explanations for suspect activity and access to a potential covert site to investigate evidence of undeclared nuclear-related activities.

Critics of the JCPOA site access provisions charge that 24 days may provide Iran with enough time to cover up certain types of nuclear activities.

As IAEA safeguards veteran Thomas Shea has noted, when an IAEA request for timely site access involves a building, and especially when it involves uranium (or plutonium), 24 days will not be long enough to prevent detection.

Secretary of Energy Ernest Moniz told Politico on July 22 that Energy Department specialists assess that, "It is essentially impossible, certainly with confidence, to believe that you're going to do this kind of work with nuclear materials and be confident at having it cleaned it up."

Would the IAEA Depend on Iran for Nuclear Residue Testing?

No. Under managed access procedures that may be employed by the IAEA, the inspected party may take environmental swipe samples at a particular site in the presence of the IAEA inspectors using swabs and containment bags provided by the IAEA to prevent cross contamination. According to former IAEA officials, this is an established procedure.

Such swipe samples collected at suspect sites under managed access would likely be divided into six packages: three are taken by the IAEA for analysis at its Seibersdorf Analytical Lab and two to be sent to the IAEA's Network of Analytical Labs (NWAL), which comprises some 16 labs in different countries, and another package to be kept under joint IAEA and Iran seal at the IAEA office in Iran as a backup and control sample if re-analysis might be required at a later stage. The process ensures the integrity of the inspection operation and the samples for all parties.

How Long Does the 24-Day Limit on Suspicious Site Access Last?

Section C, page 9, paragraph 15 of the main section of the JCPOA states that this requirement will last for 15 years. After that point in time, Iran's additional protocol will remain in place as will the Joint Commission to resolve any disputes.

Does the JCPOA require Iran to provide the IAEA with information about its past activities with possible military dimensions (PMDs)?

Yes. On November 11, 2013, Iran and the IAEA concluded a framework agreement for moving forward to resolve the outstanding concerns. Under the terms of the framework, Iran and the IAEA agreed to resolve all outstanding issues, including PMDs, in a step-by-step manner. Iran provided some but not all of the information.

The new Iran-IAEA July 15 "roadmap" requires that Iran deliver to the IAEA all information by August 15 that is necessary to allow the agency to conclude its investigation. The JCPOA requires that Iran allow the IAEA to answer follow-up questions and respond with all necessary information by October 15, and before the implementation of the agreement and the removal of nuclear-related sanctions. This will provide

the IAEA with key information necessary to make its final determination on the PMD issues and to verify that no such efforts are taking place in the future.

Resolving the questions about the past military dimension issue is important but is not a prerequisite for designing the verification and monitoring system. Nor is it realistic or necessary to expect a full "confession" from Iran that it pursued nuclear weapons in the past. After having spent years denying that it pursued nuclear weapons and having delivered a fatwa against nuclear weapons, Tehran's senior leaders cannot afford to admit that Iran hid a nuclear weapons program.

Is sanctions relief dependent on the PMD investigation?

Iran must provide the IAEA with the information and access the agency requires to complete its long-running investigation into the past possible military dimensions of Iran's nuclear program before Iran receives any relief from UN, U.S. or EU sanctions. However, sanctions relief is not dependent on the agency issuing its final report on the PMDs.

What is the IAEA's broader conclusion?

The "broader conclusion" is a rigorous designation issued by the IAEA to provide assurance that a country's nuclear program is entirely peaceful. It requires implementation of the additional protocol for a number of years, and in Iran's case, compliance with the JCPOA. The IAEA makes two conclusions as part of the broader conclusion, that there has been no diversion of nuclear materials and no indication of undeclared nuclear materials and activities. The broader conclusion goes beyond the conclusion issued to countries only applying a safeguards agreement or with outstanding questions. Under a safeguards agreement, the IAEA only reports that declared nuclear material has been used only for peaceful purposes for the year in question.

How does the JCPOA procurement channel work and how long will it last?

Under the terms of the JCPOA, if Iran wants to purchase any goods or materials that could be used for its nuclear program that are identified on established IAEA dual-use lists, the Joint Commission working group on procurement would need to review the request and authorize any purchases. The working group would also be permitted to conduct end-user checks to ensure that the materials ended up in the right places. Combined with the complete inventory of the materials that Iran uses for its nuclear program, this will help ensure a thorough accounting of dual-use materials to prevent siphoning off for a covert program. This procurement channel mechanism will be in place for no less than 10 years.

How long does the sanctions snap-back provision last?

For the 10-year duration of UN Security Council Resolution 2231, if a dispute is not addressed through the Joint Commission to the satisfaction of the P5+1, any one of the six-countries could act to snap back earlier UN Security Council sanctions on Iran. (The JCPOA specifies that if a complaining party believes that there has been a violation of the agreement even after good faith efforts to resolve it, it may call for a vote on a resolution to extend the suspension of earlier sanctions, which only requires one of the P5 to veto to trigger the re-imposition of UN sanctions.) The United States has said the P5 have agreed that they will maintain the same approach for an additional five years.

How long Does the Joint Commission last?

The JCPOA does not specifically state when the termination date for the Commission is, but some requirements of the JCPOA that the Joint Commission is responsible for overseeing will last 25 years. Therefore it will have responsibilities that last for 25 years, and possibly longer.

5. Other Issues

Does Congress have a right to see the confidential IAEA-Iran documents on concluding the agency's PMD investigation?

As an independent organization, the IAEA's process should not be subject to approval of the P5+1 or the U.S. Congress. Nor should the IAEA be forced to disclose sensitive information that could also compromise Iran's legitimate security concerns. While it is critical that Iran cooperate with the IAEA and provide the agency with the access and information it requires, the content of the agency's investigations and inspections are not typically public because sensitive information is at stake.

Additionally, the IAEA laid out its concerns about past nuclear weapons work, and it should be up to the agency to determine what access is necessary to resolve its questions, not the P5+1. The IAEA does answer to its Board of Governors, where the United

States is represented, and will be required to report on progress to the UN Security Council, where again, the United States will be fully appraised of the process.

Will the United States be able to impose more sanctions on Iran for non-nuclear related concerns?
Yes. The JCPOA prohibits the reissuance of sanctions related to Iran's nuclear activities. If the United States imposes these measures then Iran can walk away from the deal. However, additional U.S. sanctions for terrorism and human rights related issues are fair game.

Will the JCPOA trigger or head-off a proliferation cascade in the Middle East, with countries like Saudi Arabia deciding to move toward nuclear weapons.
The JCPOA imposes strict limits and monitoring on Iran's nuclear program, thus reducing the risk that Iran may someday pursue nuclear weapons. This will provide assurance to the international community that Tehran is not seeking nuclear weapons and that any deviations from the deal will be quickly noticed. This will reduce, not increase, the temptation by some states in the Middle East—particularly Saudi Arabia—to pursue the technical capabilities necessary to acquire nuclear weapons.

The alternative—no comprehensive P5+1 and Iran nuclear deal—would lead to an unconstrained Iranian nuclear program with far less monitoring. This poses a far greater threat to countries in the Middle East and could increase the possibility of a "proliferation cascade" in the region.

How does the Iran Deal compare to the 1994 Agreed Framework with North Korea?
Iran is not North Korea. The JCPOA differs substantially from agreements reached with North Korea in 1994 and 2005 regarding its nuclear program.

The IAEA inspections and monitoring measures on Iran's nuclear program will be much more intrusive and stringent than those placed on North Korea, which were limited to one site. Iran has also demonstrated that it values its position in the region and international community and it wants UN Security Council sanctions on its program removed. This only comes through adherence to an agreement.

The 1994 Agreed Framework, unlike the JCPOA, did not require North Korea to dismantle or modify its plutonium production reactor and it did not include stringent transparency and inspection provisions across the entire fuel cycle and across the country. As a result, North Korea was able to evade detection and pursue a secret uranium-enrichment program.

Is a "Better Deal" possible or necessary?
No. Nevertheless, some critics of the agreement like the American Israel Public Affairs Committee (AIPAC) argue that Congress should reject the JCPOA and "urge the administration to work with our allies to maintain economic pressure on Iran while offering to negotiate a better deal."

But that is wishful thinking.

If Congress blocks implementation of the JCPOA, it would turn an American diplomatic breakthrough into a strategic disaster. The result would be that:

- The United States would undercut its European allies and other UNSC members,
- The necessary international support for Iran-related sanctions would melt away,
- Iran would be able to rapidly and significantly expand its capacity to produce weapons-grade material,
- The United States would lose out on securing enhanced inspections needed to detect a clandestine weapons effort,
- The international nonproliferation regime would suffer a severe blow, undermining the stability of the nuclear Nonproliferation Treaty as the foundation for international security, and
- The risk of a nuclear-armed Iran and the risk of a war over Iran's program would increase.

On balance, the P5+1 and Iran nuclear deal is a strong, effectively verifiable, long-term agreement that increases the security of the United States, its allies, and Iran. It is an opportunity that we cannot afford to squander.

APPENDIX A

Summary of the Key Components of the JCPOA

The Joint Comprehensive Plan of Action is a detailed, 159-page agreement with five annexes. Implementation schedules and enforcement options are also governed by UN Security Council Resolution 2231, adopted on July 20, 2015, and Iran's compliance with the JCPOA will be verified by the IAEA according to certain requirements set forth in the agreement.

The following is a summary of the timeline and key components of the multi-year agreement.

Timeline for Implementation

- Finalization Day: conclusion of the agreement on July 14, then Iran and the United States complete domestic review processes, Iran provides the IAEA with information necessary for the agency to complete its PMD investigation
- Adoption Day: 90 days after the passage of the UN Security Council Resolution endorsing the deal (July 20, 2015), afterward Iran and the P5+1 take steps (outlined below) to meet their commitments by implementation day
- Implementation Day: The IAEA certifies that Iran has taken the key steps to restrict its nuclear program and put in place increased monitoring, and the U.S., EU, and UN implement sanctions relief

Key Requirements and Actions Mandated by the JCPOA	
Enrichment	• For 10 years operating centrifuges reduced to 5,060 IR-1 machines, total machines is 6,104 IR-1s • Excess centrifuges (over 13,000) dismantled and stored under IAEA monitoring • For 15 years level of uranium enrichment capped at 3.67 percent uranium-235 • For 15 years enrichment only at Natanz • For 10 years no production of additional IR-1 centrifuges • Between years 11-13 Iran can replace IR-1s with the equivalent capacity of IR-6 and IR-8 machines and limits lasting to years 14-15
Uranium Stockpile	• For 15 years the stockpile is kept under 300 kilograms of 3.67 percent enriched uranium in total (all forms) • Excess enriched uranium sold, shipped abroad for storage, or diluted to natural uranium levels • Uranium oxide and scrap material enriched up to 20 percent fabricated into fuel for Tehran Research Reactor, blended down, or shipped out
Fordow	• Converted to research facility for stable isotope production with Russian cooperation • 1,044 IR-1 centrifuges in six cascades will remain here, 328 for production, the remaining 700 are idle • For 15 years no introduction of uranium at the facility

Key Requirements and Actions Mandated by the JCPOA, CONTINUED	
Advanced Centrifuge Research and Development	• For 8.5 years Iran may conduct research with uranium on a single IR-4, IR-5, IR-6 and IR-8 centrifuge at Natanz • After 8.5 years test up to 30 IR-6s and 30 IR-8s • After 8 years manufacture up to 200 IR-6s and 200 IR-8s centrifuges without rotors • For 10 years Joint Commission review and approval of changes to the research and development plan
Arak Reactor	• Remove and disable the original core of the Arak reactor • Replace the core of the Arak reactor to reduce weapons-grade plutonium output, certified by the Joint Commission • For 15 years no reprocessing of spent nuclear fuel with an intention to never reprocess • Permanent commitment to ship out spent nuclear fuel • For 15 years no heavy-water reactors in Iran • For 15 years no accumulation of heavy water in Iran • Construction of hot cells or shielded glove boxes of certain specifications subject to approval of the Joint Commission
Monitoring and Verification	• By 15 October 2015 Iran fully implements PMD "roadmap" agreed with IAEA • For 10 years approval of the purchase of dual-use materials by the Joint Commission working group • For 25 years continuous monitoring of Iran's uranium mines and mills • For 20 years continuous monitoring of Iran's centrifuge production facilities • For 15 years Joint Commission oversight of IAEA access requests to inspect undeclared sites • Permanent prohibition of certain weaponization related activities • Implementation and eventual ratification of an additional protocol to Iran's safeguards agreement • Permanent implementation of modified Code 3.1 of the Subsidiary Arrangements to its Safeguards Agreement
Joint Commission	• For 25 years Joint Commission (composed of P5+1, EU and Iran for a total of 8 voting members) will hold quarterly meetings, or by request, to oversee the deal • Dispute resolution mechanism within 35 days; 15 day dispute resolution mechanism within the Joint Commission, with optional 15 day ministerial review and/or arbitration opinion from a 3 member panel, followed by 5 day review of the arbitration opinion. If no resolution and complaining party sees action as "significant non-performance," the unresolved issue can be treated as grounds to cease performing commitments in whole or part, complaining party will notify UN Security Council • Any party can go to the UN Security Council to put sanctions back in place if there is noncompliance by vetoing a resolution calling for the continuance of sanctions
UN Sanctions	• UNSC resolution 2231 endorsing JCPOA outlines termination of all previous resolutions targeting Iran's nuclear program—1696 (2006), 1737 (2006), 1747 (2007), 1803 (2008), 1835 (2008), 1929 (2010)—on implementation day. • For 10 years sanctions are subject to snapback by veto of a resolution calling for the continuation of suspension • After 10 years UN will cease to be seized of Iran's nuclear file • For 5 years the heavy arms embargo will remain in place • For 8 years the ballistic missile restrictions will remain in place

Key Requirements and Actions Mandated by the JCPOA, CONTINUED	
U.S. Sanctions	• Cease the application of economic sanctions against Iran's oil and banking sector allowing Iranian banks and companies to reconnect with international systems • Will remove designation of certain entities and individuals • Allows for licensed non-U.S. entities that are owned or controlled by a U.S. person to engage in activities with Iran permitted under JCPOA • Allows for the sale of commercial passenger aircraft to Iran • Allows for license for importing Iranian-origin carpets and foodstuffs into United States • United States takes appropriate measures to address laws at state or local level preventing full implementation of JCPOA – United States will actively encourage officials to adhere to JCPOA policy • For 8 years after Adoption date, or sooner if IAEA concludes that all nuclear activity in Iran remains peaceful, U.S. will seek legislative action to terminate/modify nuclear related sanctions • U.S. sanctions on Iran targeting human rights, terrorism and missile activities remain • United States can impose additional sanctions for non-nuclear issues (terrorism, human rights, etc.)
EU Sanctions	• Terminate all provisions of the EU Regulation related to Iran's nuclear program • Includes: financial and banking transactions; transactions in Iranian Rial; provision of U.S. banknotes to Iranian government; access to SWIFT; insurance services; efforts to reduce Iran's crude oil and petrochemical product sales; investment; transactions with Iran's energy and shipping sector; trade in gold and other precious metals; trade with Iran's automotive sector • Removes individuals and entities designated under sanctions • EU refrains from re-introducing sanctions terminated under JCPOA (Iran views any re-introduction as grounds to cease performing its commitments) • Refrain from policy intended to adversely affect normalization of economic relations with Iran • For 8 years after adoption day or at the finding of the IAEA broader conclusion EU's arms embargo and restrictions on transfer of ballistic missiles remain

APPENDIX B

Key Sanctions and UN Resolutions on Iran

Iran has been subjected to fairly comprehensive U.S. sanctions since the early 1980s for a variety of reasons, including the regime's support for terrorism, human rights violations, and proliferation concerns.

Additionally, since the UN Security Council took up the Iran nuclear file in 2006, Iran has been subjected to increasingly rigorous multilateral sanctions aimed at encouraging compliance with its nuclear nonproliferation obligations and addressing international concerns about the nature of its nuclear program.

These sanctions focus on preventing Iran from acquiring the technologies and materials needed for its nuclear and missile programs by requiring all countries to restrict sensitive exports to Iran. The sanctions geared toward slowing Iran's nuclear and missile programs appear to be increasingly effective as additional countries strengthen controls over exporting sensitive goods to Iran. But they have not prevented Iran from improving its domestic capabilities nor led Iran's leadership to abandon the pursuit of a nuclear weapons capability.

U.S.-led sanctions have increasingly targeted the Iranian energy sector, the most critical part of its economy, to impose economic pressure on Iran in the hopes of influencing the decision-making of Iran's leadership. More recently, the Iranian banking sector has been targeted by sanctions designed to isolate it from the global financial system by both the United States and the European Union.

Sanctions should remain an important component of efforts to demonstrate to Iran that it has nothing to gain and much to lose from its current nuclear ambitions, but sanctions will not be enough to end any nuclear aspirations.

The UN Security Council first resorted to employing sanctions in 2006 when Iran refused to suspend all uranium-enrichment and heavy-water-related activity. Three other resolutions tightening sanctions followed, with a June 2010 resolution introducing some of the most sweeping measures against Iran to date. Taken together, sanctions introduced under these resolutions prohibit Iran's access to proliferation-sensitive items, technical assistance, and technology. The sanctions also target designated Iranian entities and persons involved in the nuclear and ballistic missile activities that are barred by the resolutions.

UN Security Council Sanctions

Resolution	Key Proliferation-Related Provisions
1737 (2006)	• Prevent the supply of all items which could contribute to Iran's enrichment-related, reprocessing, or heavy water-related activities, or to the development of weapon delivery systems; • Iran may not export any items or technology related to nuclear programs or ballistic missile programs; • Iran should not receive financial services related to the supply or use of prohibited materials or technology; • States should freeze economic assets owned or controlled by people associated with supporting Iran's nuclear activities or weapon delivery systems.
1747 (2007)	• Iran should not receive grants, financial services, or loans except for humanitarian reasons.
1803 (2008)	• States should inspect the cargoes to and from Iran of any Iranian-owned or operated companies, provided there is reason to suspect the cargo may contain prohibited materials; • States should monitor the activities of Iranian financial institutions operating in their territories to prevent any activities that may contribute to the proliferation sensitive nuclear activities; • Individuals who are associated with Iran's proliferation sensitive nuclear activities or nuclear weapon delivery systems should not be allowed to enter the states.
1929 (2010)	• States should seize and dispose of any items being supplied or transferred to Iran which could contribute to Iran's nuclear program; • Iran should not acquire interest in uranium mining, production, or use of nuclear materials and technology; • All states should prohibit Iranian investment in uranium mining and production in their territory; • States should inspect all cargo to and from Iran if the state has reasonable reason to believe the cargo is related to Iran's pursuit of nuclear technology. States should refuse to fuel or supply ships for the same reason; • Iran should not receive financial services related to the supply or use of prohibited materials or technology; • States should not allow new branches or representative offices of Iranian banks in their territory if there is reason to believe they may be connected to proliferation-sensitive activities.

European Union Sanctions

Council Document	Proliferation-Related Sanctions
Council Regulation 423 (2007)	• Freezes the assets of individuals and entities related to Iran's nuclear and ballistic missile programs; • Prohibits the transfer of dual-use goods that could be used for Iran's nuclear program.
Council Regulation 961 (2010)	• Bans investments, sales, and supply of equipement and technology to Iran's energy sector; • Requires members states to inspect suspicious cargo going to and from Iran.
Council Regulation 267 (2012)	• Bans member states from importing oil or purchasing petrochemical products from Iran; • Bans insurance on shipments of Iranian oil; • Freezes assets connected to the Central Bank of Iran; • Prohibits trade using precious metals with Iran.

Summary of Major U.S. Sanctions on Iran

Financial and Trade Restrictions	
Banking	On Nov. 6, 2008, the Department of the Treasury banned U.S. banks from handling indirect transactions with Iranian banks.
	The Comprehensive Iran Sanctions, Accountability, and Divestment Act (CISADA) of 2010 excludes foreign banks from the U.S. financial system if they conduct transactions with the Islamic Revolutionary Guard Corps or entities sanctioned by executive orders or the United Nations.
	On Nov. 21, 2011, Secretary of the Treasury Timothy Geithner used Section 311 of the USA PATRIOT Act to identify Iran as a "jurisdiction of primary money laundering concern."
	The National Defense Authorization Act of 2012 restricts foreign banks that do business with Iran's central bank from accessing the U.S. financial system.
Assets Freeze	*Executive Order 13224 (2001)* authorizes the president to freeze assets of entities supporting international terrorism and bar U.S. transactions with these entities.
	Executive Order 13382 (2005) grants the President the authority to block the assets of WMD proliferators.
Trade and Investment	*Executive Order 12959 (1995)* bans U.S. firms from trading with or investing in Iran, with exemptions for food and medical products.
Oil and Gas Sector Restrictions	
Crude Oil Purchases	*Executive Order 12613 (1987)* bans U.S. companies from importing Iranian oil.
Refined Petroleum	The CISADA amended the Iran Sanctions Act (ISA) of 1996 by sanctioning the sale of gasoline and the sale of equipment related to Iranian energy imports and production to Iran.
Trade and Investment	The ISA sanctions foreign entities that invest in Iran's energy sector.
	Executive Order 13590 (2011) modifies the ISA to include the sanctioning of sales to Iran of oil and gas exploration and extraction equipment.
Strategic Trade Controls	
Nuclear and Missile Technology	*The Iran-Iraq Arms Nonproliferation Act of 1992* imposes sanctions on foreign entities that supply Iran with WMD technology or "destabilizing" conventional arms.
	The Iran-North Korea-Syria Nonproliferation Act of 2000 authorizes sanctions on individuals or corporations that are assisting Iran's WMD programs.
Conventional Arms	*The Arms Export Control Act of 1976* bans U.S. arms sales to Iran, given its status as a state sponsor of terrorism.
	The International Emergency Economic Powers Act of 1977, implemented by executive orders, allows for restrictions on the sale of dual-use items to Iran.
Shipping	*Executive Order 13382 (2005)* freezes the U.S.-based property of Islamic Republic of Iran Shipping Lanes and other related entities.
Travel	The CISADA imposes travel bans on Iranians determined to be involved in human rights abuses since Iran's June 12, 2009, presidential elections.

APPENDIX C

Iran-IAEA Framework for Cooperation

Iran and the International Atomic Energy Agency (IAEA) signed a separate agreement on July 14, 2015 to resolve the agency's outstanding concerns about Iran's nuclear program and possible weaponization activities. The alleged weaponization activities are frequently referred to as the possible military dimensions, or PMDs.

Although much of Iran's nuclear program consists of dual-use technology that can be dedicated to civil nuclear energy and nuclear weapons use, Tehran is widely believed to have been engaged in a series of activities that can be used for the development of a nuclear warhead. U.S. intelligence estimates have long referred to these activities as evidence of an Iranian nuclear weapons program.

In November 2011, the IAEA released information in an annex to its quarterly report that detailed Iran's suspected warhead work based on intelligence it received from the United States and several other countries, as well as its own investigation.[20] According to the report, Iran was engaged in an effort prior to the end of 2003 that spanned the full range of nuclear weapons development, from acquiring the raw nuclear material to working on a weapon that could eventually be delivered via a missile.

The series of projects that made up Iran's nuclear program, which the IAEA in its November 2011 report called "the AMAD Plan," appears to have been overseen by senior Iranian figures who were engaged in working-level correspondence consistent with a coordinated program.[21]

There are 12 main areas for investigation that the IAEA laid out in the November 2011 annex: 1) program management and structure; 2) procurement activities; 3) nuclear material acquisition; 4) nuclear components for an explosive device; 5) detonator development; 6) initiation of high explosives and associated experiments; 7) hydrodynamic experiments; 8) modeling and calculations; 9) neutron initiator; 10) conducting a test; 11) integration into a missile delivery vehicle; and 12) fusing, arming, and firing system.

Iran has denied pursuing a warhead-development program and claims that the information on which the IAEA assessment is based is a fabrication.

On November 11, 2013, Iran and the IAEA reached an agreement outlining Tehran's cooperation with the agency's investigation into Iran's past nuclear activities with possible military dimensions and to clarify the agency's unresolved concerns about Iran's nuclear program. The parties agreed on a step-by-step process to address all of the outstanding issues. Implementation of the framework proceeded on schedule, until Iran missed an August 25, 2014 deadline to provide information on two weaponization activities. Prior to that, Iran met two deadlines and provided information on 16 other areas of concern. The areas in which Iran has already provided information are as follows:

- Provide mutually agreed relevant information and managed access to the Gchine mine in Bandar Abbas.
- Provide mutually agreed relevant information and managed access to the Heavy Water Production Plant.
- Provide information on all new research reactors.
- Provide information with regard to the identification of 16 sites designated for the construction of nuclear power plants.

20. IAEA Board of Governors, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran," GOV/2011/65, November 8, 2011 (hereinafter IAEA 2011 Iran report).

21. Ibid.

- Provide clarification of the announcement made by Iran regarding additional enrichment facilities.
- Provide further clarification of the announcement made by Iran with respect to laser enrichment technology.
- Provide mutually agreed relevant information and managed access to the Saghand mine in Yazd.
- Provide mutually agreed relevant information and managed access to the Ardakan concentration plant.
- Submit an updated Design Information Questionnaire for the IR-40 reactor (heavy-water reactor at Arak).
- Take steps to agree with the IAEA on the conclusion of a Safeguards Approach for the IR-40 reactor.
- Provide mutually agreed relevant information and arrange for a technical visit to Lashkar Ab'ad Laser Centre.
- Provide information on source material that has not reached the composition and purity suitable for fuel fabrication or for being isotopically enriched, including imports of such material and on Iran's extraction of uranium from phosphates.
- Provide information and explanations for the IAEA to assess Iran's stated need or application for the development of exploding bridge wire detonators.
- Provide mutually agreed information and arrange a technical visit to a centrifuge research and development center.
- Provide mutually agreed information and managed access to centrifuge assembly workshops, centrifuge rotor production workshops, and storage facilities.
- Conclude the safeguards approach for the IR-40 reactor.

As of July 14, 2015, these were the unresolved Issues from the IAEA-Iran framework of November 2013:

- Exchange information with the IAEA with respect to the allegations related to the initiation of high explosives, including the conduct of large-scale high-explosives experimentation in Iran.
- Provide mutually agreed relevant information and explanations related to studies made and papers published in Iran in relation to neutron transport and associated modeling and calculations and their alleged application to compressed materials.

As part of a July 14 IAEA-Iran "roadmap" agreement developed in conjunction with JCPOA, Iran agreed to provide the IAEA with information on all areas of concern by August 15, 2015.

The agency will have until September 15 to ask any additional follow-up questions. Iran will then have until October 15 to provide the additional answers. The IAEA will then issue an assessment of the material by December 15. Iran must provide all of the information required by the IAEA before the JPCOA can be implemented. This ensures that Iran will not receive any sanctions relief until the IAEA receives the information it needs to resolve the outstanding PMD concerns.

The following is the text of the July 14 IAEA-Iran agreement:

Joint Statement by the IAEA Director General Yukiya Amano and the Vice-President of the Islamic Republic of Iran, President of the Atomic Energy Organization of Iran, Ali Akbar Salehi

IAEA Director General Yukiya Amano and the Vice-President of the Islamic Republic of Iran, President of the Atomic Energy Organization of Iran, Ali Akbar Salehi agreed on 14 July 2015 the following "roadmap" for the clarification of past and present outstanding issues regarding Iran's nuclear program.

The International Atomic Energy Agency (IAEA) and the Islamic Republic of Iran (Iran) agree, in continuation of their cooperation under the Framework for Cooperation, to accelerate and strengthen their cooperation and dialogue aimed at the resolution, by the end of 2015, of all past and present outstanding issues that have not already been resolved by the IAEA and Iran.

In this context, Iran and the Agency agreed on the following:

1. The IAEA and Iran agreed on a separate arrangement that would allow them to address the remaining outstanding issues, as set out in the annex of the 2011 Director's General report (GOV/2011/65). Activities undertaken and the outcomes achieved to

date by Iran and the IAEA regarding some of the issues will be reflected in the process.

2. Iran will provide, by 15 August 2015, its explanations in writing and related documents to the IAEA, on issues contained in the separate arrangement mentioned in paragraph 1.

3. After receiving Iran's written explanations and related documents, the IAEA will review this information by 15 September 2015, and will submit to Iran questions on any possible ambiguities regarding such information.

4. After the IAEA has submitted to Iran questions on any possible ambiguities regarding such information, technical-expert meetings, technical measures, as agreed in a separate arrangement, and discussions will be organized in Tehran to remove such ambiguities.

5. Iran and the IAEA agreed on another separate arrangement regarding the issue of Parchin.

6. All activities, as set out above, will be completed by 15 October 2015, aimed at resolving all past and present outstanding issues, as set out in the annex of the 2011 Director General's report (GOV/2011/65).

7. The Director General will provide regular updates to the Board of Governors on the implementation of this "roadmap."

8. By 15 December 2015, the Director General will provide, for action by the Board of Governors, the final assessment on the resolution of all past and present outstanding issues, as set out in the annex of the 2011 Director General's report (GOV/2011/65). A wrap up technical meeting between Iran and the Agency will be organized before the issuance of the report.

9. Iran stated that it will present, in writing, its comprehensive assessment to the IAEA on the report by the Director General.

10. In accordance with the Framework for Cooperation, the Agency will continue to take into account Iran's security concerns.

IAEA Imagebank

IAEA Director General Yukiya Amano and Vice President of the Islamic Republic of Iran Ali Akhbar Salehi signing a "roadmap" for the clarification of past and present issues regarding Iran's nuclear program in Vienna, July 14, 2015.

APPENDIX D

Understanding Breakout Calculations

As the U.S. intelligence community has consistently noted since 2007, Iran has the scientific, technical, and industrial capacity to produce nuclear weapons if it chooses to do so. The U.S. intelligence community has also assessed that if Iran were to make a decision to build nuclear weapons, it is more likely that it would seek to do so by means of undeclared, secret facilities, a scenario sometimes called a "sneak-out."

Thus, the realistic goal of the P5+1 for the final deal was not to make breakout impossible but to make it a more difficult and unattractive policy option for Iran.

The JCPOA accomplishes this core goal by putting in place restrictions on its uranium-enrichment capacity, the level of uranium enrichment, its uranium stockpile, and research and development in a way that lengthens the time it would take for Iran to amass enough bomb-grade nuclear material to no less then 12 months for more than a decade, by eliminating its ability to produce and separate plutonium for at least 15 years, and by putting in place stringent monitoring and verification mechanisms to quickly detect and deter any attempt to pursue a covert program.

The JCPOA will limit Iran's installed centrifuges to 6,104 IR-1 centrifuges, of which 5,060 will be used to enrich uranium for 10 years. This, combined with the 300-kilogram limit on Iran's stockpile of 3.5 percent enriched uranium gas, increases the time it would take Iran to accumulate enough material for one bomb to more than a year, if such an effort were not detected.

Other restrictions limit Iran's breakout potential through the uranium route. For 15 years, Iran's low-enriched uranium stockpile cannot exceed 300 kg. Agreed limits on Iran's deployment of advanced centrifuge machines in years 11-13 of the JCPOA will ensure that its overall enrichment capacity remains the same. Given other reporting requirements and monitoring of Iran's centrifuge program through year 20 of the agreement, Tehran will not have the ability to quickly ramp up its enrichment capacity without prompt detection.

It is important to remember that the milestone being measured in this definition of "breakout" is the accumulation of enough uranium hexafluoride gas for one bomb, not the bomb's actual construction or initial operating capability. Although the production of fissile material is arguably the most resource intensive and difficult step toward building nuclear weapons, there are several additional technical hurdles, including designing and constructing an explosive device and integrating it into a delivery system (most likely a ballistic missile) so it would reliably detonate.

Iran would need to convert the material into powder form, fabricate the metallic core of the weapon from the powder, assemble other weapons components that had been previously developed or acquired on an independent track, and integrate the weapons package into a delivery vehicle.

This process could be more easily hidden, but it would require several months or longer.

States developing nuclear weapons typically conduct multiple, large-scale nuclear test explosions to perfect their warhead designs, particularly the smaller, lighter, and more efficient designs needed for missiles.

With existing U.S. national means of intelligence and the International Monitoring System established to verify compliance with the Comprehensive Test Ban Treaty, any Iranian test would very likely be detected. If Iran were to try to "sneak out" to build nuclear weapons, Tehran would have to accept a lower confidence level concerning its warhead design or risk detection.

Iran is very unlikely to break out of the nuclear Nonproliferation Treaty to acquire only one nuclear weapon.

Even if Iran were willing to tolerate the large uncertainties deriving from an untested nuclear weapons design, a single weapon would add additional uncertainties regarding missile performance and the ability of the warhead to penetrate the sophisticated missile defenses deployed in the region. Tehran would be staking everything on the perfect performance of one untested system. It is highly improbable that Iran would plan to break out of the NPT by building only one nuclear weapon. Calculating timelines based on a one-device scenario therefore compounds the misimpression already left by using a breakout definition that falls short of actually building a weapon.

However, if Tehran were to choose to increase the odds of success by planning to build multiple weapons, it would increase the need for fissile material, thus lengthening the breakout timelines and increasing the chances of international detection and blocking actions.

The robust inspection regime in the JCPOA would include increased reporting requirements for Iran on its nuclear activities and grant the right of timely, on-site inspections at undeclared sites to the International Atomic Energy Agency. While designed to detect clandestine enrichment activities, such a regime will also significantly enhance the collection of information relevant to the identification of post-enrichment activities that could be targeted to disrupt a weapons program.

APPENDIX E

Iran's Ballistic Missiles and the Nuclear Deal

For more than a decade, the possibility of Iran developing nuclear warheads for its medium-range ballistic missiles has been at the top of U.S. security worries for the region, followed by Iran's potential to expand the range of its missile forces to threaten Europe and the United States.

With approximately 1,000 short- and medium-range ballistic missiles, Iran has one of the largest deployed ballistic missile forces in the Middle East. Its most sophisticated deployed ballistic missile is the liquid-fueled Shahab-3. Based on the North Korean Nodong missile, the Shahab-3 has a range of about 1,300 kilometers. Variations of the Shahab-3, including the Ghadr-1, are reported to have a range of almost 2,000 kilometers.

Iran has made progress in developing and testing solid-fueled missile technologies, which could significantly increase the mobility of Iran's missile force. Iran first tested a two-stage, solid fuel-propelled missile, the Sajjil-2, which has a reported range of roughly 2,000 kilometers, in 2007. It conducted several more tests through February 2011. However, export control restrictions have prevented Iran from developing the capacity to domestically produce solid-fueled motors, which may account for Iran not having recently tested the Sejjil-2. Iran has also developed a two-stage, liquid-fueled, space launch vehicle (SLV), the Safir. Between February 2009 and February 2015 Iran successfully launched five satellites into space using the Safir SLV. A 2009 report by the

Shaiegan/AFP/Getty Images

Iran prepares to test a Shahab-3 missile in 2009. The range of the Shahab-3 allows Iran to target Israel and other U.S. assets in the Middle East.

National Air and Space Intelligence Center (NASIC) assessed that the Safir "can serve as a test bed for long-range ballistic missile technologies" and could serve as an intermediate-range ballistic missile (IRBM) if converted to a ballistic missile. It is believed that Iran is also developing a larger space launch vehicle, the Simorgh, which has yet to be tested.

Iran Deal Heads Off Threat of Nuclear Warheads, Continues Restrictions on Missiles

Now, with the conclusion of the Joint Comprehensive Plan of Action (JCPOA) between the P5+1 and Iran, which will block Iran from building nuclear weapons for well over a decade, along with a new UN Security Council resolution (2231) on the nuclear deal, which extends restrictions on Iran's ballistic missile activities and trade, the potential threat from Iranian ballistic missiles has been radically reduced.

In the long negotiations between Iran and the P5+1 countries (China, France, Germany, Russia, the United Kingdom, and the United States), the parties had avoided contentious issues beyond the nuclear realm in the belief that resolving the nuclear imbroglio was the highest international security priority and including other issues could overload the agenda and jeopardize reaching any agreement.

Senior U.S. officials stressed the talks were focused exclusively on resolving concerns about Iran's growing nuclear program—not, for example, on its support for terrorism, behavior in the region, or human rights practices.

However, among the restrictions established by six UN Security Council resolutions in response to Iran's sensitive nuclear activities are restrictions on Iran's ballistic missile activities relating to the delivery of a nuclear weapon and restrictions on heavy conventional arms transfers to Iran.

UN Security Council Resolution 1737, passed in December 2006, stated that countries must not provide technical or financial assistance, training, or resources related to certain nuclear and ballistic missile-related goods, and that all member states must refrain from importing designated nuclear and ballistic missile-related items from Iran.

UN Security Council Resolution 1929, passed in June 2010, established a comprehensive arms embargo on Iran, banning the sale of "battle tanks, armored combat vehicles, large caliber artillery systems, combat aircraft, attack helicopters, warships, missiles or missile systems" to Iran. Iran was also prohibited from undertaking any activity related to

U.S. Navy photo

On December 9, 2002 the Spanish naval vessel *SPS Navarra* intercepted and boarded the North Korean freighter *So San*, several hundred miles southeast of Yemen at the request of the U.S. government. The *So San* was carrying a cargo of 15 Scud missiles and 15 conventional warheads with 250 kg of high explosive, 23 fuel tanks of nitric acid and 85 drums of chemicals. The incident helped lead to the establishment of the Proliferation Security Initiative.

ballistic missiles, and the resolution requires states to take necessary measures to prevent technology relevant to ballistic missiles from reaching Iran.

The primary purpose of these resolutions was to restrict Iran's sensitive nuclear activity until such time as negotiations could resume and lead to an agreement preventing Iran from building nuclear weapons.

Undersecretary of State Wendy Sherman had assured Congress during her early testimony on the negotiations that Iran's ballistic missiles would be addressed, but she did not specify how this would occur.

Iran's position was that the negotiations were about its nuclear program and not about its ballistic missiles or conventional military capabilities; a replacement resolution in response to an agreement on the nuclear issues should therefore not maintain any restrictions on its ballistic missile activities and acquisition of conventional arms. The Russians and Chinese were in support of Iran's view.

Even U.S. Secretary of State Kerry acknowledged in response to a question at his July 14 press conference that the earlier UNSC Resolution (1929) pertaining to Iran's missiles "… says specifically that if Iran comes to negotiate—not even get a deal, but comes to negotiate—sanctions would be lifted."

Missile Restrictions and Heavy Weapons Embargo Extended

Despite the Russian, Chinese and Iranian opposition, U.S. negotiators dug in their heels. Although not

explicitly addressed in the JCPOA, UN Security Council Resolution 2231, unanimously adopted on July 20, contains an eight-year restriction on Iranian (nuclear-capable) ballistic missile activities and a five-year ban on conventional arms transfers to Iran, including missiles and missile systems.

Specifically, Annex B of the new resolution "calls upon Iran not to undertake any activity related to ballistic missiles designed to be capable of delivering nuclear weapons, including launches using such ballistic missile technology." The proscription regarding Iran's nuclear-capable ballistic missile activities in UNSC Resolution 2231 ("calls upon Iran not to…") is less definitive than UNSC Resolution 1929 from 2010, which said Iran "shall not undertake," yet the restriction remains. The resolution also grants the Security Council the authority to review and deny on a case-by-case basis any transfer to Iran of materials, equipment, goods, or technology that could contribute to nuclear weapons delivery systems.

Moreover, even after restrictions on arms sales and ballistic missile activities are lifted under the new resolution, they would still be subject to re-imposition "in the event of significant non-performance by Iran of its JCPOA commitments…"

These features of the arrangement have not gone over well in Tehran. According to the official statement from Tehran, issued in response to the resolution, "Iranian military capabilities, including ballistic missiles, are exclusively for legitimate defense. They have not been designed for WMD capability, and are thus outside the purview or competence of the Security Council resolution and its annexes." A prominent Iranian hardliner complained, "The negotiating team was not supposed to negotiate on Iran's ballistic missile technology."

Despite the U.S. negotiators' success in retaining features of the earlier resolution's constraints on ballistic missiles and conventional arms, U.S. critics of the JCPOA either entirely ignore the UN's adoption of a new multi-year arms trade embargo and its continuing restrictions on Iranian (nuclear-capable) ballistic missile activities or they complain that these restrictions are not permanent.

Opponents of the Iran deal also discount the other continuing international measures of control over Iran's ballistic missiles outside the JCPOA and UNSC Resolution 2231. Iranian missile transfers to a number of specified hot spots would violate other UNSC resolutions and thus be susceptible to international interdiction. The Missile Technology Control Regime (MTCR) and the Proliferation Security Initiative (PSI) are other multilateral impediments to Iranian transfer of ballistic missiles.

Finally, a number of U.S. unilateral tools remain in place to impede ballistic missile proliferation, including executive orders, legislative prohibitions and sanctions, and bilateral cooperative measures in support of regional interdiction activities.

A Much Lower Threat From Iran's Ballistic Missiles

In spite of the hurdles, which must still be overcome to fully implement the JCPOA, it is important to consider how carrying out the nuclear deal is likely to affect Iran's potential ballistic missile capabilities during the coming decade.

First and foremost, the comprehensive nuclear deal with Iran will block Iran's pathways to nuclear weapons, thus ensuring that Iran cannot develop a nuclear warhead capable of being delivered via ballistic missile. This renders Iran's ballistic missiles far less of a threat to regional and international security.

Second, even without the nuclear weapons constraints in the JCPOA, the reality of Iran's ballistic missile program has never quite lived up to its reputation. Iran never developed or flight-tested a long-range ballistic missile; it has never even asserted a need to build one. This professed disinterest stands in contrast to Tehran's boastful posture with regard to many other home-grown weapons programs and its explicit justification for medium-range missiles as a deterrence against Israeli attack.

In fact, after developing a modest inventory of relatively inaccurate medium-range ballistic missiles, Iran seems to have put most of its recent energies into improving the performance of shorter-range missile systems, more relevant to Iran's immediate neighborhood around the Persian Gulf. No medium-range missiles have flown since 2012; even the long-awaited Simorgh space-launch vehicle, with technology relevant to developing longer-range ballistic missiles, has yet to appear. Although "death to America" may still be heard during Friday prayers in Tehran, neither the nuclear warhead nor the delivery vehicle for administering such a blow is being built.

Now, with both the JCPOA's impediments to pursuing nuclear weapons and the new UN Security Council resolution extending restrictions on nuclear-capable ballistic missile activity and missile trade years into the future, the potential magnitude of the Iranian ballistic missile threat has been significantly reduced.

APPENDIX F

The Military Option

U.S. President Barack Obama has stated that the United States will not allow Iran to obtain nuclear weapons and that "all options are on the table" to prevent this outcome. This expression is generally used as shorthand for a preventive military strike against Iran's nuclear facilities, presumably even without international authorization or broad support and absent any imminent military threat from Iran.

The objective of such an attack would be to seriously damage Iran's potential ability to develop nuclear weapons. In September 2012, however, more than 30 former high-ranking U.S. officials and military officers endorsed a report concluding that a sustained military strike on Iran by the United States would only set back Iran's nuclear program up to four years and subsequently increase Iran's motivation to build nuclear weapons to inhibit any future attack.[22]

A military attack against Iran's nuclear facilities would likely prompt Iran to withdraw from the International Atomic Energy Agency, probably accompanied by an Iranian revocation of its safeguards agreement and withdrawal from the nuclear Nonproliferation Treaty. These actions would close off the most important source of information available to the international community on the status of Iran's nuclear program and increase uncertainty over time about the extent of Iran's nuclear activities.

A military operation targeting Iran's nuclear capability would require a major, sustained air campaign. The target list would likely extend far beyond Iran's 25 declared nuclear facilities and related sites to include Iran's air defenses, command and control nodes, and means of retaliation, such as its ballistic and cruise missile forces and the naval vessels used to lay anti-ship mines. Such a military campaign would probably continue for weeks.

Beyond the strike assets, additional resources would be required for personnel recovery and post-strike battle damage assessments. A campaign of this magnitude would necessarily involve phases, allowing some Iranian assets not initially struck to be removed and hidden. Afterward, the United States would soon confront difficult decisions concerning the need to go back and attack surviving facilities or disrupt the reconstruction of those that had been destroyed.

The Iranian government's natural inclination to retaliate in response to an attack would be reinforced by popular sentiment. Iran's nationalistic population is overwhelmingly supportive of the country's nuclear program and sensitive about perceived threats to national sovereignty.

Such retaliation could take a number of forms, from ballistic missile attacks against U.S. military bases in the region and the cities, ports, and oil terminals of U.S. allies in the Persian Gulf to missile and rocket attacks against Israel. One of the most vulnerable retaliatory targets would be oil tanker traffic flowing through the Strait of Hormuz. Ninety percent of the oil produced by Persian Gulf states passes through the strait, as does almost 35 percent of all seaborne-traded oil and almost 20 percent of all oil traded worldwide.[23]

In 2006, Supreme Leader Ayatollah Ali Khamenei warned that if the United States punished or attacked Iran, then "definitely the shipment of energy from this region will be seriously jeopardized." The most effective way to drive up oil costs would be to block the strait, halting or at least reducing the passage of shipping by laying several hundred mines in the water. Iran has a variety of platforms it could use

22. "Weighing Benefits and Costs of Military Action Against Iran," The Iran Project, July 2012, http://www.wilsoncenter.org/sites/default/files/IranReport_091112_FINAL.pdf.

23. U.S. Energy Information Administration, "World Oil Transit Chokepoints," August 22, 2012, http://www.eia.gov/countries/analysisbriefs/World_Oil_Transit_Chokepoints/wotc.pdf.

for this task. From the first evidence that mines had been laid, maritime insurance rates and the price of oil would skyrocket, compelling the United States to undertake a mine-clearing campaign.

Given the limited number of mine countermeasure assets available and their vulnerability to Iranian attack, clearing even a relatively safe channel for passage would take several days; clearing the entire strait could take a month.

During a January 31, 2012, Senate Intelligence Committee hearing, Defense Intelligence Agency Director Lt. Gen. Ronald Burgess said the Iranians "have the capability, we assess, to temporarily close" the strait.[24] Other experts stated that efforts to reopen the vital waterway in the event of an Iranian closure could only be accomplished as part of a major military operation, which "could quickly become a war to clear the Iranian harbors and coast of most remnants of the country's military."[25]

Another vector of Iranian retaliation might be to sponsor Hezbollah and Hamas attacks against Israel. Thousands of short-range rockets of varying degrees of sophistication are available in Gaza and southern Lebanon for such action.

Iran could use surrogates to launch attacks on U.S. military forces deployed in the region, which has already happened sporadically and in varying degrees. In the wake of an unprovoked U.S. attack on Iran, the governments in Kabul, Baghdad, Islamabad, and elsewhere would be much less inclined to help provide protection for U.S. forces and more inclined to make deals with the militant opposition in Iran.

A close look at the military option reveals that it would fail at permanently halting Iran's nuclear weapons pursuits and present grievous new challenges for U.S. foreign, domestic, and security policies, adding incalculable costs to the nation in blood and treasure.

24. U.S. Defense Intelligence Agency, "Senate Select Intelligence Committee Holds Hearing on Worldwide Threats," January 31, 2012.

25. Caitlin Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," *International Security*, Vol. 33, No. 1 (Summer 2008): 117.

Photo by Lior Mizrahi/Getty Images

An Israeli F-16 jet takes off on December 9, 2014 at the Ovda airbase in the Negev Desert near Eilat, southern Israel.

APPENDIX G

Timeline of Nuclear Diplomacy with Iran

NOVEMBER 1967: Iran's first nuclear reactor, the U.S.-supplied five-megawatt Tehran Research Reactor (TRR), goes critical. It operates on uranium enriched to about 93 percent (it is converted to run on 20 percent in 1993), which the United States also supplies.

FEBRUARY 1970: The Iranian parliament ratifies the nuclear Nonproliferation Treaty (NPT).

1974: Shah Reza Pahlavi establishes the Atomic Energy Organization of Iran (AEOI) and announces plans to generate about 23,000 megawatts of energy over 20 years, including the construction of 23 nuclear power plants and the development of a full nuclear fuel cycle. Initiating this plan, Iran reaches an agreement with Germany to build two nuclear power reactors at Bushehr. A U.S. National Intelligence Estimate (NIE) expresses concerns that the shah's regional and nuclear ambitions may lead Iran to develop nuclear weapons.

1979: The Iranian Revolution and the seizure of the U.S. embassy in Tehran result in a severing of U.S.-Iranian ties and damages Iran's relationship with the West. Iranian nuclear projects are halted. Germany halts construction of the Bushehr power plants.

1987: Iran acquires technical schematics for building a P-1 centrifuge from the Abdul Qadeer Khan network.

1992: Congress passes the Iran-Iraq Arms Nonproliferation Act of 1992, which prohibits the transfer of controlled goods or technology that might contribute "knowingly and materially" to Iran's proliferation of advanced conventional weapons.

1993: Conversion of the TRR is completed by Argentina's Applied Research Institute. It now runs on fuel enriched to just under 20 percent, 115 kilograms of which is provided by Argentina. The contract for the conversion was signed in 1987.

JANUARY 1995: Iran signs a contract with Russia to finish constructing one of the Bushehr nuclear power plants.

AUGUST 2002: The National Council of Resistance on Iran, the political wing of the terrorist organization Mujahideen-e Khalq (MeK), holds a press conference where the organization declares Iran has built nuclear facilities near Natanz and Arak. The United States is believed to have already known about the existence of the facilities.

SEPTEMBER 12, 2003: The International Atomic Energy Agency (IAEA) Board of Governors adopts a resolution calling for Iran to suspend all enrichment- and reprocessing-related activities. The resolution requires Iran to declare all material relevant to its uranium-enrichment program and allow IAEA inspectors to conduct environmental sampling at any location. Finally, the resolution urges Iran to implement an additional protocol to its safeguards agreement. The IAEA set a deadline of Oct. 31 for Iran to meet these conditions.

OCTOBER 21, 2003: Iran agrees to meet IAEA demands by the Oct. 31 deadline. In a deal struck between Iran and European foreign ministers, Iran agrees to suspend its uranium-enrichment activities and conclude an additional protocol to its safeguard agreement.

DECEMBER 18, 2003: Iran signs an additional protocol to its IAEA safeguards agreement.

JUNE 18, 2004: The IAEA rebukes Iran for failing to cooperate with IAEA inspectors. Iran responds by refusing to suspend enrichment-related activities as it had previously pledged.

NOVEMBER 14, 2004: Iran notifies the IAEA that it will suspend enrichment-related activities following talks with France, Germany, and the United Kingdom. According to the so-called Paris Agreement, Iran would maintain the suspension for the duration of talks among the four countries. As a result, the IAEA Board of Governors decides not to refer Tehran to the UN Security Council.

FEBRUARY 27, 2005: Russia and Iran conclude a nuclear fuel supply agreement in which Russia would provide fuel for the Bushehr reactor it is constructing and Iran would return the spent nuclear fuel to Russia. The arrangement is aimed at preventing Iran from extracting plutonium for nuclear weapons from the spent nuclear fuel.

AUGUST 8, 2005: Iran begins producing uranium hexafluoride at its Isfahan facility. As a result, France, Germany, and the United Kingdom halt negotiations with Tehran.

SEPTEMBER 24, 2005: The IAEA adopts a resolution finding Iran in noncompliance with its safeguards agreement by a vote of 22-1 with 12 members abstaining. The resolution says that the nature of Iran's nuclear activities and the lack of assurance in their peaceful nature fall under the purview of the UN Security Council, paving the way for a future referral.

FEBRUARY 4, 2006: A special meeting of the IAEA Board of Governors refers Iran to the UN Security Council in a 27-3 vote, with five abstentions. The resolution "deems it necessary for Iran to" suspend its enrichment-related activities, reconsider the construction of the Arak heavy-water reactor, ratify the additional protocol to its safeguards agreement, and fully cooperate with the agency's investigation.

FEBRUARY 6, 2006: Iran tells the IAEA that it will stop voluntarily implementing the additional protocol and other non-legally binding inspection procedures.

APRIL 11, 2006: Iran announces that it has enriched uranium for the first time. The uranium enriched to about 3.5 percent was produced at the Natanz pilot enrichment plant.

JUNE 6, 2006: China, France, Germany, Russia, the United Kingdom, and the United States (the so-called P5+1, referring to the five permanent members of the UN Security Council and Germany) propose a framework agreement to Iran offering incentives for Iran to halt its enrichment program for an indefinite period of time. The proposal requires Iran to do three things before negotiations begin: cooperate fully with the IAEA investigation, resume implementing its additional protocol, and suspend all enrichment-related activities. The proposal stated that the enrichment moratorium could be lifted if Iran met these conditions and if Iran demonstrated a "credible and coherent economic rationale in support of the existing civilian power generation program." Iran later rejects the call to suspend enrichment, but says other elements of the proposal are workable.

JULY 31, 2006: The UN Security Council adopts Resolution 1696, making the IAEA's calls for Iran to suspend enrichment-related and reprocessing activities legally binding for the first time. The resolution is approved by 14 members of the council, with Qatar voting against. The resolution also endorses the P5+1 proposal for a "comprehensive arrangement" on the Iran nuclear issue.

DECEMBER 23, 2006: The UN Security Council unanimously adopts Resolution 1737, imposing sanctions on Iran for its failure to suspend its enrichment-related activities. The sanctions prohibit countries from transferring sensitive nuclear- and missile-related technology to Iran.

MARCH 24, 2007: The UN Security Council unanimously adopts Resolution 1747 in response to Iran's continued failure to comply with the council's demand to suspend uranium enrichment. The resolution expands sanctions against Iran, prohibiting it from exporting any arms, and targets additional individuals and firms.

DECEMBER 3, 2007: The United States publicly releases an unclassified summary of a new National Intelligence Estimate (NIE) on Iran's nuclear program. The NIE says that the intelligence community judged "with high confidence" that Iran halted its nuclear weapons program in the fall

of 2003 and assessed with moderate confidence that the program had not resumed as of mid-2007. The report defines Iran's nuclear weapons program as "design and weaponization work" as well as clandestine uranium conversion and enrichment. The NIE also said that Iran was believed to be technically capable of producing enough highly enriched uranium for a nuclear weapon between 2010 and 2015.

MARCH 3, 2008: The UN Security Council passes Resolution 1803, further broadening sanctions on Iran. The resolution was adopted in a 14-0 vote with Indonesia abstaining. It requires increased efforts on the part of member states to prevent Iran from acquiring sensitive nuclear or missile technology and adds 13 persons and seven entities to the UN blacklist. The resolution calls on states to inspect the cargoes of transports suspected of violating the sanctions.

JUNE 14, 2008: The P5+1 present a new comprehensive proposal to Iran updating its 2006 incentives package. The new proposal maintained the same basic framework as the one in 2006, but highlighted an initial "freeze-for-freeze" process wherein Iran would halt any expansion of its enrichment activities while the UN Security Council agreed not to impose additional sanctions. Officials from P5+1 countries said that a key aim of the new initiative was demonstrating clearly to the Iranian people the benefits of cooperation.

APRIL 8, 2009: Following an Iran policy review by the new Obama administration, the United States announces that it would participate fully in the P5+1 talks with Iran, a departure from the previous administration's policy requiring Iran to meet UN demands first.

SEPTEMBER 25, 2009: President Barack Obama, British Prime Minister Gordon Brown, and French President Nicolas Sarkozy announced that Iran has been constructing a secret, second uranium-enrichment facility in the mountains near the holy city of Qom. IAEA spokesman Marc Vidricaire said that Iran informed the agency Sept. 21 about the existence of the facility, but U.S. intelligence officials said Iran offered the confirmation only after learning that it had been discovered by the United States.

OCTOBER 1, 2009: The P5+1 and Iran agree "in principle" to a U.S.-initiated, IAEA-backed proposal to fuel the TRR. The proposal entails Iran exporting the majority of its 3.5 percent-enriched uranium in return for 20 percent-enriched uranium fuel for the TRR, which has exhausted much of its supply. This agreement was later met with domestic political opposition in Iran, resulting in attempts by Tehran to change the terms of the "fuel swap."

FEBRUARY 9, 2010: Iran begins the process of producing 20 percent-enriched uranium, ostensibly for the TRR.

MAY 17, 2010: Brazil, Iran, and Turkey issue a joint declaration attempting to resuscitate the TRR fuel-swap proposal. In the declaration, Iran agrees to ship 1,200 kilograms of 3.5 percent-enriched uranium to Turkey in return for TRR fuel from France and Russia. France, Russia, and the United States reject the arrangement, citing Iran's larger stockpile of 3.5 percent-enriched uranium and the failure of the declaration to address Iran's enrichment to 20 percent.

JUNE 9, 2010: The UN Security Council adopts Resolution 1929, significantly expanding sanctions against Iran. In addition to tightening proliferation-related sanctions and banning Iran from carrying out nuclear-capable ballistic missile tests, the resolution imposes an arms embargo on the transfer of major weapons systems to Iran. The resolution received 12 votes in favor, with Brazil and Turkey voting no and Lebanon abstaining.

JULY 1, 2010: Obama signs the Comprehensive Iran Sanctions, Accountability, and Divestment Act, tightening U.S. sanctions against firms investing in Iran's energy sector, extending those sanctions until 2016, and imposing new sanctions on companies that sell refined petroleum to Iran. The law seeks to identify countries at risk of serving as a conduit for sensitive technologies to Iran to bolster their export controls to prevent sales of these technologies to Iranian entities.

JULY 26, 2010: The EU agrees to further sanctions against Iran. A statement issued by EU member state foreign ministers refers to the new sanctions as "a comprehensive and robust package of measures in the areas of trade, financial services,

energy, [and] transport, as well as additional designations for [a] visa ban and asset freeze."

SEPTEMBER 16, 2010: The Stuxnet computer virus is first identified by a security expert as a directed attack against an Iranian nuclear-related facility, likely the Natanz enrichment plant.

MAY 8, 2011: Iran's Bushehr nuclear power plant begins operations, according to Atomstroyexport, the Russian state-owned company constructing and operating the plant.

NOVEMBER 8, 2011: The IAEA releases a report detailing a range of activities related to nuclear weapons development in which Iran is suspected to have engaged as part of a structured program prior to 2004. The report raises concerns that some weapons-related activities occurred after 2003. The information in the report is based primarily on information received from other countries, but also includes information from the agency's own investigation.

DECEMBER 31, 2011: As part of the fiscal year 2012 National Defense Authorization Act, Congress passes legislation that will allow the United States to sanction foreign banks if they continue to process transactions with the Central Bank of Iran.

JANUARY 2012: The EU passes a decision that will ban all member countries from importing Iranian oil beginning July 1, 2012. Other provisions of the decision will prevent member countries from providing the necessary protection and indemnity insurance for tankers carrying Iranian oil.

APRIL 14, 2012: Iran meets with the P5+1 in Istanbul for talks both sides call "positive." They agree on a framework of continuing negotiations with a step-by-step process and reciprocal actions. The parties meet again in May, June and July.

AUGUST 10, 2012: The United States passes further sanctions legislation that prevents foreign banks from repatriating funds paid to Iran for oil purchases. The legislation also further targets individuals or entities that provide services to Iran's energy sector, help Iran evade sanctions, or transport Iranian oil.

OCTOBER 15, 2012: The EU approves further sanctions on limiting natural gas imports and on financial transactions between EU countries and Iranian banks.

FEBRUARY 25, 2013: Negotiations between Iran and the P5+1 resume in Almaty, Kazakhstan. The P5+1 proposal is based on the 2012 negotiations. The parties meet again in March and April before agreeing they are too far apart to keep negotiating.

JUNE 13, 2013: Hassan Rouhani, a former nuclear negotiator for Iran from 2003-2005, is elected the new president of Iran. Rouhani promises greater transparency in Iran's nuclear program in a speech following his election.

SEPTEMBER 26, 2013: Iranian Foreign Minister Mohammed Javad Zarif, who will lead the Iranian nuclear negotiating team, presents Rouhani's approach to the nuclear talks to the P5+1 on the sidelines of the UN General Assembly meeting in New York. Secretary of State John Kerry meets with Zarif after the presentation.

SEMPTEMBER 27, 2013: Obama and Rouhani speak by telephone about Iran's nuclear program, after which Obama tells reporters that he believes a nuclear deal can be reached.

OCTOBER 15–16, 2013: Iran and the P5+1 resume talks in Geneva. The parties meet again November 7-10 and are joined by the Foreign Ministers.

NOVEMBER 11, 2013: Iran and the IAEA reach a framework for the agency to resolve its outstanding concerns about Iran's nuclear program, including its investigations in the possible military dimensions of Iran's past activities. An initial set of actions for Iran to take within the next three months is announced.

NOVEMBER 20–24, 2013: The P5+1 and Iran reach a first-phase agreement, known as the Joint Plan of Action, that halts Iran's nuclear progress, rolls-back its capabilities in some areas, and increases IAEA monitoring, in exchange for limited sanctions relief. The deal will last six months.

JANUARY 9–12, 2014: After two rounds of meetings in December, the P5+1 and Iran reach an agreement on the implementation of the Joint Plan of Action and agree to begin on January 20.

JANUARY 20, 2014: Implementation of the first-phase agreement begins. The IAEA confirms that Iran has taken the necessary actions to limit and roll back aspects of its nuclear program and the United States and the European Union announce the sanctions waivers as specified by the deal.

FEBRUAY 9, 2014: Iran and the IAEA meet to discuss further actions for Iran to take under the November 11 framework agreement to resolve the agency's concerns about Iran's nuclear program. They agree on additional actions, including Iran's past work on exploding bridgewire detonators, one of the past activities with possible military dimensions.

FEBRUARY 17–20, 2014: Negotiations between Iran and the P5+1 on the comprehensive agreement begin in Vienna. The parties agree on an agenda and framework to guide the talks. They meet again in March, April, May and June.

MAY 21, 2014: Iran and the IAEA announce an additional five actions for Iran to complete before August 25. Two of the activities that Iran agrees to provide information on relate to possible military dimensions.

JULY 2–19, 2014: Iran and the P5+1 continue talks in Vienna on a comprehensive nuclear agreement. Early on June 19, the parties announce that they will extend the talks through November 24 and keep the measures agreed to in the interim agreement in place. The parties also announce additional actions that both sides will take.

AUGUST 25, 2014: Iran misses a deadline to complete two actions on five areas of concern to the IAEA as part of the agreement that Iran and the agency reached in November 2013.

NOVEMBER 24, 2014: After multiple rounds of talks in September, October, and November, Iran and the P5+1 announce that negotiations will be extended. The parties announce that they now aim to reach a political agreement by March and then complete the technical annexes by June 30. Both sides will continue to implement the conditions of the interim Joint Plan of Action from November 2013. Iran and the P5+1 also make additional commitments.

MARCH 3, 2015: Prime Minister Netanyahu delivers a speech to a joint session of Congress. His speech claims that the Iran deal "would all but guarantee that Iran gets [nuclear] weapons, lots of them."

MARCH 9, 2015: Senator Tom Cotton and 46 other senators sign an open letter to the Parliament of Iran. The letter warns that any deal reached without legislative approval could be revised by the next president "with the stroke of a pen."

APRIL 2, 2015: After meetings in January, February, and March, Iran and the P5+1 announce agreement on a general framework that outlines the broad parameters of a nuclear deal. The United States issues a more specific factsheet on the details. Iran and the P5+1 agree to continue meeting to finalize a deal before June 30.

MAY 12, 2015: President Obama signs the Iran Nuclear Agreement Review Act, allowing Congress a vote on the final deal.

JUNE 26, 2015: Secretary Kerry flies to Vienna for the last round of negotiations with the P5+1 and Iran. Between June 26-July 14 various foreign ministers from the P5+1 fly in and out of Vienna to meet with Kerry and Zarif.

JULY 3, 2015: IAEA Director General Yukiya Amano flies to Tehran to meet with Iranian leadership on the IAEA's investigation into the PMDs and discuss monitoring and verification in a final nuclear deal.

JULY 14, 2015: Iran and the P5+1 reach the Joint Comprehensive Plan of Action (JCPOA). Iran and the IAEA also announce a "roadmap" for resolving the agency's outstanding concerns.

JULY 19, 2015: The Obama administration submits the nuclear deal plus its supporting verifications and assessments to the U.S. Congress. This starts the 60-day congressional review period. Congress must vote to approve or disapprove of the deal by Sept. 17. Obama than has 12 days to veto the legislation, followed by a 10-day congressional period to review the text of the deal.

JULY 20, 2015: The UN Security Council unanimously adopts a resolution endorsing the deal and setting up a mechanism to lift and reimpose sanctions

in the event of a violation. With the passage of the resolution, under the terms of the JCPOA the agreement will be adopted in 90 days.

JULY 21, 2015: Zarif presents the nuclear deal to the Iranian parliament. The parliament moves to review the bill and put in place a committee to approve the deal.

AUGUST 15, 2015: Iran must provide the IAEA with information and access to resolve its past concerns about nuclear weaponization work under the July 14 Iran-IAEA "roadmap."

SEPTEMBER 15, 2015: IAEA reviews Iran's information and asks any follow-up questions.

OCTOBER 15, 2015: Iran responds to the IAEA's request.

DECEMBER 15, 2015: The IAEA issues its assessment about the PMDs.

2016: When and if the IAEA verifies Iran has completed key nuclear-related commitments specified in the JCPOA, the agreement will be formally implemented.

The Arms Control Association (ACA), founded in 1971, is a national nonpartisan membership organization dedicated to promoting public understanding and support for effective policies to address the threats posed by the world's most dangerous weapons. Through its research, public education, and media outreach programs, including the monthly journal, *Arms Control Today*, ACA provides policy-makers, the press and the interested public with authoritative information, analysis and commentary on arms control proposals, negotiations and agreements, and related national security issues.

For well over a decade, the sensitive nuclear fuel-cycle activities of the Islamic Republic of Iran have been at the center of international concerns about the further spread of nuclear weapons.

On July 14, negotiators from the P5+1 (China, France, Germany, Russia, the United Kingdom, and the United States) and Iran secured a comprehensive nuclear agreement—the Joint Comprehensive Plan of Action (JCPOA)—which is designed to verifiably block Iran's pathways to nuclear weapons development and guard against a clandestine weapons program in exchange for sanctions relief.

This is the fourth and substantially revised edition of our "Solving the Iranian Nuclear Puzzle" briefing book. This volume includes

- **a summary of the history and status of Iran's nuclear program,**
- **a review of the impact and record of the 2013 interim agreement,**
- **a detailed summary and explanation of the JCPOA,**
- **answers to more than two-dozen frequently asked questions, and**
- **a summary of the Iran-IAEA work plan on verification and compliance issues.**

Our briefing book is intended to improve public and policymaker understanding of this complex agreement with far-reaching consequences for the nuclear nonproliferation regime and for international peace and security.

Arms Control Association
1313 L Street, NW, Suite 130
Washington, D.C. 20005
www.armscontrol.org